

*Australasian Lichenology*  
 Number 73, July 2013 ISSN 1328-4401



*Australasian Lichenology*  
 Number 73, July 2013 ISSN 1328-4401

The cosmopolitan *Physcia adscendens* is widely distributed in New Zealand and south-eastern Australia, especially on the bark of introduced ornamental and fruit trees, but also on diverse man-made materials, among them shadecloth, fenceposts, timber gates and siding, footpaths, concrete, and gravestones. Among its several distinctive traits are its long, pale marginal cilia and helmet-shaped soralia (seen here from the underside of the thallus).

1 mm 

CONTENTS

ADDITIONAL LICHEN RECORDS FROM AUSTRALIA

Archer, AW; Elix, JA (75) *Pertusaria platystoma*..... 2

Rogers, RW (76) *Pyrenothrix nigra*..... 4

ARTICLES

Kantvilas, G; Divakar, PK—New combinations in *Austroparmelina* (Parmeliaceae)....6

Elix, JA; Archer, AW—A new sorediate variety of *Pertusaria melanospora* (lichenized Ascomycota, Pertusariaceae)..... 8

Archer, AW; Elix, JA—*Anomalographis tulliensis*, a new species in the Australian Graphidaceae..... 10

Galloway, DJ; Vitikainen, O—Contributions to a history of New Zealand lichenology 4. Richard Helms (1842–1914)..... 12

Elix, JA; Kantvilas, G—New taxa and new records of *Buellia sensu lato* (Physciaceae, Ascomycota) in Australia..... 24

Elix, JA—New crustose lichen taxa (lichenized Ascomycota) from Australia..... 45

RECENT LITERATURE ON AUSTRALASIAN LICHENS ..... 54

**Additional lichen records for Australia 75.**

***Pertusaria platystoma* Malme**

**Alan W. Archer**

National Herbarium of New South Wales  
Mrs Macquaries Road, Sydney, N.S.W. 2000, Australia  
e-mail: alanw.archer@bigpond.com

**John A. Elix**

Research School of Chemistry, Building 33  
Australian National University, Canberra, A.C.T. 0200, Australia  
e-mail: John.Elix@anu.edu.au

**Abstract:** The corticolous species *Pertusaria platystoma* Malme (Pertusariaceae) is reported from northern New South Wales, the first record from Australia. The name *Pertusaria simulans* Malme is reduced to a synonym of *P. platystoma*.

A 2005 *Pertusaria* collection from New South Wales has been identified as *Pertusaria platystoma* Malme, a species not previously known from Australia. The specimen was identified from microscopic examination, secondary lichen products and comparison with the published description.

***Pertusaria platystoma* Malme, Ark. Bot. 28A(9), 12 (1936)** Fig. 1  
Type: Brazil, Matto Grosso, Corumbá, G.O.A. Malme 3918, 9.viii.1894; holotype: S.

*Pertusaria simulans* Malme, Ark. Bot. 28A(9), 19 (1936) non *P. simulans* Zahlbr., Denkschr. Akad. Wiss. Wien Math.-naturwiss. Kl. 104, 334 (1941); nom. inval. [= *P. otagoana* D.J. Galoway, New Zealand J. Bot. 21, 195 (1983)]  
Type: Brazil, Matto Grosso, Serra da Chapada, Buruti, G.O.A. Malme 3911, 17.vi.1894; holotype: S.

*Thallus* corticolous, off-white; surface dull, conspicuously tuberculate; *apothecia* verruciform, flattened-hemispherical, scattered or sometimes confluent, 0.8–1.5(–2) mm diam., *ostioles* black, 1(–2) per verruca; *ascospores* fusiform-ellipsoid, hyaline, smooth, 4 per ascus, 85–110 × 37–45 µm.

*Chemistry:* 4,5-dichlorolichexanthone, the only lichen compound present.

The species is characterized by the tuberculate thallus, asci with 4 ascospores and, in particular, the presence of 4,5-dichlorolichexanthone as the sole lichen compound present.

In his key to the species from Brazil, Malme differentiated *P. platystoma* from *P. simulans* by the verrucose rather than non-verrucose thallus (Malme 1936). Apart from that slight difference, the holotypes are identical; both contain 4,5-dichlorolichexanthone and have asci with four ascospores, which in the case of *P. simulans* are 78–100 µm long.

4,5-Dichlorolichexanthone is widely distributed in the genus *Pertusaria*, and it occurs in approximately 18% of the taxa whose chemistry has been reported (159 of 906); it does not occur in subgenus *Monomurata* (Archer 1997). In the majority of taxa, the xanthone is accompanied by other compounds such as depsidones (for example stictic, constrictic or norstictic acids) or depsides (2'-*O*-methylperlatolic, perlatolic, planaic or divaricatic acids).

Only three other corticolous taxa have 4,5-dichlorolichexanthone as their major lichen compound, namely *P. mundula* Müll.Arg., with 8 ascospores per ascus, 55–70 µm long, described from Brazil (Müller 1884), the Australian *P. irregularis* Müll.Arg., with 2 ascospores per ascus, 130–155 µm long (Müller 1895), and *P. rigida* Müll.Arg., with 8 ascospores per ascus, 65–80 µm long, from India (Müller 1893). *Pertusaria*

*subrosea* var. *octospora* Zahlbr., described from China (Zahlbruckner 1930), is a later synonym of *P. rigida* and also contains 4,5-dichlorolichexanthone as its sole lichen compound. *Pertusaria irregularis* also contains traces of 2,4,5-trichlorolichexanthone, and *P. rigida* contains additional traces of the 3- and 6-demethyl derivatives of 4,5-dichlorolichexanthone.

**SPECIMEN EXAMINED**

*New South Wales:* • Jacks Creek State Forest, 21 km SSW of Narrabri, 30°27'19"S, 149°43'26", 205 m alt., on *Allocasuarina* in *Eucalyptus-Callitris* woodland, J.A. Elix 45781, 10.v.2005 (CANB).

**References**

- Archer, AW (1997): The lichen genus *Pertusaria* in Australia. *Bibliotheca Lichenologica* 69, 5–249.  
Malme, GO (1936): *Pertusariae Expeditionis Regnellianae primae*. Ark. Bot. 28A(9), 1–27.  
Müller, J (1884): Lichenologische Beiträge XIX. *Flora* 67, 349–354.  
Müller, J (1893): Lichenes Manipurensis. *J. Linn. Soc. Bot.* 29, 217–231.  
Müller, J (1895): Lecanoreae et Lecideae Australienses. *Bull. Herb. Boissier* 3, 632–642.  
Zahlbruckner, A (1930): Lichenes, in Handel-Mazzetti, H. *Symbolae Sinica* 3, 1–254.



Fig. 1. *Pertusaria platystoma* Malme (Elix 45781, CANB).

**Additional lichen records for Australia 76.**  
***Pyrenothrix nigra* (Ascomycota: Pyrenothrichaceae)**

**Roderick W. Rogers**

Queensland Herbarium, Mt Coot-tha Rd, Toowong, Queensland 4068, Australia

**Abstract:** The filamentous, cyanophilic lichen *Pyrenothrix nigra* is reported for the first time from Australia. It was collected from bark in a rainforest in south-eastern Queensland.

Riddle (1917) described *Pyrenothrix nigra* from specimens collected in Florida. It is also known from New Zealand (Galloway 2007), and it has been tentatively reported from the Galapagos Islands (Bungartz *et al.* 2013). Now, the species, its genus and family are reported for the first time from Australia. A second species, the foliicolous *P. mexicana* Herrera-Campos, Huhndorf & Lücking, has been described from rainforest in Mexico.

***Pyrenothrix nigra*** Riddle, *Bot. Gaz.* **64**, 513 (1917)

Type: U.S.A., Florida: West Palm Beach, on shrub oaks, R. Thaxter, xii.1897 (holotype: FH *n.v.*).

*Thallus* corticolous, consisting of a loose tangle of threads, 1–5 cm diam.; individual threads composed of hyphae anastomosing around a central filament of the *Scytonema* photobiont c. 0.1 mm diam. and 10 mm long. Hyphae cellular, brown, forming an adnate sheath usually 1 cell thick, the cells somewhat swollen at the ends, often curved with a small gap between neighbouring cells. *Ascomata* black, perithecioid, pear-shaped, the neck short and ill-defined; ostiole apical. Perithecial wall of 1 or 2 layers of isodiametric cells; cell walls thick, pigmented. Hamathecium of long hyaline periphysoids that neither line the neck canal nor penetrate the hymenium. *Asci* fissitunicate, broadly clavate to almost globular, 1–, 8-spored. *Ascospores* submuriform, with 3–5 transverse septa and 0–1 longitudinal septa per segment, pale to dark grey-brown or black, 17–32 × 6–9 µm, slightly constricted at the transverse septa. *Pycnidia* not seen.

**Remarks**

*Pyrenothrix nigra*, a very inconspicuous and almost certainly overlooked lichen, is known from a single collection in south-eastern Queensland. Sterile specimens resemble early stage *Dictyonema* colonies in their anatomy, both having a *Scytonema* symbiont encased in a sheath of filamentous hyphae. However, *Dictyonema* has a blue sheen, whereas *Pyrenothrix nigra* is very dark brown or black.

This lichen has been illustrated by Tschermak-Woess (1983) and Herrera-Campos *et al.* (2005).

**SPECIMEN EXAMINED**

Queensland: • Mount Castle Lookout, Goomburra State Forest, 50 km NE of Warwick, 27°57'S, 152°23'E, on bark of a tree trunk in deeply shaded rainforest, R.W. Rogers 8738, 28.ix.1987 (BRI 689075).

**References**

Bungartz, F; Ziemmeck, F; Yáñez Ayabaca, A; Nugra, F; Aptroot, A (2013): CDF Checklist of Galapagos Lichenized Fungi – FCD Lista de especies de Hongos liquenizados de Galápagos. In: F.Bungartz, H.Herrera, P.Jaramillo, N.Tirado, G.Jiménez-Uzcátegui, D.Ruiz, A.Guézou & F.Ziemmeck (eds), *Charles Darwin Foundation Galapagos Species Checklist – List de Especies de Galápagos de la Fundación Charles Darwin*. Charles Darwin Foundation/Fundación Charles Darwin, Puerto Ayora, Galapagos: <http://checklists.Datazone.darwinfoundation.org/true-fungi/lichens/> Last updated 6 June 2013.

Galloway, DJ (2007): *Flora of New Zealand Lichens. Revised Second Edition including lichen-forming and lichenicolous fungi* 1486–1487. Manaaki Whenua Press, Lincoln.

Herrera-Campos, M; Huhndorf, S; Lücking R (2005): The foliicolous lichen flora of Mexico I: a new, foliicolous species of *Pyrenothrix* (Chaetothyriales: Pyrenothrichaceae). *Mycologia* **97**, 356–361.

Riddle, LW (1917): *Pyrenothrix nigra* gen. et spec. nov. *Botanical Gazette* **64**, 513–515.

Tschermak-Woess, E (1983): *Lichenothrix riddlei* is an ascolichen and also occurs in New Zealand – light and electron microscopical investigations. *Plant Systematics and Evolution* **147**, 299–322.

## New combinations in *Austroparmelina* (Parmeliaceae)

Gintaras Kantvilas

Tasmanian Herbarium, Private Bag 4, Hobart, Tasmania, Australia 7001

Pradeep K. Divakar

Departamento de Biología Vegetal II, Facultad de Farmacia, Universidad Complutense de Madrid, Plaza de Ramón y Cajal, Madrid 28040, Spain.

**Abstract.** The new combinations *Austroparmelina pallida* (Elix & Kantvilas) Kantvilas & Divakar comb. nov. and *Austroparmelina whinrayi* (Elix) Kantvilas & Divakar comb. nov. are proposed.

### Introduction

Ongoing reappraisal of the classification of the Parmeliaceae using molecular characters (e.g. Blanco *et al.* 2004, 2005; Crespo *et al.* 2010a; Divakar *et al.* 2006, 2010, 2012) recently led to the description of a new genus, *Austroparmelina* (Crespo *et al.* 2010b). That genus has an Australasian-southern African distribution, and includes species formerly placed in the genera *Parmelina* Hale and *Canoparmelia* Elix & Hale. The former is now restricted to the Northern Hemisphere, whereas the latter is more widespread.

*Austroparmelina* is characterized by a grey, foliose thallus of sublinear to irregular lobes, short, simple rhizines, relatively large ascospores (9–18 × 4–8 µm) with a thick perispore, and a chemistry dominated by orcinol depsides such as lecanoric and gyrophoric acids (Crespo *et al.* 2010b). It includes some of the most characteristic and widespread Australian lichens, such as *A. pseudorelicina* (Jatta) A.Crespo, Divakar & Elix, which is a common epiphyte in forest and woodland in cooler, moister habits, *A. pruinata* (Müll.Arg.) A.Crespo, Divakar & Elix, common on twigs in drier woodland and mallee, and *A. labrosa* (Zahlbr.) A.Crespo, Divakar & Elix, which is found on bark and rocks.

Two rare Tasmanian endemic species of *Parmelina* were not included in the molecular study by Crespo *et al.* (2010b). Subsequent attempts to extract DNA from existing specimens, all of which are in excess of ten years old, were unsuccessful, as were efforts to obtain new, fresh collections. Nevertheless, there seems no doubt that they belong in *Austroparmelina*, especially when their morphological and geographical affinities with other species of the genus are considered. Accordingly, new combinations are introduced here.

### Taxonomy

1. ***Austroparmelina pallida*** (Elix & Kantvilas) Kantvilas & Divakar comb. nov.  
MB804965

Basionym: *Parmelina pallida* Elix & Kantvilas, *Australasian Lichenology* 49: 12 (2001). Type: Tasmania, South Arm, Fort Direction Road, 43°02'S, 147°25'E, c. 50 m alt., on *Allocasuarina verticillata* in degraded, dry, open woodland on roadside, 12 February 2001, G. Kantvilas 165/01 (HO – holotype).

This isidiate species is similar to the common and widespread *A. conlabrosa* (Hale) A.Crespo, Divakar & Elix, from which it differs chiefly by having a pale tan (instead of black) underside (see Elix & Kantvilas 2001, Kantvilas *et al.* 2002). Several searches near the type locality failed to find the species again, and the tree from which the type specimen was collected has since been felled and removed.

2. ***Austroparmelina whinrayi*** (Elix) Kantvilas & Divakar comb. nov.  
MB804966

Basionym: *Canoparmelia whinrayi* Elix, *Mycotaxon* 47: 105 (1993); *Parmelina whinrayi* (Elix) Kantvilas & Elix, *Australasian Lichenology* 49: 14 (2001). Type: Tasmania, west of the road from Marawah to the Arthur River, SSE of West Point, 1 February 1969, J.S. Whinray (MEL – holotype).

This sorediate species is very similar to *A. labrosa*, from which it differs solely by having a pale brown (instead of black) undersurface (Elix 1993; 1994; Kantvilas *et al.* 2002). It is known from only three widely separated coastal localities, where it was collected from the bark of trees and shrubs. Nowhere was it common.

### References

- Blanco, O; Crespo, A; Divakar, PK; Elix, JA; Lumbsch, HT (2005): Molecular phylogeny of parmotretooid lichens (Ascomycotina, Parmeliaceae). *Mycologia* 97, 150–159.
- Blanco, O; Crespo, A; Elix, JA; Hawksworth, DL; Lumbsch, HT (2004): A molecular phylogeny and a new classification of parmelioid lichens containing *Xanthoparmelia*-type lichenan (Ascomycota, Lecanorales). *Taxon* 53, 959–975.
- Crespo, A; Kauff, F; Divakar, PK; del Prado, R; Pérez-Ortega, S; Amo de Paz, G; Ferencova, Z; Blanco, O; Roca-Valiente, B; Nunez-Zapata, J; Cubas, P; Arguello, A; Elix, JA; Esslinger, TL; Hawksworth, DL; Millanes, A; Molina, MC; Wedin, M; Ahti, T; Aptroot, A (2010a): Phylogenetic generic classification of parmelioid lichens (Parmeliaceae, Ascomycota) based on molecular, morphological and chemical evidence. *Taxon* 59, 1735–1753.
- Crespo, A; Ferencova, Z; Pérez-Ortega, S; Elix, JA; Divakar, PK (2010b): *Austroparmelina*, a new Australasian lineage in parmelioid lichens (Parmeliaceae, Ascomycota). *Systematics and Biodiversity* 8, 209–221.
- Divakar, PK; Crespo, A; Blanco, O; Lumbsch, HT (2006): Phylogenetic significance of morphological characters in the tropical *Hypotrachyna* clade of parmelioid lichens (Parmeliaceae, Ascomycota). *Molecular Phylogenetics and Evolution* 40, 448–458.
- Divakar, PK; Lumbsch, HT; Ferencova, Z; Del Prado, R; Crespo, A (2010): *Remototrachyna*, a newly recognized tropical lineage of lichens in the *Hypotrachyna* clade (Parmeliaceae, Ascomycota), originated in the Indian subcontinent. *American Journal of Botany* 97, 579–590.
- Divakar, PK; Del Prado, R; Lumbsch, HT; Wedin, M; Esslinger, TL; Leavitt, SD; Crespo, A (2012): Diversification of the newly recognized lichen-forming fungal lineage *Montanelia* (Parmeliaceae, Ascomycota) and its relation to key geological and climatic events. *American Journal of Botany* 99, 2014–2026.
- Elix, JA (1993): New species in the lichen family Parmeliaceae (Ascomycotina) from Australia. *Mycotaxon* 47, 101–129.
- Elix, JA (1994): Parmeliaceae. *Flora of Australia* 55, 1–360.
- Elix, JA; Kantvilas, G (2001): Two new species of Parmeliaceae (lichenized Ascomycotina) from Tasmania. *Australasian Lichenology* 49, 12–15.
- Kantvilas, G; Elix, JA; Jarman, SJ (2002): *Tasmanian Lichens Identification, Distribution and Conservation Status I Parmeliaceae*. Flora of Australia Supplementary Series 15, Australian Biological Resources Study, Canberra.

**A new sorediate variety of *Pertusaria melanospora*  
(lichenized Ascomycota, Pertusariaceae)**

**John A. Elix**

Research School of Chemistry, Building 33  
Australian National University, Canberra, A.C.T. 0200, Australia  
email: John.Elix@anu.edu.au

**Alan W. Archer**

National Herbarium of New South Wales  
Mrs Macquaries Road, Sydney, N.S.W. 2000, Australia  
email: alanw.archer@bigpond.com

**Abstract:** *Pertusaria melanospora* var. *sorediata* Elix & A.W.Archer is described as new to science. It differs from var. *melanospora* in having a sorediate upper surface.

The lichen *Pertusaria melanospora* Nyl. var. *melanospora* is widespread and common on siliceous coastal rocks in southern Australia (South Australia, New South Wales and Victoria) (Archer 2007), and is also known from South Africa, New Zealand and South America. It is characterized by the saxicolous habit, the pale yellow to yellow-brown thallus that lacks isidia and soredia, verruciform apothecia with conspicuous black ostioles that become pseudolecanorine, 8-spored asci, coloured ascospores (pale blue-grey or brown, or more rarely colourless) and by the presence of arthothelin. We have now discovered a sorediate variety of the species, which is described below.

***Pertusaria melanospora* var. *sorediata* Elix & A.W.Archer, var. nov.** Fig. 1  
MB 804341

*Pertusaria melanosporae* similis sed superfice sorediatis differt.

**Type:** Australia, South Australia, Kangaroo Island, Cape St Albans, 35°48'S, 138°07'E, 20 m alt., on laterite in pasture, *G. Kantvilas* 176/10, 24.ix.2010 (holotype – HO, isotype – AD).

**Thallus** crustose, ±continuous, areolate, buff-yellow to yellow-brown, epruinose, matt, smooth, pustular-sorediate, to 10 cm wide and 0.3 mm thick; individual areoles crowded, plane to weakly convex or concave, 0.1–0.5 mm wide; prothallus white, surrounding the thallus or absent; **soredia** granular, initiated at the margins of the areoles in pustules that soon becoming abraded, at length spreading across the thallus; soredia granules 40–60 µm wide, becoming partially corticate with age; upper cortex 20–25 µm thick; photobiont layer 50–75 µm thick, with individual cells 7–15 µm wide; medulla white, 125–150 µm thick, no calcium oxalate (H<sub>2</sub>SO<sub>4</sub>-), I-. **Apothecia** absent to conspicuous, verruciform, immersed or flattened-hemispherical with a constricted base, concolorous with thallus, becoming pseudolecanorine, 1 per verruca, 0.2–0.5 mm wide. **Ascospores** 8 per ascus, irregularly biseriate, ellipsoidal, smooth, colourless or pale bluish grey or brown, 60–75 × 30–37 µm. **Pycnidia** not seen.

**Chemistry:** Thallus K-, C+ yellow-orange, P-, UV+ dull orange; containing arthothelin (major), 4,5-dichloronorlichexanthone (trace), 2,5-dichloronorlichexanthone (trace), ±2,4-dichloronorlichexanthone (trace), ±thiophanic acid (trace), ±atranorin (trace).

**Etymology:** The varietal name derives from the lichen's sorediate upper surface.

**Remarks**

In colour and chemistry the new variety is identical to *Pertusaria melanospora* var. *melanospora*, but it can be readily distinguished by the sorediate upper surface.

*Pertusaria melanospora* var. *sorediata* is known from coastal and hinterland rocks in southern and eastern Australia, Tasmania and New Zealand. Commonly associated species include *Buellia halonia* (Ach.) Tuck., *B. homophylla* (C.Knight) Zahlbr., *B. stellulata* (Taylor) Mudd, various *Caloplaca* species, *Carbonea latypizodes* (Müll.Arg.) Knoph & Rambold, *Paraporpidia leptocarpa* (C.Bab. & Mitt.) Rambold & Hertel, *Parmotrema*

*reticulatum* (Taylor) M.Choisy, *Pertusaria xanthoplaca* Müll.Arg., *Tephromela atra* (Huds.) Hafellner, *Xanthoparmelia australasica* D.J.Galloway, *X. mougeotina* (Nyl.) D.J.Galloway and *X. tasmanica* (Taylor) Hale.

**SPECIMENS EXAMINED**

**AUSTRALIA. South Australia:** • Winter Hill, 4 km NW of Port Lincoln, 34°42'S, 135°50'E, 235 m alt., on granite rocks in grassland, *J.A. Elix* 71717A, 41718, 21.ix.1994 (CANB); • Kangaroo Island, Hog Bay, 3 km E of Penneshaw, 35°43'S, 137°57'E, 15 m alt., on exposed coastal rocks in grassland, *H. Streimann* 54865, 54868, 27.ix.1994 (AD, CANB). **New South Wales:** • Nundera Point, 1 km NE of Kioloa, 35°33'S, 150°24'E, 1 m alt., on granite rocks along the foreshore, *J.A. Elix* 22946, 22950, 3.xi.1989 (CANB); • Limestone Valley Creek, 9 km NE of Canowindra, 33°29'S, 148°46'E, 680 m alt., on weathered sandstone rocks in pasture, *J.A. Elix* 23392, 6.xii.1989 (CANB); • Shell Beach, 2 km N of Kioloa, 35°32'41''S, 150°22'50''E, 1 m alt., on exposed coastal rocks, *J.A. Elix* 45639, 16.ix.2008 (CANB).

**Australian Capital Territory:** • Shepherds Lookout, above the Murrumbidgee River, 15.5 km W of Canberra, 35°15'S, 148°58'E, 550 m alt., on porphyry rocks on dry hillside with scattered *Callitris endlicheri*, *J.A. Elix* 26719, 10.iv.1992 (CANB).

**Tasmania:** • Cockle Bay Lagoon, 42°42'S, 147°56'E, 1 m alt., on dolerite cobbles along sea shore, well above high tide mark, *G. Kantvilas* 218/11, 24.vii.2011 (HO); • Spiky Bridge, 42°11'S, 148°04'E, 60 m alt., in sheltered crevices of dolerite outcrops in coastal pasture, *G. Kantvilas* 225/11, 11.viii.2011 (CANB, HO).

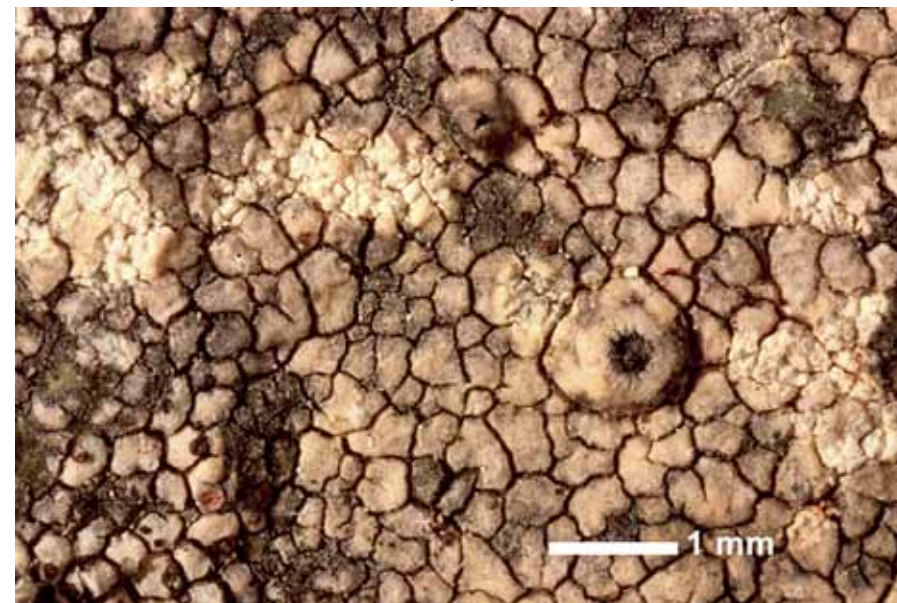
**NEW ZEALAND.** • South Island, Cable Bay, 17 km NE of Nelson, 39°09'S, 173°24'E, ca. 4 m alt., on coastal rocks, *A.W.Archer* P795, 16.xi.1995 (BAFC, BCC, NSW).

**Acknowledgement**

We thank Dr G. Kantvilas (HO) for the loan of specimens and for helpful discussion.

**Reference**

Archer, AW (2004): Pertusariaceae. *Flora of Australia* 56A, 116–172.



*Pertusaria melanospora* var. *sorediata* (A.W. Archer P795 in NSW).

*Anomalographis tulliensis*, a new species in the Australian Graphidaceae

Alan W. Archer

National Herbarium of New South Wales, Mrs Macquaries Road,  
Sydney, N.S.W. 2000, Australia  
e-mail: alanw.archer@bigpond.com

John A. Elix

Research School of Chemistry, Building 33  
Australian National University, Canberra, A.C.T. 0200, Australia  
e-mail: John.Elix@anu.edu.au

**Abstract:** *Anomalographis tulliensis* is described as new to science. The new species is the first report of the genus in Australia.

The most recent account of the Australian Graphidaceae (Archer 2009) contains descriptions of 19 genera. In this paper we describe a new species of *Anomalographis* Kalb, namely *A. tulliensis* A.W.Archer & Elix, the first record of this genus in Australia.

**Anomalographis tulliensis** A.W.Archer & Elix, sp. nov. MB 804577

Fig. 1

Similar to *Anomomorpha subtorquens* (Nyl.) Staiger, but differs in having monoseptate ascospores that are colourless in iodine, a non-inspersed hymenium and in lacking lichen substances.

Type: Queensland: Tully Falls Weir, 28 km S of Ravenshoe, 17°46'36"S, 145°33'51"E, alt. 620 m, on base of tree in submontane rainforest, J.A. Elix 44749, 7.viii.2006 (holotype – CANB; isotype – BRI).

*Thallus* pale greyish white, corticolous, upper surface finely soresiate; *apothecia* lirelliform, numerous, sometimes crowded, white, semi-immersed to sessile, usually simple, straight, curved or sinuous; lips closed, 0.5–1(–1.5) mm long, 0.1–0.25 mm wide; exciple not carbonized, inconspicuous; hymenium 60–80 µm tall, not inspersed; *ascospores* 8 per ascus, ellipsoid, irregularly 1-seriate, hyaline, 1–, 1-septate, 6–8 × 3–4 µm. *Chemistry*: no lichen substances detected.

*Etymology*: the epithet *tulliensis* is derived from Tully Falls and *-ensis*, place of origin.

**Notes:** The lichen genus *Anomalographis* Kalb was created to include *Graphis madeirensis* Tavares, an unusual "*Graphis*" species with 1-septate ascospores (Kalb & Hafellner 1992). The genus is characterised by lirelliform apothecia, a non-carbonized exciple, a non-inspersed hymenium and hyaline, 1–, 1-septate ascospores. Four genera in the Graphidaceae superficially resemble *Anomalographis*, viz. *Acanthothecis* Clem., *Anomomorpha* Nyl., *Carbacanthographis* Staiger & Kalb and *Gymnographopsis* C.W. Dodge, but all are variously distinct. Thus, the ascospores in *Acanthothecis* are usually longer than 20 µm and are muriform or multilocular. The ascospores of *Anomomorpha* can be less than 10 µm long, but they react I+ blue, and the hymenium is inspersed. The *Carbacanthographis* exciple is completely carbonized, and the ascospores in *Gymnographopsis* are muriform. Superficially, *A. tulliensis* resembles *Anomomorpha subtorquens*, but that species differs in containing neotricone, in having an inspersed hymenium, and in having submuriform ascospores that react blue in iodine. The saxicolous *Anomalographis madeirensis* (Tavares) Kalb contains norstictic acid (Staiger 2002), in contrast to *A. tulliensis*, which is corticolous and lacks lichen compounds.

At present this new species is known only from the type collection. Associated species include *Baculifera micromera* (Vain.) Marbach, *Herpothallon echinatum* Aptroot, Lücking & Will-Wolf, *Pertusaria velata* (Turner) Nyl., *Phyllopsora buettneri* (Müll.Arg.) Zahlbr., *Porina eminentior* (Nyl.) P.M.McCarthy and *Usnea baileyi* (Stirt.) Zahlbr.

**References**

Archer, AW (2009): Graphidaceae. *Flora of Australia* 57, 84–194.  
Kalb, K; Hafellner, J (1992): Bemerkenswerte Flechten und lichenicole Pilze von der Insel Madeira. *Herzogia* 9, 45–102.  
Staiger, B (2002): Die Flechtenfamilie Graphidaceae. *Bibliotheca Lichenologica* 85, 85–88.



Fig. 1. *Anomalographis tulliensis*, holotype (CANB); bar = 1 mm

Contributions to a history of New Zealand lichenology 4\*.  
Richard Helms (1842–1914).

David J. Galloway  
Landcare Research, Private Bag 1930, Dunedin 9054, New Zealand  
e-mail: gallowayd@xtra.co.nz

Orvo Vitikainen  
Botanical Museum, Finnish Museum of Natural History, PO Box 7, FIN-00014  
University of Helsinki, Finland

\* Part 3 was published in *Australasian Lichenology* 46, 7–17 (2000).

### Introduction

Richard Helms, the son of Frederick Helms, a Lutheran minister, and his wife Caroline, was born in Altona (Holstein) near Hamburg in Germany on 12 December, 1842. He immigrated to Melbourne in 1858, where he worked as a tobacconist. In 1862 he moved to Dunedin, where he turned to dentistry and watchmaking. He returned to Melbourne again, but in 1872 he was settled in Greymouth, where he set up business as a watchmaker and jeweller. In 1876 he was working in Nelson as a dentist, but by 1878 he was back in Greymouth again as a watchmaker, and in that year he married a widow, Sarah Ann Elder, by whom he had two daughters (Hedley 1915; Godley 2001). He left Greymouth late in 1888 to become a collector for the Australian Museum in Sydney, and for the rest of his life he lived and worked in Australia, earning a reputation as "...one of the most versatile and diligent natural scientists in Australia" (Hedley 1915; Alexander 1916; Maiden 1922; Chisholm 1972).

From his Greymouth base, Helms quickly established himself as an acute and zealous natural history collector (Hedley 1915; Weidner 1967; Chisholm 1972; Godley 2001). His interests were wide: birds, plants of all kinds, shells and insects. By the early 1880s he was specifically thanked by F.W. Hutton FRS (1836–1905) as both a friend and a knowledgeable collector of land snails (Hutton 1883, 1884a, 1884b). His collections and discoveries in New Zealand entomology were many and notable, including bees (Cameron 1898) and beetles (see Skelley & Leschen 2007), and in 1882 in the Paparoa Range he discovered the rare, monospecific Forest Ringlet butterfly, *Dodonidia helmsii*, now endangered, which was named in his honour (Fereday 1883; Butler 1884). Through his younger brother Alwin in Hamburg, who operated as a dealer in natural history objects (Sayre 1975), Richard Helms' natural history collections from the environs of Greymouth and the Paparoa Range to the north of the town reached both museums and private collectors in Europe and Great Britain, and in surprisingly large numbers.

In Britain, the wealthy collector James Cosmo Melvill (1845–1929), who had a vast herbarium of plants (said to number some 500,000 specimens) as well as major collections of molluscs, butterflies, moths, beetles and bees, added many Richard Helms specimens to his holdings (in effect a private museum). Melvill came from a privileged background, and began collecting natural history objects as a child. In 1904, he gifted his large collections to Owen's College Manchester, now Manchester University (Melvill 1904; Weiss 1930). From Melvill's collection, the Manchester entomologist Peter Cameron described five new species of Hymenoptera between 1887 and 1889 from Greymouth collections made by Helms. In 1898, in a paper recording 64 species from Greymouth, he made the following observations:

"...The species of Hymenoptera enumerated and described in this paper were collected in the vicinity of Greymouth, New Zealand by the late Mr. Richard Helms [Helms died in 1914!] whose assiduous labours have added so much to our knowledge of the Insect Fauna of New Zealand, and who, after his departure therefrom, did equally good work in investigating the Natural History of Australia...I am

certain that, if the islands were to be again explored by a naturalist of the caliber of Mr. Helms, the list might easily be doubled, particularly if unworked localities were investigated..." (Cameron 1898).

Helms also regularly sent material to the British entomologist David Sharp FRS (1840–1922), who described many new taxa from near Greymouth. It was an important link for Helms, and in an obituary of Sharp, the New Zealand entomologist G.V. Hudson (1867–1946) wrote:

"...From early in the "seventies" of last century until about the year 1888 he was in constant correspondence with that indefatigable collector the late Mr. R. Helms, of Greymouth, and as a result of the joint labours of these two naturalists some of our most conspicuous and remarkable beetles were first made known to science..." (Hudson 1923).

In an obituary of Helms, Charles Hedley observed:

"...He was one of a type, now vanishing, of keen, self-taught, field naturalists...who did such excellent work in the past generation. The whole range of natural science attracted him; in botany, zoology, geology, and ethnology, he was equally interested and of these his knowledge was encyclopaedic. In the field he was an expert hunter, handy with tricks and traps and having the wisdom of a savage as to where a bird would nest or a beetle burrow. Quite careless of hardships, such as cold, hunger, or fatigue, he would explore alone in the roughest country..." (Hedley 1915).

An acknowledged collector of zeal and purpose in New Zealand entomology and conchology, Helms was equally skilled as a collector in several areas of botany (Godley 2001), including ferns, liverworts, mosses and, as we shall see, lichens. Apart from a few lichens collected in Fiordland by Dr David Lyall (1817–1895) during the *Acheron* survey of 1847–1851 (Babington 1855), Richard Helms' Westland lichens were the first major 19th century collection from the West Coast of South Island, and as such deserve to be better known and acknowledged. The present note is therefore offered as a contribution to knowledge of an extraordinarily versatile natural history collector who, in a decade (1878–1888), collected, discovered, published on (Helms 1883a-c) and traded Westland's biota to the rest of the world.

### Richard Helms, Ferdinand Arnold and Hugo Lojka: circulating Greymouth lichens to the world

In the 19th century, a common way to promote interest in the developing field of lichenology, largely at first within the Northern Hemisphere, was in the production and issuing of exsiccatae, collections of dried lichens (usually in fascicles of 50 numbers) from a particular region, accurately determined by a recognized authority (see Sayre 1969). Greymouth lichens collected by Richard Helms in 1886 comprise numbers 1209, 1210, 1214, 1215, and 1240 of Ferdinand Arnold's (1828–1901) *Lichenes Exsiccati*, circulated in 1887 or 1888 (Sayre 1969: 113). That exsiccata was one that Charles Knight also contributed to, as he did to the *Lichenotheca Universalis*, fasc. III (1886) of the Hungarian lichenologist Hugo Lojka (1844–1887) (Galloway 2013a). In the Nylander Archive held in the University Library in Helsinki are several letters from Lojka that give valuable information on Helms' New Zealand lichen collections, and of William Nylander's (1822–1899) part in determining those collections. In 1885 Lojka began issuing sets of lichen exsiccatae under the title *Lichenotheca Universalis* (Sayre 1969: 141). According to Willey (1887), Lojka:

"...had projected the issue of a series of specimens illustrating the lichen flora of the earth. He had enlisted as contributors a large number of botanists and collectors, and had issued five fascicles of fifty numbers each, and had others in preparation, when his death, which occurred Sept 7th of this year, after a painful illness, has, it is to be

feared, put an end to this important undertaking. The parts of the world chiefly represented in the fascicles already issued, are: Europe, Southern Africa, North America, New Holland and New Zealand... The classification and nomenclature of this collection is that of Nylander, ... At least three sets of this collection, of which we suppose that only from twenty five to thirty have been issued, have been sent to this country, one of them to the Smithsonian Institution, while the others are in private hands..."

For New Zealand, Lojka first secured impressive collections of mainly Wellington lichens from Charles Knight, the recently retired Auditor General (Galloway 2013a), and he also availed himself of the service offered by Helms' younger brother, Alwin Helms, to obtain further specimens from New Zealand. Most likely too, Ferdinand Arnold obtained his Greymouth lichens for his exsiccatae from the same source. In 1881, Alwin Helms placed an advertisement in the Dresden botanical journal *Hedwigia*, offering at "reasonable" rates, fine examples of New Zealand plants, including ferns, lycopods, algae, lichens and mosses (Helms 1881). Seven years later in the same journal (Helms 1888) he was much more explicit, advertising five different plant collections for sale on behalf of his brother in Greymouth: "...offerirt folgende von Herrn Richard Helms in Greymouth auf Neuseeland, Südinsel, hergestellte Sammlungen" The mosses, determined by Karl Müller of Halle, were priced at 30–40 marks for 70 specimens; liverworts determined by Stephani from Leipzig were priced at 15 marks for 24 specimens; ferns and lycopods were priced at 40–75 marks for 113 specimens, and single specimens of the above classes plus algae were all priced at 50 pfennigs. No mention is made of lichens, presumably because Lojka was taking all that Richard Helms could supply for his 25–30 sets of *Lichenotheca Universalis*. Extant letters from Lojka to Nylander show that Lojka was optimistic at obtaining a good supply of New Zealand lichens from Richard Helms through his brother Alwin in Hamburg, but he also complained of the high charges imposed by Alwin Helms.

On 9 February, 1887, Lojka wrote:

"...Honoured Sir  
I could get Dr. Richard Helms, from Greymouth, New Zealand to collect lichens there for me. Now I have received from him a large delivery of lichens unfortunately for a lot of money. Amongst them are some very beautiful *Sticta* species but also some bark lichens, but strangely enough hardly any *Graphidei*. About 18 specimens will be sufficient according to the number of specimens for my "Lichenotheca". I would like to give 5 specimens to Arnold. I dare to ask you whether you would be disposed to identify these. At present I am busy sorting them and will number everything. There should be more than 100 numbers. Helms did not add any labels or other notes. The material would make for you a nice little publication. According to my knowledge there is very little known about the isle of Greymouth. I would take the liberty, although my means are modest, to offer you a small fee of 100 francs which seems insignificant for your trouble. As not all specimens are duplicates, I would please ask you to return those specimens that are for my herbarium, through M. Abbe Hue. I will send you one specimen of each species where there are duplicates. By the way Mr. Helms has asked for return of the collections and he is keen to re-collect what I need..."

Obviously Nylander accepted Lojka's offer of a fee for providing identifications as Lojka's letter of 17 February, 1887, shows:

"...Honoured Sir  
I am very pleased that you accept my request and I assure you in advance of my gratitude. The New Zealand specimens are extraordinarily beautiful and ample except for those where there is little material. I

will send the specimens for my herbarium to you so that you can do the identifications more easily. I have just completed their curation. Now I must number the specimens. If you don't mind uplifting the specimens from the Customs Office I will address them directly to you. I will place together individual genera in a separate envelope to make it easier for you. When arranging the species I may have taken some species two or three times for something else as happens when you do not know the species. About 20 numbers will be sufficient for a Lichenotheca. Especially *Sticta latifrons*, *menziesii*, *filix*, *Cladina retipora*, *Lec. russula*, *Sticta physciospora*, *Lecanora gelidea* etc..."

On 22 February, Lojka wrote again to explain further to Nylander his progress with arranging Helms' collections:

"...I am working on the New Zealand specimens but I am otherwise very busy so the work continues very slowly. At present I have completed 83 "numbers" of the Stictaceae, but these might represent 30–35 species at most. Unfortunately I don't know the Lindig collection, though I think it unlikely that you will have seen more beautiful gatherings. That is to say the material is copious and I have reserved the most beautiful and magnificent specimens for my own herbarium. I think you will enjoy identifying these collections, and that this will give you the opportunity of writing an independent work on them such as yours on St Thome [a reference to Nylander (1886)], only more extensive. The specimens are numbered and in their packets. As well, each specimen has a numbered slip of paper which you can use for your notes, to arrange the species systematically, and which you can then use for the arrangement of your manuscript. Please return the paper slips together with the specimens.

As I want to keep 25 of the New Zealand species for my Lichenotheca, and to send back one specimen of each species to Dr. Helms and as I also could manage such species for my Lichenotheca which until now are not available in sufficient numbers, you would do me a great favour if you could deal with the "Helmsiana" first. Helms could become a real support for the Lichenotheca. Of course he needs to beware of certain things. He has, for example, not collected a single *Ramalima* and hardly any *Graphideae*. I will ask him to pay more attention to smooth-barked trees and evergreen leaves. Unfortunately his collections are extremely expensive. Part of the "bark" lichens he seems to have taken from his firewood. "Stone" lichens are his weakest part, and he has gathered mainly round pebbles with *Lecanora gelida* and *perrugosa*, as well as *Byssus iolithus* [*Trentepohlia*]. About 15 kg of stones made up very little. I hope I may be able to pack and send everything in two days time. Unfortunately the thick paper packets make the parcels very voluminous but hopefully they will stand the test by protecting the specimens from ruin..."

On 3 March, 1887, Lojka wrote:

"...I must keep this Dr. Helms a bit dependent on me otherwise he will do business off his own bat instead of delivering to me the desired specimens for the Lichenotheca. Can you buy maps of Fuegia and New Zealand or should I send you these? There is nothing written in Ritter's "Geographical Lexicon" about Greymouth. Alwin Helms from Hamburg wrote to me that Greymouth is situated on the West Coast of the South Island, opposite of Christchurch and Blenheim, so that the three cities form a triangle..."

A fortnight later, on 25 March, 1887, Lojka observed:



“...According to my knowledge Helms is a citizen of Hamburg and seems to be a very clever man. He is living in Greymouth and has family there. He collects extraordinary shells, and also birds, skeletons, insects, butterflies, ferns, phanerogams and mosses. The collections are sold for horrendous prices by his brother Alwin in Hamburg. Alwin Helms seems to be a tradesman. Actually I have converted Richard Helms to the lichens, after I had seen some “Stictas” from him. Saxicolous lichens he doesn’t manage very well. He has not collected anything on leaves and on all those various shrubs à la Rhododendron which grow there in the Paparoa Mountains. I wrote directly to him last week. Later he will receive a “type collection” and he should then collect good things for the Lichenotheca...Hartmann has written too, that he wants to send me a box of lichens. I write this name the way he writes it himself. He has been to New Guinea but he was shipwrecked during the last night of the return journey on the coast of New Zealand and he has lost all his collections. He was a wealthy man but he has now lost his money and has to work to keep his family alive. Mr Knight knows him well...”

On 12 June, 1887, Lojka wrote to Nylander about succumbing to illness, and in two further letters (13 and 24 July, 1887), he indicated that he hoped to visit Siebenbürgen [Transylvania] to recuperate. But by 11 August, 1887, he was too ill to write to Nylander unaided, and by 7 September, 1887, he was dead at the age of 42. His high hopes for the issue of further sets of *Lichenotheca Universalis* that would showcase Helms’ Westland lichen collections were alas never realised. Lojka’s friend and trustee of his estate was the young Viennese lichenologist Carl Eggerth Jr. (1861–1888), who in his own brief life amassed a notable collection of lichen exsiccatae, including many specimens from Lojka, in total amounting to some 35,000 specimens (von Wettstein 1889; Svojtka 2009, 2010). In a letter to Nylander written on 4 August, 1890, Lojka’s sister Mathilde explained that she and her sisters were trying to sell their brother Hugo’s lichen herbarium that Carl Eggerth had valued at 6000 forints [equal in today’s currency to 38,000 euros or 49,000 US dollars], since they could no longer afford the high rent of the rooms in Budapest where Lojka’s collections were housed. Mathilde Lojka intimated to Nylander that they would be happy with a price of 1000 forints for the lichen herbarium, and hoped that Nylander might help them find a purchaser; otherwise, the collection would go to the University of Vienna.

Two years previously and not long before his own sudden death from heart disease at age 26, Carl Eggerth Jr. wrote to Nylander on 10 January, 1888, acknowledging the receipt of Nylander’s card to him of 8 January(!) and mentioning “...Professor Lojka himself told me before his death that he had promised you a specimen of every collection of Helms...” that the herbarium was still in Budapest and that nobody had yet had the time or opportunity to search for these specimens, and he politely asked Nylander “...only to have a little patience...”. After Carl Eggerth Jr. died in Vienna on 30 March, 1888, his father Carl Eggerth Sen. (1834–1888 – he died in Vienna on 7 September) donated his son’s large lichen herbarium to the University. The entry (#887) in the Botany Department’s herbarium accession book records receipt of this magnificent gift on 25 May, 1888, (von Wettstein 1889; Svojtka 2009, 2010; Walter Till, pers. comm.). Part of Lojka’s lichen herbarium, including many Helms and Knight specimens, is also now housed in the cryptogamic collections of the Natural History Museum in Vienna, the specimens bearing a stamp “Herbarium Lojkanum”.

#### Richard Helms’ lichen collections

Helms’ lichens today are found in many European herbaria. Galloway (1985: xxv) lists BM, FI, H-NYL, MANCH, M, PC, W and WU; however, the list is more extensive than that, since material of both Arnold’s [*Lich. Exs.* Nos 1209, 1210, 1214, 1215 and 1240] and Lojka’s exsiccatae, which contains Helms collections, were distributed to

FH, G and NY (Sayre 1969), and are present also in S, US and UPS. A significant collection of Helms’ Westland plants is in the Cosmo Melville Herbarium in the Manchester Museum (MANCH), Helms being listed as having contributed algae, lichens (see also Seaward 2003), bryophytes, pteridophytes and vascular plants (Franks 1973: 16). Hertel (1980: 378) lists Helms as a collector represented in Munich’s (M) lichen herbarium, and Hertel & Schreiber (1988: 160, 224, 325) list Helms as a collector of lichens, mosses and vascular plants.

#### Publications relating to Helms’ lichens

Müller Argoviensis (1879) published four new names for lichens collected by Helms near Greymouth that were sent to him by Ferdinand von Mueller in Melbourne. They were *Cladonia aggregata* v. *straminea* Müll.Arg. [= *Cladia aggregata*]; *Sticta coronata* Müll.Arg. [= *Pseudocyphellaria coronata*]; *Lecanora rhodophthalma* Müll.Arg. [= *Placopsis rhodophthalma*] and *Patellaria* (sect. *Biatorina*) *gompholoma* Müll.Arg. [= *Megalospora gompholoma*].

Nylander (1888) cited 80 of Helms specimens in his compendium of New Zealand lichens (23% of the total listed), describing 14 of them as new: *Amphinomium pannarinum* Nyl. [= *Pannaria fulvescens*]; *Baeomyces heteromorphus* f. *rubens* Nyl. [= *B. heteromorphus*]; *Lecanora perflavida* Nyl. [= *L. symmicta*]; *Lecidea atroflavella* Nyl. [= *Rhizocarpon superficiale*]; *Lecidea concordans* Nyl. [= *Mycoblastus hypomelinus*]; *Lecidea sylvicollella* Nyl. [= *Micarea erratica*]; *Leioderma pyncnophorum* Nyl.; *Pertusaria adveniensi* Nyl. [= *Coccotrema cucurbitula*]; *Pertusaria adveniensi* Nyl. [= *Coccotrema cucurbitula*]; *Pertusaria globulifera* var. *glaucumopsis* Nyl. [= *P. circumcincta*]; *Stictina intricata* var. *subargyracea* Nyl. [= *Pseudocyphellaria intricata*]; *Stictina astictina* Nyl. [= *Pseudocyphellaria montagnei*]; *Verrucaria leptaleina* Nyl. [= *Porina leptaleina*] and *Verrucaria perfragilis* Nyl. [= *Porina exocha*].

#### The lichens

The following annotated list of New Zealand lichens collected by Richard Helms comes mainly from material (55 sheets) held in the Cosmo Melville herbarium (MANCH) and specimens from the Nylander Herbarium in Helsinki (H-NYL), supplemented with records from Geneva (G), Munich (M), the Natural History Museum in Vienna (W), the University of Vienna (WU) and the Queensland Herbarium (BRI). From collections so far examined, it appears that nearly all of Helms’ lichens were collected from localities in Westland during his time of residence there, mainly from the environs of Greymouth (Marsden Road, Cobden) and from the Paparoa Range that he visited in 1886 and 1888. The lichens are listed alphabetically, with names being those in current use (Galloway 2007) except where otherwise specified. Provenance of collections is given in square brackets, together with notes on particular specimens and additional comments when relevant.

*Baeomyces heteromorphus* [Helms 40, Greymouth 1886, as *B. heteromorphus* f. *rubens* Nyl. (Nylander 1888: 14); holotype: H-NYL 40293! The designations as lectotype (Galloway 1980: 80; 2007: 126) are in error, and the Helsinki specimen indicated above is correctly the holotype.]

*Bunodophoron insigne* [Helms s.n., Paparoa Range, 5.vii.1888 MANCH!]

*B. microsporium* [Helms s.n., Paparoa Range, 5.vii.1888. 3 small specimens on card 14 × 15 cm. MANCH!]

*B. scrobiculatum* [Helms s.n., Paparoa Range, 5.vii.1888. 2 sheets with 15 specimens. MANCH!]

*Bunodophoron* sp. [Helms s.n., as “*Sphaerophoron compressum*” (Nylander 1888: 13), not seen]

*Caloplaca subpyracea* [Helms 254, Greymouth 1886; syntype: H-NYL 29846!]

*Coenogonium luteum* [Helms 32, Greymouth 1886, as “*Lecidea lutea*” (Nylander 1888: 78), H-NYL 21948!]

*Cladia aggregata* [Helms 142, 143 H-NYL 37575!; Helms s.n., near Cobden 22 July, 1888. 1 sheet with 2 specimens. MANCH!]  
*C. retipora* [Helms s.n., Paparoa Range at 3000 ft, 5 July, 1888. 4 sheets with 32 specimens. MANCH!]  
*Cladonia* ?*campbelliana* [Helms s.n., as “*Cladonia degenerans* f. *anomea*” (Nylander 1888: 18), not seen]  
*C. chlorophaea* [Helms s.n., Greymouth, as “*Cladonia pyxidata* f. *chlorophaea*” (Nylander 1888:17) not seen]  
*C. confusa* [Helms s.n., as “*Cladina pycnoclada*” (Nylander 1888: 20), not seen; Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. 2 sheets with 6 specimens. MANCH!]  
*C. degenerans* f. *haplolea* [Helms 132, Greymouth 1886 H-NYL 38596!]  
*C. fimbriata* [Helms s.n., Greymouth (Nylander 1888:17) not seen]  
*C. furcata* [Helms 117, Greymouth 1886 (as “*C. furcata* subsp. *racemosa*” Nylander 1888: 19) H-NYL 39610!]  
*C. macilentia* [Helms 136,165, 168, Greymouth 1886, H-NYL 38091, 38096, 38013!]  
*C. murrayi* [Helms 141, Greymouth, as *C. cornucopioides* (Nylander 1888: 20), H-NYL 37932!]  
*C. ochrochlora* [Helms 8, H-NYL 39108; 157, Greymouth 1886, as “*C. chordalis* f. *soredians*” (Nylander 1886: ##) holotype. : H-NYL ##!, fide Ahti (1980: 238)]  
*C. ramulosa* [Helms 134, 158, s.n., Greymouth 1886 as “*C. pityrea*” (Nylander 1888: 18), and Helms 144, as f. *hololepis*, H-NYL 38511!]  
*C. scabriuscula* [Helms 138, 139, 160, Greymouth, as *C. adspersa* (Nylander 1888: 19), H-NYL 39255!]  
*C. southlandica* [Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. 1 sheet with 4 specimens. MANCH!]  
*C. squamosa* f. *densata* Nyl. [Helms 130, Greymouth, (Nylander 1888: 19); holotype: H-NYL 39237!]  
*C. tenerrima* [Helms 133, Greymouth, as *C. gracilis* ssp. *chordalis*, H-NYL 38874!]  
*Coccotrema cucurbitula* [Helms 267, Greymouth 1886, as “*Pertusaria adveniens*” Nyl. (Nylander 1888: 70); holotype: H-NYL 23577!, isotype: W; Helms 273, Greymouth 1886, as “*Pertusaria adventans* Nyl.” (Nylander 1888: 70); holotype: H-NYL 23579!, isotype: W (see Messuti 1996)]  
*Collema laeve* [Helms 20, Greymouth 1886 H-NYL 41867! – det. G. Degelius, 1972]  
*Dibaeis arcuata* [Helms 41, Greymouth 1886, as “*Baeomyces fungoides*” (Nylander 1888: 13-14), H-NYL 40268!]  
*Lecanora demersa* [Helms 241, Greymouth 1886, as *Lecidea melastroma* Nyl. (Nylander 1888: 107), H-NYL 16081!]  
*L. symmicta* [Helms 255b, Greymouth, as “*Lecanora perflavida* Nyl.” (Nylander 1888: 64); holotype: H-NYL 26317!, isotype: W]  
*Lecidea muscescens* [Helms 253, Greymouth 1886; holotype: H-NYL 20923 pr.p.!, isotype: W]  
*Leifidium tenerum* [Helms s.n., Greymouth November 1886, as “*Sphaerophoron tenerum* f. *stereocauloides*”; comm. Eggerth; Arnold, Lich., Exs. 1210, H-NYL p.m. 562! H; Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. 1 sheet with 12 specimens. MANCH!]  
*Leioderma pycnophorum* [Helms 221, “Ad Greymouth super vegetabilia destructa” 1887; holotype: H-NYL 30952!, isotype: W! The designations as lectotype (Galloway & Jørgensen 1987: 386; Galloway 2007: 784) are incorrect, and the Helsinki specimen indicated above is correctly the holotype.]  
*Lepraria* sp [Helms 25, Greymouth 1866, mentioned in Nylander (1888: 136) as *Lepraria latebrarum* Ach.; H-NYL 43283!]  
*Leptogium aucklandicum* [Helms 207, as “*Leptogium tremelloides* var. *pichneum* (Nylander 1888: 10), not seen; Helms Paparoa Range, July, 1888. MANCH!]  
*Leptogium burgessii* [Helms 211, Greymouth 1886, - H-NYL 41407!; Helms 26, Greymouth 1886; as “*Collema thysanaeum* (Nylander 1888: 8) - H-NYL 41852!]  
*Leptogium crispatellum* [Helms 214, “Corticola ad Greymouth” 1886; holotype: H-NYL 41462!]

*L. gelatinosum* (With.) J.R.Laundon [Helms 202, Greymouth, as “*Leptogium sinuatum*” (Nylander 1888: 10), H-NYL 414606!]  
*L. phyllocarpum* [Helms 202, as “*Stephanophoron phyllocarpum*” (Nylander 1888: 10), not seen]  
*Megalalaria grossa* [Helms 227, Greymouth 1886, as “*Lecidea grossa*” (Nylander 1888: 110), H-NYL 112084!]  
*Megaloblastenia marginiflexa* [Helms s.n., Greymouth 1886, as “*Lecidea marginiflexa*” (Nylander 1888: 87-88), ex Arnold Lich. Exs. 1240, comm. Eggerth, H-NYL 4536, H; UPS (L-169924)]  
*Megalospora campylospora* [Helms 231, Greymouth, as “*Lecidea taitensis*” (Nylander 1888: 87), H-NYL 18174]  
*M. gompholoma* [Helms 21, Greymouth, ex F. v Mueller, as “*Patellaria gompholoma* Müll. Arg.”; holotype: G (see Sipman 1983: 105)]  
*Menegazzia* sp. [Helms 179, as “*Parmelia pertusa*” (Nylander 1888: 28), H-NYL 34229!]  
*Micarea erratica* [Helms 238, Greymouth 1886, as “*Lecidea melacina*” (Nylander 1888: 88), H-NYL 18196; Helms 252, Greymouth 1886, as “*Lecidea sylvicolella* Nyl.” (Nylander 1888: 108); holotype: H-NYL 10640!]  
*Mycoblastus dissimulans* [Helms 236, Greymouth 1886, as “*Lecidea concordans* Nyl.” (Nylander 1888: 108); holotype: H-NYL 10903!]  
*Nephroma plumbeum* [Helms 220, Greymouth 1886, as “*Nephromium lyallii*”, H-NYL 33038!]  
*Pannaria fulvescens* [Helms 65, “Super vegetabilia destructa ad Greymouth” – as “*Amphinomium pannarinum*” Nyl. (Nylander 1888: 9); holotype: H-NYL 41725!, isotype: WU (see Jørgensen & Galloway 1992: 266)]  
*P. implexa* [Helms 51, Greymouth 1886, as “*Psoroma sphinctrinum* var. *crispellum*”, H-NYL 30767!]  
*P. leproloa* [Helms 54, Greymouth, as “*Psoroma sphinctrinum* var. *leproloa*”, H-NYL 30778!]  
*P. sphinctrina* [Helms 188, Greymouth 1886 H-NYL 30765, as *Psoroma sphinctrina* subsp. *discreta* (“contains vicanicin (major)” det. J.A. Elix 2000)]  
*Parmotrema grayanum* [Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. 1 packet. MANCH!]  
*P. perlatum* [Helms, Paparoa Range about 3000 ft, 5 July, 1888. 1 specimen. MANCH!]  
*Peltigera dolichorhiza* [Helms s.n., Paparoa Range at 2000 ft. MANCH!; Helms 219, New Zealand. UPS (L-536460)]  
*Pertusaria circumcincta* [Helms 272, 272b, 266, Greymouth 1886, as “*Pertusaria globulifera* var. *glaucomopsis* Nyl.” (Nylander 1888: 67); syntypes: H-NYL 23766!, H-NYL 23768!, H-NYL 23767!]  
*P. sorodes* [Helms 268, Greymouth 1886, as “*Pertusaria subcommunis* Nyl.” (Nylander 1888: 67); holotype: H-NYL 22950! The designations as lectotype (Galloway 1985: 379; 2007: 1160) are incorrect, and the Helsinki specimen indicated above is correctly the holotype.]  
*P. truncata* [Helms 274, Greymouth, as “*Pertusaria subglobulifera*” (Nylander 1888: 68). H-NYL 23493!]  
*Phlyctis subuncinata* [Helms 262, Greymouth 1886, as “*Phlyctella egentior*” (Nylander 1888: 73), H-NYL 22314]  
*Placopsis argyrea* [Helms 256, “Ad Greymouth” (Nylander 1888: 56 – as *Placopsis rhodomma*)]  
*P. rhodocarpa* [Helms 251, “saxicola ad Greymouth” (Nylander 1888: 56)]  
*P. rhodophthalma* [Helms s.n., ex F. v Mueller 1879; holotype: G!, isotype: BRI 475716! (see Galloway 2013b)]  
*Porina exocha* [Helms 22, on bark and corticolous hepatics, as “*Verrucaria perfragilis* Nyl.” (Nylander 1888: 128–129); lectotype: H-NYL 1929, residual syntype: H-NYL 1930, fide (McCarthy 1995: 330)]  
*P. leptaleina* [Helms 281, Greymouth on podocarp scale 1886, as *Verrucaria leptaleina* Nyl. (Nylander 1888: 130); holotype: H-NYL 1788!]

*Pseudocyphellaria argyracea* [Helms 93, 96, Greymouth 1886, as "*Stictina intricata*", not seen; Helms 35 as "*f. subargyracea*" (Nylander 1888: 29), H-NYL 34094!; Helms 96 W!]  
*P. billardieri* [Helms 21, Greymouth 1886, H-NYL 33471; Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. 1 sheet with 3 specimens. MANCH!; Helms 110 W!]  
*P. chloroleuca* [Helms 101 W!]  
*P. cinnamomea* [Helms s.n., Near Cobden, 22 July, 1888; Paparoa Range 5 July, 1888, 13 October 1888. 6 sheets with 31 specimens. MANCH!; Helms 30, 48, 81, 82, 84, 88 W!. Labelled by Nylander as "*Stictina fragillima*"]  
*P. coriacea* [Helms 34, Greymouth 1886, as "*Ricasolia coriacea*" (Nylander 1888: 40), H-NYL 33375; ex F. v Mueller 1893 G!; Helms 34 W!]  
*P. coronata* [Helms s.n., ex F. v Mueller 1893 G002589!; Paparoa Range 5 July, 1888. MANCH!; Helms Greymouth, Nov. 1886, ex Arnold Lich. Exs. 1214 – as *Sticta orygmata* H-NYL p.m. 1970, H, W! UPS (L-169893)]  
*P. dissimilis* [Helms 38, 83, 86, 87, 94, 112 W! Material in Herbarium Lojkanum (W) is labelled "*Sticta filix* Ach." in Lojka's hand (see Galloway 1988: 123, fig. 54; 125, fig. 55)]  
*P. favoolata* [Helms s.n., Greymouth comm. F. v Mueller 1879, G002904!; Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. 2 sheets with 7 specimens MANCH!; Helms 63, ex Herb. Lojka M!; Helms 21, 44 W!; 2 sheets with 4 specimens WU!]  
*P. fimbriatoides* [Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. 1 specimen. MANCH!]  
*P. glabra* [Helms s.n., Greymouth, as "*Sticta freycinetii*" (Nylander 1888: 39), not seen; Helms, Paparoa Range about 3000 ft, 5 July, 1888. 2 sheets. MANCH!; Helms 59, 74, 75, 76, 77, 106 W! Helms' collection 77 (see Galloway 1988: 146, fig. 68), a very large specimen almost 30 cm across, has a printed label in Lojka's hand "Lich. Austral, misit R. Helms. No. 6 *Sticta freycinetii* v. *prolifera* Müll. Arg. Prope Greymouth Novae Zelandiae. R. Helms"; two sheets with 4 specimens, one labelled "*Sticta dissimulata*, Helms 39, Neuseeland Lojka" WU!]  
*P. granulata* [Helms s.n. (Nylander 1888: 36) not seen]  
*P. gretae* [Helms s.n., as *Sticta obvoluta*, H-NYL 33543; Helms 33 W! Labelled by Nylander "*Sticta obvoluta*"]  
*P. homoeophylla* [Helms s.n., Greymouth, as "*Sticta homoeophylla*" (Nylander 1888: 38) not seen; Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. MANCH!; Helms 45 W!]  
*P. intricata* [Helms 64, as *Stictina intricata* H-NYL 34071; Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. 2 sheets. MANCH!; Helms 35, 64, 93, 96 W! As noted in Galloway (1988: 170–171) "...the lectotype of this taxon (W) was collected by Richard Helms and is in Herbarium Lojkanum. It consists of three specimens having a mustard-yellow upper surface, broadly rounded lobes, and mainly laminal soralia, although towards the centre the lobes have linear, marginal soralia (see Galloway 1988: 170, fig. 82B). A sheet in WU labelled *Nymphaea intricata* f. *subargyracea* Nyl., has 7 specimens of *Pseudocyphellaria intricata* collected in New Zealand (probably from near Greymouth in Westland) by Richard Helms [64]. Specimens from both W and WU are growing on *Leptospermum* bark and seem to be from the same collection. Other lichens associated with the dominant *P. intricata* include *Leioderma soreliatum*, *Leptogium cyanescens*, *Pannaria fulvescens* and *Psoroma leprololum*". An illustration of Helms 93 is given in Galloway (1988: 170, fig. 82B)].  
*P. lindsayi* [Helms 90, 102 W!]  
*P. lividofusca* [Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888, 2 sheets. MANCH!; Helms 28, 69, 79, 91, 92, 103 W!]  
*P. montagnei* [Helms 66, "Corticola ad Greymouth" as *Stictina astictina* Nyl. (Nylander 1888: 30); holotype: H-NYL33987!, isotypes: W!, WU! (labelled as "*Sticta physciospora*"). The designation as lectotype (Galloway & James (1980: 300) is incorrect, and the Helsinki specimen indicated above is correctly the holotype).  
*P. multifida* [Helms 39, 287, as "*Sticta dissimulata*" (Nylander 1888: 37) H-NYL 33525!, H-NYL 33529!; Helms 101, H-NYL 33510; Helms 105, as *Sticta variabilis* H-NYL 33604, 33605; Helms 68, 104, 105, 287 W!; Helms 61, as "*Sticta subvariabilis*" WU!]

*P. physciospora* [Helms s.n., Greymouth, as "*Sticta physciospora*" (Nylander 1888: 38), not seen]  
*P. pickeringii* [Helms s.n., Greymouth, as "*Sticta Urvillei*" (Nylander 1888: 35) not seen; Helms 63 W!; Helms 63 labelled in purple ink by Lojka "*Sticta flavicans*" WU!]  
*P. rubella* [Helms s.n., H-NYL 33570; Helms 286 W!]  
*P. rufovirescens* [Helms s.n. Greymouth Nov. 1886, as *Sticta fossulata*, ex Arnold Lich. Exs. 1215, UPS (L-169894); Ibid., comm. Eggerth H!, W!; Helms, ex F. v Mueller 1893 G!; Helms 125 "R. Helms Nov., 1886, comm. Eggerth" M!]  
*Psoroma araneosum* [Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. MANCH!]  
*P. pholidotoides* [Helms 194, H-NYL 30772! "(too fragmentary for accurate determination" PWJ)[ames] 1965]  
*P. pholidotoides* f. *flavida* nom. nud. [Helms 196, Greymouth 1886, H-NYL 30777]  
*Punctelia subrudecta* [Helms 181, Greymouth 1886, as "*Parmelia subrudecta*" H-NYL 35032]  
*Rhizocarpon superficiale* [Helms 252, Lapidicola ad Greymouth 1886, as "*Lecidea atroflavella* Nyl." (Nylander 1888: 114); holotype: H-NYL 10640 pr.p.!]  
*Roccellinastrum neglectum* [Helms 245, Greymouth 1886, as "*Byssocaulon filamentosum*" (Nylander 1888: 77), H-NYL 22065]  
*Siphula decumbens* [Helms 127, "Supra terram ad Greymouth", 1886; holotype: H-NYL 40178!, isotypes: UPS (L-107595); W! (ex Herb, Lojkanum). The designations as lectotype (Galloway 1985: 524; 2007: 1626) are incorrect, and the Helsinki specimen indicated above is correctly the holotype. Helms material identified as *Siphula medioxima* Nyl. (Nylander 1888: 15) was lectotypified on material in W (Kantvilas 1998: 120)]  
*Siphula dissoluta* [Helms 131, Greymouth 1886; holotype H-NYL 40177!, isotype: W! (ex Herb, Lojkanum). The designations as lectotype (Galloway 1985: 525; 2007: 1628) are incorrect, and the Helsinki specimen indicated above is correctly the holotype.]  
*Stereocaulon corticatum* [Helms s.n. (Nylander 1888: 15), not seen]  
*S. ramulosum* [Helms s.n., Greymouth, Nov., 1886, Arnold Lich. Exs. 1209 comm. Eggerth – as *Stereocaulon proximum*, H-NYL p.m. 661, H; Ibid., UPS (L-169887); Helms Paparoa Range 200–3000 ft, 5 July, 1888. 4 sheets and 31 specimens, some labelled as "*Stereocaulon macrocarpoides* Nyl.". MANCH!]  
*Sticta filix* [Helms s.n., Paparoa Range about 3000 ft, 5 July, 1888. 2 sheets. MANCH!]  
*Sticta fuliginosa* [Helms 36, Greymouth, as "*Stictina fuliginosa*" (Nylander 1888: 31) not seen]  
*S. latifrons* [Helms s.n., towards the Paparoa Range, 15 July 1886 – a large specimen 25 × 28 cm; Paparoa Range; 5 July, 1888, 3 specimens on a sheet. MANCH!]  
*S. subcaperata* [Helms 100, New Zealand 1886 (Nylander 1888: 31) H-NYL33165]  
*Thelidium maurospilum* [Helms s.n., Lapidicola ad Greymouth, as "*Verrucaria maurospila* Nyl." (Nylander 1888: 134); holotype: H-NYL, not seen]  
*Thelotrema lepadinum* [Helms s.n., Greymouth (Nylander 1888: 76), not seen]  
*T. subtile* [Helms 269, Greymouth – as "*T. bicavatum* Nyl." H-NYL 22789!]

I would like to thank the following: (1) Dr Sean R. Edwards and Dr Rachel Webster (Manchester Museum), Dr Walter Brunnbauer and Dr Anton Igersheim (Naturhistorisches Museum, Vienna), Dr Philippe Clerc (Geneva), Prof. Hannes Hertel (Munich), Prof. Friederich Ehrendorfer and Dr Walter Till (Dept of Botany, University of Vienna), Prof. Roland Moberg (Uppsala) and Mr Alan Bolin (Queensland Herbarium, Brisbane) for information on and help in locating Helms lichen material; (2) Mag. Matthias Svojtka (Vienna) for his help with literature relating to Carl Eggerth Jr.; (3) Prof. Mark Seaward (Bradford) for help with literature; (4) Gerd Klein (formerly of Roxburgh) for his kind help in translating the Lojka-Nylander correspondence, and (5) the late Dr Eric Godley (Christchurch) for several stimulating conversations about Richard Helms.

## References

- Ahti, T (1980): Taxonomic revision of *Cladonia gracilis* and its allies. *Annales Botanici Fennici* **17**, 195–243.
- Alexander, WB (1916): Obituary: Mr Richard Helms. *Journal and Proceedings of the Royal Society of Western Australia* **1**, xxviii–xxix.
- Babington, C (1855): Lichenes. In: Hooker, JD (ed.) *The Botany of the Antarctic Voyage of H.M. Discovery Ships Erebus and Terror in the Years 1839–1843. II Flora Novae Zelandiae. Part II. Flowerless Plants*, pp. 266–311. Lovell Reeve, London.
- Butler, AG (1884): On a new Genus of Butterfly from New Zealand *Annals and Magazine of Natural History series* **5**, **13**, 171–173.
- Cameron, P (1898): Notes on a collection of Hymenoptera from Greymouth, New Zealand, with descriptions of a new species. *Memoirs and Proceedings of the Manchester Literary and Philosophical Society (Manchester Memoirs)* **42**, 1–53.
- Chisholm, AH (1972): Helms, Richard (1842–1914). *Australian Dictionary of Biography. Vol. IV: 1851–1890, D–J*, 374. Melbourne University Press, Melbourne.
- Fereday, RW (1883): Description of a species of butterfly new to New Zealand and probably to science. *Transactions and Proceedings of the New Zealand Institute* **15**, 193–195.
- Franks, JW (1973): Herb. MANCH. A guide to the contents of Manchester Museum. *Manchester Museum Publications, New Series* **1**, **73**, 1–29.
- Galloway, DJ (1980): Notes on the lichen genus *Baeomyces* in New Zealand. *Botaniska Notiser* **133**, 77–83.
- Galloway, DJ; James, PW (1980): Nomenclatural notes on *Pseudocyphellaria* in New Zealand. *Lichenologist* **12**, 291–303.
- Galloway, DJ (1985): *Flora of New Zealand Lichens*. New Zealand Government Printer, Wellington.
- Galloway, DJ; Jørgensen, PM (1987): Studies in the lichen family Pannariaceae II. The genus *Leioderma* Nyl. *Lichenologist* **19**, 345–400.
- Galloway, DJ (1988): Studies in *Pseudocyphellaria* (lichens) I. The New Zealand species. *Bulletin of the British Museum (Natural History) Botany* **17**, 1–267.
- Galloway, DJ (2001): *Placopsis elixii*, a new lichen from New Zealand, with notes on some other species of *Placopsis* (Nyl.) Linds. (Agyriaceae) in New Zealand. *Bibliotheca Lichenologica* **78**, 49–63.
- Galloway, DJ (2007): *Flora of New Zealand Lichens. Revised second edition including lichen-forming and lichenicolous fungi*. Manaaki Whenua Press, Lincoln.
- Galloway, DJ (2013a): Charles Knight's letters to F.C.G. Arnold (Munich) on New Zealand and Australian lichens, 1881–1886. *New Zealand Botanical Society Newsletter* **112**, in press.
- Galloway, DJ (2013b): The lichen genera *Aspiciliopsis* and *Placopsis* (Trapeliales: Trapeliaceae: Ascomycota) in New Zealand. *Phytotaxa* (in press).
- Godley, EJ (2001): Biographical notes (42): Richard Helms (1842–1914). *New Zealand Botanical Society Newsletter* **64**, 39–41.
- Hedley, C (1915): Presidential Address. *Journal and Proceedings of the Royal Society of New South Wales* **49**, 11–14.
- Helms, A (1881): Anzeige [Advertisement]. *Hedwigia* **20**, 112.
- Helms, A (1888): Herr Alwin Helms, Hamburg Eimsbüttel, Emilienstrasse 47, offeriert folgende von Herrn Richard Helms in Greymouth auf Neuseeland, Südinsel, hergestellte Sammlungen: *Hedwigia* **27**, 36.
- Helms, R (1883a): A Maori rat at Greymouth. *New Zealand Journal of Science* **1**, 466.
- Helms, R (1883b): Habits of beetles (Fam. Silphidae). *New Zealand Journal of Science* **1**, 516.
- Helms, R (1883c): Remarkable pigeons. *New Zealand Journal of Science* **1**, 516–517.
- Hertel, H (1980): Index collectorum lichenum Herbarii Monacensis. Ein Sammlerverzeichnis des Flechtenherbars der Botanischen Staatssammlung München. *Mitteilungen der Botanischen Staatssammlung München* **16**, 333–462.
- Hertel, H; Schreiber, A (1988): Die Botanische Staatssammlung München 1813–1988. Eine Übersicht über die Sammlungsbestände. *Mitteilungen der Botanischen Staatssammlung München* **26**, 81–512.
- Hudson, GV (1923): David Sharp, 1840–1922. *Proceedings of the New Zealand Institute* **54**, xiv–xv.
- Hutton, FW (1883): Descriptions of new land shells. *Transactions and Proceedings of the New Zealand Institute* **15**, 134–141.
- Hutton, FW (1884a): Notes on some New Zealand land shells, with descriptions of new species. *Transactions and Proceedings of the New Zealand Institute* **16**, 161–186.
- Hutton, FW (1884b): Revision of the Mollusca of New Zealand. *Transactions and Proceedings of the New Zealand Institute* **16**, 186–212.
- Jørgensen, PM; Galloway, DJ (1992): Pannariaceae. *Flora of Australia* **54**, 246–293.
- Kantvilas, G (1998): Studies on the lichen genus *Siphula* in Tasmania II. The *S. decumbens* group. *Herzogia* **13**, 119–138.
- Maiden, JH (1922): Records of Australian Botanists. Second Supplement. *Journal and Proceedings of the Royal Society of New South Wales* **55**, 150–169.
- McCarthy, PM 1995: A reappraisal of *Clathroporina* Müll.Arg. (Trichotheliaceae). *Lichenologist* **27**(5), 321–350.
- Melville, JC (1904): *A brief account of the general herbarium formed by James Cosmo Melville, 1867–1904: and presented by him to the Museum in 1904*. Sherratt & Hughes, Manchester.
- Messuti, MI (1996): Notes on the lichen genus *Coccotrema* in southern South America. *New Zealand Journal of Botany* **34**, 57–64.
- Müller Argoviensis, J (1879): Lichenologische Beiträge VIII. *Flora* **62**(11), 161–169.
- Nylander, W (1886): Lichenes insulae San Thomé. *Flora* **69**, 171–178.
- Nylander, W (1888): *Lichenes Novae Zelandiae*. Paul Schmidt, Paris.
- Sayre, G (1969): Cryptogamae exsiccatae – an annotated bibliography of published exsiccatae of Algae, Lichenes, Hepaticae, and Musci. Introduction, I. General cryptogams, II. Algae, III. Lichenes. *Memoirs of the New York Botanical Garden* **19**, 1–174.
- Sayre, G (1975): Cryptogamae Exsiccatae – an annotated bibliography of exsiccatae of Algae, Lichenes, Hepaticae, and Musci. V. Unpublished exsiccatae. I. Collectors. *Memoirs of the New York Botanical Garden* **19**(3), 277–243.
- Schönbeck-Temesy, E (1992): Zur Geschichte des Herbars der Wiener Universität. *Abhandlungen der Zoologisch-Botanischen Gesellschaft in Österreich* **26**, 69–95.
- Seaward, MRD (2003): Lichen Herbarium at the Manchester Museum: 1, Collectors. *The Naturalist* **128**, 41–47.
- Sipman, HJM (1983): A monograph of the lichen family Megalosporaceae. *Bibliotheca Lichenologica* **18**, 1–241.
- Skelly, PE; Leschen, RAB (2007): Erotylinae (Insecta: Coleoptera: Cucujoidea: Erotylidae): taxonomy and biogeography. *Fauna of New Zealand/Ko te Ainga Pepeke o Aotearoa* **59**, 1–58.
- Svojtka, M (2009): Sammler als Wegbereiter naturwissenschaftlicher Erkenntnis – Fallstudien Leopold Johann Nepomuk von Sacher- Masoch (1797–1874) und Karl Eggerth (1861–1888). *Berichte der Geologischen Bundesanstalt* **45**, 40–43.
- Svojtka, M (2010): Der geordnete Mikrokosmos: Privatsammler als Wegbereiter naturwissenschaftlicher Erkenntnis. *Scripta Geo-historica* **4**, 141–166.
- Weidner, H (1967): Ein Altoner als Erforscher der Insekten Neuseelands. In: *Geschichte der Entomologie in Hamburg. Abhandlungen und Verhandlungen des Naturwissenschaftlichen Vereins in Hamburg N.F. Bd IX, Supplement*, 164–166.
- Weiss, FE (1930): Three Manchester botanists: Leopold Hartley Grindon, Charles Bailey, James Cosmo Melville. *Northwestern Naturalist* **5**, 17–22, 81–86, 150–156.
- Wettstein, R von (1889): Karl Eggerth. Nachruf. Vienna, Verlag der Oesterreichischen botanischen Zeitschrift, 4 pp. Privately printed.
- Willey, H (1887): Botanical Notes. *Lichenotheca Universalis. Bulletin of the Torrey Botanical Club* **14**, 247–249.

New taxa and new records of *Buellia sensu lato*  
(Physciaceae, Ascomycota) in Australia

John A. Elix

Research School of Chemistry, Building 33  
Australian National University, Canberra, A.C.T. 0200, Australia  
email: John.Elix@anu.edu.au

Gintaras Kantvilas

Tasmanian Herbarium, Private Bag 4  
Hobart, Tasmania 7001, Australia  
email: Gintaras.Kantvilas@tmag.tas.gov.au

**Abstract:** *Buellia amandineaeformis* Elix & Kantvilas, *B. austroalpina* Elix & Kantvilas, *B. epigaella* Elix & Kantvilas, *B. extenuatella* Elix & Kantvilas, *B. nebulosa* Elix & Kantvilas, *B. poimena* Elix & Kantvilas, *B. polyxanthonica* var. *isidiata* Elix & Kantvilas, *B. stellulata* var. *tasmanica* Elix & Kantvilas, *B. testaceina* Elix & Kantvilas and *B. yilliminningensis* Elix & Kantvilas are described as new to science. *Buellia macularis* Zahlbr. and *B. saxorum* A.Massal. are reported as new to Australia, and the new combination *Amandinea falklandica* (Darb.) Elix & Kantvilas is made. In addition, new state and territory records are reported for another twelve species.

### Introduction

Inspired by the need to augment the first account for the genus *Buellia* in Australia (Elix 2011), this paper continues our investigation of *Buellia*-like lichens with re-examined herbarium material and recent collections (see Elix & Kantvilas 2013 for our first installment, dealing with the genus *Amandinea*). Research on buellioid lichens over the last decade or so has led to the segregation of several well-defined groups of species as separate genera (e.g., see Marbach 2000). Thus, *Buellia* in the strict sense is now limited to species with *Callispora*-type ascospores, bacilliform or weakly clavate conidia and a hymenium usually interspersed with oil droplets (Bungartz *et al.* 2007), the so-called *Hafellia* group (Moberg *et al.* 1999). However, a large residue of often-unrelated taxa cannot be assigned to any segregate genera at this stage, and remain classified in *Buellia* in the broad sense. The present paper focuses on those taxa.

### Material and methods

The study is based on herbarium holdings, chiefly in the Tasmanian Herbarium (HO) and the Australian National Herbarium (CANB), and on recent collections and field observations by the authors. Chemical constituents were identified by thin-layer chromatography (Elix & Ernst-Russell 1993), high-performance liquid chromatography (Elix *et al.* 2003) and comparison with authentic samples. Calcium oxalate was detected by treatment of medullary tissue with a 10% aqueous solution of sulfuric acid. It forms colourless, needle-shaped crystals that are readily observed under a stereomicroscope.

### The new taxa

1. *Buellia amandineaeformis* Elix & Kantvilas, sp. nov.  
MB 804232

Fig. 1

*Amandineae falklandicae* similis sed ascosporis parvioribus, 10–14  $\mu\text{m}$  longis, 5–8  $\mu\text{m}$  latis, et conidiis bacilliformibus, 3–4  $\mu\text{m}$  longis, 0.7–1  $\mu\text{m}$  latis differt.

*Type:* Australia, Tasmania, above Black Gully Creek, 1 km NE of Hamilton, 42°33'S, 146°51'E, 140 m alt., on loose sandstone pebbles in very open, degraded *Eucalyptus pauciflora* woodland, *G. Kantvilas* 235/99, 3.vi.1999 (holotype – HO).

*Thallus* crustose, areolate, pale tan to dirty yellow-brown, dark brown or olive-brown, continuous to dispersed in patches 2–4 cm wide, scabrid, in part granulose and sorediate; soredia developing at the eroded margins of the areoles, more rarely

spreading over the entire upper surface; individual areoles 0.1–0.5 mm wide and to 0.3 mm thick; prothallus not apparent; cortex c. 10  $\mu\text{m}$  thick; medulla white, I–, lacking calcium oxalate ( $\text{H}_2\text{SO}_4$ -); photobiont cells 7–15  $\mu\text{m}$  diam. *Apothecia* 0.2–0.7 mm wide, scattered or crowded, lecideine, broadly adnate to sessile; disc black, epruinose, plane to convex; proper excipulum distinct, persistent or excluded in older, convex apothecia, in section 20–50  $\mu\text{m}$  thick, outer zone opaque brown-black, K–, inner zone paler brown. *Epihymenium* 6–10  $\mu\text{m}$  thick, brown, K–, N–. *Hypothecium* 50–80  $\mu\text{m}$  thick, dilute red-brown to dark brown, K–. *Hymenium* 60–70  $\mu\text{m}$  thick, colourless, not interspersed; paraphyses 1.5–2.0  $\mu\text{m}$  wide, simple to branched, capitate, with apices 4–5  $\mu\text{m}$  wide, dark brown; asci of the *Bacidia*-type, 8-spored. *Ascospores* at first of the *Physconia*-type, then of the *Buellia*-type, 1-septate, olive-green to brown, ellipsoid, 10–14  $\times$  5–8  $\mu\text{m}$ ,  $\pm$  constricted at the septum; outer spore-wall smooth. *Pycnidia* immersed, black, c. 0.1 mm wide; conidia bacilliform, 3–4  $\times$  0.7–1  $\mu\text{m}$ .  
*Chemistry:* Thallus K–, P–, C–, UV–; no lichen substances detected.

*Etymology:* the species epithet reflects the superficial similarity of this new species to *Amandinea falklandica*.

### Remarks

*Buellia amandineaeformis* is a distinctive species, readily recognized by the presence of soredia and the lack of lichen substances. The thallus can be quite variable, ranging from scabrid and sparingly sorediate along the margins of some areoles to granular and eroded with the soredia spreading over the upper surface. Superficially, it resembles *Amandinea falklandica* (Darb.) Elix & Kantvilas comb. nov. (see page 38), another species with an areolate, scabrid, sorediate thallus but lacking discrete soralia. The two species differ in the size of their ascospores and form of the conidia. *Amandinea falklandica* has larger *Physconia*-type ascospores, 14–20  $\times$  8–12  $\mu\text{m}$ , and filiform, curved conidia, 15–20  $\times$  0.7–1  $\mu\text{m}$ .

The new species is known from several localities in eastern Tasmania, where it occurs on siliceous pebbles and boulders in degraded grassy woodland and roughly cleared sheep pasture. Associated species include *Candelariella vitellina* (Hoffm.) Müll. Arg., *Flavoparmelia haysonii* (C.W.Dodge) Hale, *Monerolechia badia* (Fr.) Kalb, *Punctelia pseudocoralloidea* (Gyeln.) Elix & Kantvilas and various species of *Caloplaca* and *Xanthoparmelia*.

### SPECIMENS EXAMINED

*Tasmania:* • Glen Connell Road, 41°54'S, 147°19'E, 220 m alt., on dolerite boulders in rough pasture, *G. Kantvilas* 1324/01, 12.xii.2001 (HO); • Pontville Small Arms Range Complex, 42°41'S, 147°17'E, 50 m alt., on basalt boulders in grassland-herbfield, *G. Kantvilas* 241/03, 18.vi.2003 (HO).

2. *Buellia austroalpina* Elix & Kantvilas, sp. nov.  
MB 804233

Fig. 2

*Buelliae aethaleae* similis sed hypothecio rufo-fusco, epihymenio rufo-fusco, pigmentosum aeruginosum deficienti, atranorinum etiam acidum norsticticum continententi et prothallo prominenti destituto differt.

*Type:* Australia, New South Wales, Mount Kosciuszko National Park, Thredbo River, 2 km S of Thredbo Village, 36°30'S, 148°18'E, 1500 m alt., on seasonally inundated granite boulders in the river bed, *G. Kantvilas* 171/04, 18.iv.2004 (holotype – HO; isotype – CANB).

*Thallus* crustose, continuous, smooth, rimose, white, becoming grey-brown where water-damaged, 2–3 cm wide and to 0.3 mm thick; prothallus marginal, brown-black to black, very thin, to 0.1 mm wide; cortex c. 10  $\mu\text{m}$  thick; medulla white, I+ blue, lacking calcium oxalate ( $\text{H}_2\text{SO}_4$ -); photobiont cells 7–14  $\mu\text{m}$  diam. *Apothecia* 0.2–0.5

mm wide, scattered, cryptolecanorine or lecideine, persistently immersed, not becoming sessile; disc brown-black to black, epruinose, plane to concave; proper excipulum very thin and reduced (*aethalea*-type), in section reddish brown, 10–20(–30)  $\mu\text{m}$  thick, hardly differentiated from the paraphyses, typically surrounded by a thin thalline rim. *Epihymenium* to 12  $\mu\text{m}$  thick, pale red-brown, K–, N–. *Hypothecium* 30–50  $\mu\text{m}$  thick, dark red-brown, K–. *Hymenium* 60–80  $\mu\text{m}$  thick, colourless, not interspersed; paraphyses 1.8–2.5  $\mu\text{m}$  wide, mostly simple, capitate, with apices 3.5–5  $\mu\text{m}$  wide, colourless to pale red-brown; asci of the *Bacidia*-type, 8-spored, 48–57  $\times$  14–22  $\mu\text{m}$ . *Ascospores* at first approximating the *Physconia*-type, soon of the *Buellia*-type, 1-septate, olive-green to brown, ellipsoid, 14–20  $\times$  6–8  $\mu\text{m}$ ,  $\pm$  constricted at the septum; outer spore-wall usually finely ornamented. *Pycnidia* immersed, black, c. 0.1 mm wide; conidia bacilliform, 4.5–5.5  $\times$  1  $\mu\text{m}$ .

**Chemistry:** Thallus K+ yellow, P+ yellow, C–, UV–; containing atranorin (major), norstictic acid (minor), connorstictic acid (trace). Norstictic acid can be absent in submerged (darker grey-brown) portions of the thallus.

**Etymology:** The epithet is derived from the habitat of the new species in the Australian Alps.

#### Remarks

*Buellia australpina* is characterized by the smooth, white thallus, immersed apothecia, the red-brown, N– epihymenium, the dark red-brown hypothecium and the presence of atranorin and norstictic acid. It is very similar to *B. aethalea* (Ach.) Th.Fr., a widespread and variable species with similar, immersed apothecia, albeit often rather deformed and angular or comma-shaped, and  $\pm$  identical ascospores. The differences between the two species are subtle: *B. aethalea* differs in having a conspicuous, black prothallus surrounding the thallus and often growing between the areoles, forming a tessellated mosaic; it also lacks atranorin, has a very pale brown to colourless hypothecium, and almost invariably contains aeruginose, N+ reddish pigments in the epithecium and elsewhere.

At present, the new species is known only from the type specimen, collected from intermittently submerged granite boulders in a fast-flowing alpine stream in eucalypt woodland. There it was associated with the remarkable local endemic, *Hueidea australiensis* Kantvilas & P.M. McCarthy, and an unidentified species of *Catillaria*.

### 3. *Buellia epigaella* Elix & Kantvilas, sp. nov. MB 804234

Fig. 3

*Buellia epigaeae* similis sed apotheciis epruinosis, hypothecio brunneo vel porphyreo, ascosporis minoribus, 15–20  $\mu\text{m}$  longis, 6.5–8.5  $\mu\text{m}$  latis, et conidiis filiformibus, 12–16  $\mu\text{m}$  longis differt.

**Type:** Australia, Queensland, Jondaryan-Mount Tyson road, opposite Oakey Golf Club, 27°23'05"S, 151°36'44"E, 390 m alt., on soil in remnant *Pittosporum-Eucalyptus* woodland, J.A. Elix 39765, 5.v.2005 (holotype – BRI; isotypes – CANB, HO).

**Thallus** crustose to verrucose or bullate, continuous, white, dirty white to yellowish grey, dull, epruinose, 1–4.5 cm wide; individual verrucae convex, 0.1–0.3 mm wide; prothallus absent; cortex 100–150  $\mu\text{m}$  thick; medulla white, I–, lacking calcium oxalate ( $\text{H}_2\text{SO}_4$ –), to 0.2 mm thick or indistinct and merging with the substratum, occasionally with rhizinoe strands. *Apothecia* 0.5–1.5 mm wide, lecideine, immersed to sessile; disc black, epruinose, plane to weakly convex; proper excipulum distinct at first, excluded with age, in section 40–100  $\mu\text{m}$  thick, dark red-brown to brown-black in the outer part, colourless within. *Epihymenium* 10–15  $\mu\text{m}$  thick, medium brown to dark olive-brown, K–, N–. *Hypothecium* 75–125  $\mu\text{m}$  thick, dark brown to dark red-brown. *Hymenium* 75–110  $\mu\text{m}$  thick, colourless, not interspersed; paraphyses 1.5–2.5  $\mu\text{m}$

wide, simple to weakly branched, capitate, with apices 4–6  $\mu\text{m}$  wide, brown or dark brown; asci of the *Bacidia*-type, 8-spored or fewer. *Ascospores* of the *Buellia*-type, 1-septate, olive-green to brown, ellipsoid, 15–20  $\times$  6.5–8.5  $\mu\text{m}$ , uniformly thin-walled; outer spore-wall ornamented. *Pycnidia* immersed; conidia filiform, straight or often curved, 12–16  $\times$  1  $\mu\text{m}$ .

**Chemistry:** Thallus K–, P–, C–, UV–; no lichen substances detected.

**Etymology:** The specific epithet refers to the similarity of this species to *Buellia epigaea* (Pers.) Tuck., along with the Latin *-ella* (diminutive), with reference to the ascospores.

#### Remarks

This new species is characterized by the crustose, verrucose to bullate thallus, the epruinose apothecia, the moderately large ascospores with an ornamented outer spore-wall and by the absence of lichen substances. *Buellia epigaea* (Hoffm.) Tuck. is superficially very similar, but differs in its medulla containing calcium oxalate ( $\text{H}_2\text{SO}_4$ +), in having finely white-pruinose apothecial discs, larger ascospores (14–26  $\times$  6–12  $\mu\text{m}$ ), a colourless to pale brown hypothecium, and bacilliform conidia (5–7  $\mu\text{m}$  long). The two species also have different ecological preferences. Whereas *B. epigaea* is muscicolous or terricolous on dry, calcareous soils, *B. epigaella* occurs on sandy loams and over bryophytes.

The new species is known from several localities in inland areas of southern and central Queensland, where it occurs on soil and over bryophytes. Commonly associated lichens include various *Cladonia* species, *Diploschistes muscorum* (Scop.) R.Sant. subsp. *bartlettii* Lumbsch, *Endocarpon* sp., *Lepraria lobificans* Nyl., *Paraporpidia glauca* (Taylor) Rambold and *Psora decipiens* (Ach.) Ach.

#### SPECIMENS EXAMINED

**Queensland:** • Leichhardt Highway, 12 km SSE of Taroom, 25°45'S, 149°51'E, 200 m alt., on soil in disturbed monsoon scrub, J.A. Elix 35089, 30.viii.1993 (BRI, CANB, HO); • Hell Hole, c. 36.5 km NW of Milo Homestead, 25°33'S, 144°10'E, 200 m alt., on soil of old ant nest mounds below *Acacia clivicola* shrubs, R.W. Purdie 4170, 20.ix.1992 (CANB).

### 4. *Buellia extenuatella* Elix & Kantvilas, sp. nov. MB 804235

Fig. 4

*Amandineae extenuatae* similis sed conidiis bacilliformibus, 4–6  $\mu\text{m}$  longis, 0.5–1  $\mu\text{m}$  latis differt.

**Type:** Australia, South Australia, Kangaroo Island, track to Cape Gantheaume, 36°04'S, 137°27'E, on *Leucopogon parviflorus* in coastal heathland, G. Kantvilas 323/08, 29.ix.2008 (holotype – HO; isotypes – AD, CANB).

= *Buellia extenuata* f. *athallina* Müll.Arg., *Bull. Herb. Boissier* 1: 50 (1893).

**Type:** Australia, Victoria, Kew, on dead log, F.R.M. Wilson 705 (NSW! – lectotype here designated; G – isolectotype).

**Thallus** crustose, endophloeodal and not apparent, or forming a thin, discontinuous, white or pale grey, membranaceous film <100  $\mu\text{m}$  thick over the substratum, esorediate; prothallus absent; cortex 10–15  $\mu\text{m}$  thick; photobiont cells 7–15  $\mu\text{m}$  wide. *Apothecia* 0.1–0.3 mm wide, lecideine, slightly immersed to sessile; disc black to brown-black, plane to weakly convex, epruinose; proper excipulum distinct, persistent, in section 15–20  $\mu\text{m}$  thick, the outer zone dark brown to black-brown, slightly darker than the hypothecium, K–, inner zone pale brown. *Epihymenium* 4–8  $\mu\text{m}$  thick, dark brown, dark olive-brown or brown-black, K–. *Hypothecium* 70–100  $\mu\text{m}$  thick, yellow-brown to medium brown. *Hymenium* 60–80  $\mu\text{m}$  thick, colourless, not interspersed; paraphyses 1.7–2  $\mu\text{m}$  wide, simple to weakly branched, capitate, with apices 5–6  $\mu\text{m}$  wide, dark brown; asci 8-spored. *Ascospores* of the *Buellia*-type,

1-septate, olive to olive-brown or olive-grey, ellipsoid, 11–19 × 5–8 µm, slightly curved; outer spore-wall smooth. *Pycnidia* immersed, black, 0.08–0.1 mm wide, brown-black; conidia bacilliform, 4–6 × 0.5–1 µm.

*Chemistry*: thallus K–, C–, P–, UV–; no lichen substances detected.

*Etymology*: the specific epithet is derived from the similarity of the species to *Buellia extenuata* Müll.Arg. [= *Amandinea extenuata* (Müll.Arg.) Marbach, a synonym of *Amandinea punctata* (Hoffm.) Coppins & Scheid. according to Bungartz *et al.* (2007)], together with the Latin *-ella* (diminutive) with reference to the thallus.

**Notes**: Morphologically the new species resembles some depauperate specimens of *Amandinea punctata*, but it differs in often lacking any apparent thallus, in having smaller apothecia (0.2–0.6 mm wide in *A. punctata*), somewhat narrower ascospores (5–10 µm wide in *A. punctata*) and, more particularly, in having short, bacilliform conidia (*A. punctata* has filiform conidia, 14–20 µm long). *Buellia schaeferi* De Not. has a nondescript thallus similar to that of *B. extenuatella*, but has smaller, *Buellia*-type ascospores (6–12 × 3.5–5.5 µm) and shorter, short-oblong to ellipsoid conidia, 1.5–3 µm long. The type of *Buellia extenuata* f. *athallina* consists of a few apothecia and rare pycnidia on a small piece of wood. The ascospores, and more particularly the conidia, are identical with those of *B. extenuatella*.

The new species is known from Western Australia, South Australia, Victoria and New South Wales, where it occurs on twigs in *Callitris* and *Eucalyptus* woodland and, as in the case of the type specimen, in tall, scrubby, coastal heathland. Commonly associated species include *Austroparmelia pruvinata* (Müll.Arg.) A. Crespo, Divakar & Elix, *Buellia dissa* (Stirt.) Zahlbr., *B. microsporella* Elix, *Flavoparmelia rutidota* (Hook.f & Taylor) Hale, *Hyppogymnia billardierei* (Mont.) Filson, *Lecanora flavidomarginata* de Lesd., *Pertusaria thiospoda* C. Knight, *P. trimera* (Müll.Arg.) A. W. Archer, *Physcia nubila* Moberg and *Punctelia subalbicans* (Stirt.) D. J. Galloway & Elix.

#### SPECIMENS EXAMINED

*Western Australia*: • Charles Gardner Flora Reserve, central track, 20 km SW of Tamin along the old York Road, 31°47'24"S, 117°28'07"E, 305 m alt., on twigs of dead shrub in *Eucalyptus* woodland with *Allocasuarina* and *Acacia*, J.A. Elix 31854, 22.iv.2004 (CANB).

*South Australia*: • Southern Flinders Ranges, near Saltia Hill, 17 km ENE of Port Augusta, 32°28'S, 137°56'E, 300 m alt., on base of *Eucalyptus camaldulensis* on steep rocky slope with scattered *Eucalyptus* and *Casuarina*, J.A. Elix 41854, 23.ix.1994 (B, CANB).

*New South Wales*: • Goonoo State Forest, Ranters Creek, Cashels Dam Road, 33 km SE of Gilgandra, 31°58'25"S, 148°51'46"E, 360 m alt., on dead *Calytrix* twigs in *Eucalyptus-Callitris* woodland with *Calytrix* and *Grevillea* understorey, J.A. Elix 37393, 12.x.2005 (CANB).

#### 5. *Buellia nebulosa* Elix & Kantvilas, sp. nov. MB 804236

Fig. 5

Ascis singularibus, corpo axiali plus minusve cylindrico, typo *Lecanorae* aliquantum pertinenti, habitu *Buelliae abstractae* (Nyl.) H. Olivier parum similes sed ascosporis latioribus, 10–13 µm longis, 5–7.5(–8) µm latis differt.

*Type*: Australia, Tasmania, Skullbone Plains, 42°02'S, 146°19'E, 1000 m alt., on rock in a sheltered overhang over a wombat burrow in open heathland, G. Kantvilas 143/12, 29.ii.2012 (holotype – HO; isotype – CANB).

*Thallus* crustose, inconspicuus, pale dingy grey-brown to olive-brown, forming discontinuous patches to c. 10 cm wide and to 100–200 µm thick, but often much thinner, effuse to ±absent and with only the apothecia apparent; prothallus absent; cortex c. 10 µm thick; medulla I–, lacking calcium oxalate (H<sub>2</sub>SO<sub>4</sub>–); photobiont cells 8–15 µm diam. *Apothecia* 0.1–0.5 mm wide, scattered, lecidine, broadly adnate to

sessile; disc black, epruinose, plane to markedly convex; proper excipulum distinct and persistent, becoming reduced to ±excluded in older, convex apothecia, in section 25–40 µm thick, outer zone dark brown to brown-black, K–, N+ orange-brown, inner zone paler brown. *Ephymenium* 8–12(–18) µm thick, dark brown to dark olive-brown, K–, N–. *Hypothecium* 20–80 µm thick, olive-brown to dark brown, K–. *Hymenium* (40–)55–65 µm thick, colourless, not interspersed; paraphyses 1.5–2.0 µm wide, simple to branched, capitate, with apices 4–8 µm wide, dark brown; asci rather variable, approximating the *Bacidia*- to *Lecanora*-types, 8-spored. *Ascospores* at first of the *Physconia*-type, then of the *Buellia*-type, 1-septate, grey-green to brown, ellipsoid, 10–13 × 5–7.5(–8) µm, not constricted at the septum; outer spore-wall smooth to faintly ornamented when old. *Pycnidia* not seen.

*Chemistry*: Thallus K–, P–, C–, UV–; no lichen substances detected.

*Etymology*: the epithet, from the Latin *nebulosus* (clouded), reflects the scarcity of distinctive characters in the species.

#### Remarks

*Buellia nebulosa* is a very inconspicuous species, often with little apparent thallus and detectable only by its numerous, tiny, sessile apothecia scattered over the surface of its rock substratum. Older apothecia are markedly convex and seemingly immarginate, and are superficially more suggestive of a species of *Micarea* than *Buellia*. As its specific epithet implies, the new species has few remarkable distinguishing characteristics, yet we have been unable to place our specimens into any other genus. Its asci are unusual in not being unequivocally of the typically conical *Bacidia*-type. Rather, its *masse axiale* is frequently cylindrical and penetrates the entire tholus. A somewhat similar ascus type is seen in *B. testaceina*, a new species described below.

*Buellia abstracta* (Nyl.) H. Olivier exhibits a similar chasmothecial growth habit, with its thallus mostly hidden beneath the mineral grains of the substratum, but it differs in containing norstictic acid, and having significantly narrower, *Buellia*-type ascospores, 9–13 × 3.5–6 µm. Several superficially similar Australian collections remain unassigned, and differ from *B. nebulosa* by having typical, *Bacidia*-type asci, and either containing norstictic acid or having larger ascospores, 12–16 × 7–9 µm.

This new species is known only from the Tasmanian type specimen. The collection was from a probably nutrient-enriched, specialized site in alpine heathland, notably a sheltered, overhanging rock face above the burrow of the native marsupial, *Vombatus ursinus* Shaw (wombat). No other lichens were present.

#### 6. *Buellia poimena* Elix & Kantvilas, sp. nov. MB 804237

Fig. 6

*Buelliae lacteoidae* similis sed ephymenio brunneo non-areruginoso et acidum norsticticum deficienti differt.

*Type*: Australia, Tasmania, Skullbone Plains, ridge SW of Kenneth Lagoon, 42°03'S, 146°20'E, 980 m alt., on dolerite boulders in alpine heathland, G. Kantvilas 693/12, 12.xii.2012 (holotype – HO; isotype – CANB).

*Thallus* crustose, rimose-areolate, pale grey to pale blue-grey, more rarely brown or dark brown, ±continuous in patches to 8 cm wide and 1 mm thick, matt, smooth or becoming eroded, esorediate, epruinose; individual areoles 0.4–1.2 mm wide, angular, ±plane, sometimes a little raised at the margins and easily dislodged from the substratum; prothallus black, surrounding the thallus and rarely occurring between adjacent areoles, typically inconspicuous and not apparent; cortex 10–25 µm thick; photobiont cells 8–13 µm wide; medulla white, I–, 0.15–0.75 mm thick, lacking calcium oxalate (H<sub>2</sub>SO<sub>4</sub>–). *Apothecia* 0.3–0.9 mm wide, scattered to crowded, lecidine, roundish or irregularly distorted by mutual pressure, immersed in or among the areoles, rarely adnate; disc black, epruinose, persistently plane; proper excipulum

persistent, rarely excluded with age, black or masked by a necrotic thalline veil, in section 20–80  $\mu\text{m}$  thick with outer part dark brown to brown-black, K<sup>-</sup>, N<sup>+</sup> orange-brown, inner part pale brownish to colourless. *Epithymenium* to 10  $\mu\text{m}$  thick, dark brown to dark olive-brown, N<sup>-</sup>. *Hypothecium* 40–100  $\mu\text{m}$  thick, colourless to pale yellow-brown, K<sup>-</sup>, interspersed with numerous oil droplets. *Hymenium* 45–80  $\mu\text{m}$  thick, colourless, likewise interspersed in the lower part; paraphyses 1.7–2.5  $\mu\text{m}$  wide, simple to moderately branched, capitate, with apices dark brown, 4–5.5  $\mu\text{m}$  wide. *Asci* of the *Bacidia*-type, 8-spored. *Ascospores* of the *Physconia*-type, slightly centrally constricted and with median wall thickenings, 1-septate, olive-grey to brown, broadly ellipsoid, 11–20  $\times$  6–10  $\mu\text{m}$ ; outer spore-wall finely ornamented. *Pycnidia* immersed; conidia elongate-cylindrical, straight, 5–10(–15)  $\times$  1  $\mu\text{m}$ .

**Chemistry:** Medulla K<sup>+</sup> yellow or K<sup>-</sup>, C<sup>+</sup> pale red, PD<sup>+</sup> yellow or PD<sup>-</sup>; gyrophoric acid (major), lecanoric acid (minor),  $\pm$ 5-*O*-methylhiascic acid (major),  $\pm$ methyl psoromate (major).

**Etymology:** The specific epithet is derived from *poimena*, meaning “hill” in the language of the indigenous Tasmanians (Plomley 1976), and refers to the highland habitat of the species.

#### Remarks

Morphologically the new species resembles the North American *B. lacteoides* de Lesd., in that both species have immersed apothecia and relatively large, *Physconia*-type ascospores. However, *B. lacteoides* has an amyloid medulla and an aeruginose pigment in the excipulum, plus an epithymenium that reacts N<sup>+</sup> red-violet. The two species can readily be distinguished chemically, because *B. lacteoides* contains norstictic acid (major), atranorin (minor), and  $\pm$ accessory gyrophoric acid. Methyl psoromate is a very rare substance, previously known only from *Lecanora intumescens* (Rabenh.) Rabenh. (Elix *et al.* 1997).

The new species is known from highland areas of Tasmania and New South Wales, where it occurs on large boulders and outcrops in open heathland, typically at alpine elevations. In Tasmania, it occurs on a variety of rock types, including Jurassic dolerite and Precambrian metamorphosed sediments. Commonly associated species include *Poeltiaria coromandelica* (Zahlbr.) Rambold & Hertel, *Paraporphidia leptocarpa* (C.Bab. & Mitt.) Rambold & Hertel, *Lecanora farinacea* Fée, *L. polytropa* (Ehrr.) Rabenh., *Xanthoparmelia stygiodes* (Nyl. ex Croub.) O.Blanco, A.Crespo, Elix, D.Hawksw. & Lumbsch, *Rimularia psephota* (Tuck.) Hertel & Rambold, *Rhizocarpon geographicum* (L.) DC., *Stereocaulon caespitosum* Redinger and *Umbilicaria cylindrica* (L.) Delise ex Duby.

#### SPECIMENS EXAMINED

**New South Wales:** • Great Dividing Range, Rocky Pic, 5.5 km E of Captains Flat, 35°35'23"S, 149°30'13"E, 1250 m alt., on shale rock in open *Eucalyptus-Tasmannia* woodland, J.A. Elix 45850, 10.iii.2004 (CANB); • Mount Kosciuszko National Park, Charlottes Pass, 36°24'S, 148°19'E, 1800 m alt., on alpine granite boulders, G. Kantvilas 163/04, 17.iv.2004 (HO).

**Tasmania:** • summit of Sandbanks Tier, 41°51'S, 146°52'E, 1400 m alt., on exposed, windswept, dolerite rocks, G. Kantvilas 338/00A, 24.vi.2000 (HO); • Cradle Mountain-Lake St. Clair National Park, Hounslow Heath, 42°38'S, 145°56'E, 1140 m alt., on Precambrian, metamorphosed outcrops in alpine heath, G. Kantvilas 548/02, 14.x.2002 (CANB, HO); • Mt Mueller, eastern peak, 42°47'S, 146°28'E, 1235 m alt., on alpine dolerite rocks, G. Kantvilas 17/03, 9.ii.2003 (HO); • Blue Peaks, northern summit, 41°43'S, 146°22'E, 1350 m alt., on alpine dolerite rocks, G. Kantvilas 528/06, 20.xi.2006 (HO); • Schnells Ridge, 43°01'S, 146°25'E, 1070 m alt., on quartzite rocks in alpine heathland, G. Kantvilas 310/07, 20.x.2007 (HO); • Maria Island, summit of Bishop and Clerk, 42°35'S, 148°07'E, 585 m alt., on exposed dolerite boulders, G. Kantvilas 80/09A, 28.ii.2009 (HO); • Skullbone Plains, 42°02'S, 146°19'E, 1000 m alt., on boulders in open heathland, G. Kantvilas 92/12, 138/12, 29.ii.2012 (HO).

7. ***Buellia polyxanthonica*** Elix var. ***isidiata*** Elix & Kantvilas, var. nov. MB 804240

Fig. 7

A varietate *polyxanthonica* isidiis subglobosis, simplicibus vel parce ramosis recedit.

**Type:** Australia, Western Australia, Erskine Range, Great Northern Highway, between Derby and Fitzroy Crossing, 17°51'S, 124°20'E, 120 m alt., on lateritic rocks with a SW aspect along the escarpment in *Triodia*-dominated grassland, J.A. Elix 22329 & H. Streimann, 18.v.1988 (holotype – CANB).

**Thallus** crustose, rimose-areolate, yellow to deep yellow-green, dull or glossy,  $\pm$ continuous, to 5 cm wide and to c. 0.1 mm thick, esorediate, isidiate; individual areoles 0.1–0.4 mm wide, angular,  $\pm$ plane; isidia subglobose, simple or sparingly branched, apices corticate and rarely blackened or often becoming eroded and granular; prothallus conspicuous, black, surrounding the thallus and growing among the areoles; cortex 15–30  $\mu\text{m}$  thick; medulla white, I<sup>-</sup>, to 90  $\mu\text{m}$  thick, lacking calcium oxalate (H<sub>2</sub>SO<sub>4</sub>-). *Apothecia* 0.1–0.4 mm wide, lecidine, scattered to confluent, round, adnate then sessile; disc black, epruinose, plane to weakly convex; proper excipulum thin, persistent,  $\pm$ excluded with age, in section 35–50  $\mu\text{m}$  thick, outer part dark brown, inner part pale brown, K<sup>-</sup>. *Epithymenium* 10–15  $\mu\text{m}$  thick, dark brown, forming a deep yellow solution in KOH, N<sup>-</sup>. *Hypothecium* 50–100  $\mu\text{m}$  thick, dark brown, K<sup>-</sup>. *Hymenium* 35–50  $\mu\text{m}$  thick, colourless, not interspersed; paraphyses 1.5–2.5  $\mu\text{m}$  wide, sparingly branched, capitate, with brown apices, 4–5  $\mu\text{m}$  wide; *asci* of the *Bacidia*-type, 8-spored. *Ascospores* of the *Physconia*-type, 1-septate, grey-green to brown, ellipsoid, 12–20  $\times$  6–8  $\mu\text{m}$ , with median thickenings; outer spore-wall ornamented. *Pycnidia* not seen. **Chemistry:** Thallus K<sup>-</sup>, P<sup>-</sup>, C<sup>+</sup> orange, UV<sup>+</sup> yellow or orange; containing thiophanic acid (major or minor), 3-*O*-methylthiophanic acid (major),  $\pm$ thuringione (trace),  $\pm$ arthothelin (trace),  $\pm$ isoarthothelin (trace),  $\pm$ asemone (trace),  $\pm$ 2,7-dichlorolichexanthone (trace),  $\pm$ 3-*O*-methylasemone (trace),  $\pm$ di-*O*-methylthiophanic acid (trace).

**Etymology:** The varietal name refers to the isidiate upper surface of the lichen.

#### Remarks

In colour and chemistry, the new variety is identical to *Buellia polyxanthonica* Elix var. *polyxanthonica* (Elix 2009a), but it can be readily distinguished by the presence of isidia.

The new variety is known from Western Australia, Northern Territory and Queensland, where it is relatively common on sheltered sandstone rocks in *Triodia*-dominated grassland and monsoon savannah. Commonly associated species include *Australiaena streimannii* Matzer, H.Mayrhofer & Elix, *Caloplaca leptozona* (Nyl.) Zahlbr., *Dimelaena elevata* Elix, Kalb & Wippel, *D. tenuis* (Müll.Arg.) H.Mayrhofer & Wippel, *Diploschistes actinostomus* (Pers.) Zahlbr., *Lecanora austrosorediosa* (Rambold) Lumbsch, *Lepraria coriensis* (Hue) Sipman, *Parmotrema praesorediosum* (Nyl.) Hale and *Pertusaria remota* A.W.Archer.

#### SPECIMENS EXAMINED

**Western Australia:** • Type locality, J.A. Elix 22301, 22306, 22315, 22322, 22333 & H. Streimann, 18.v.1988 (CANB).

**Northern Territory:** • Border Waterhole, c. 140 km N of Cammoweal, 18°37'S, 137°59'E, 150 m alt., on sandstone rocks in *Triodia* grassland, K. Thomas BW4, 21.iv.1995 (CANB).

**Queensland:** • Just E of entrance to Carnarvon National Park, 90 km NNW of Injune, 25°04'S, 148°16'E, 460 m alt., on sandstone rocks in *Eucalyptus* woodland, J.A. Elix 34244, 21.viii.1993 (CANB); • Boodjamulla (Lawn Hill) National Park, Amphitheatre Pool, Stockyard Camp, c. 350 km NW of Mount Isa, 18°28'S, 138°14'E, 140 m alt., on sandstone rocks in *Triodia* grassland on tableland dissected by creek, K. Thomas A1, A2, 20.iv.1995 (CANB).



8. *Buellia stellulata* (Taylor) Mudd var. *tasmanica* Elix & Kantvilas, var. nov. Fig. 8 MB 804241

*Buelliae stellulatae* var. *stellulatae* similis sed acida 2'-O-methylperlatolicum et confluenticum deficienti differt.

*Type:* Australia, Tasmania, Boat Harbour, 10 km NW of Wynyard, 40°57'S, 145°38'E, 2 m alt., on quartzite rocks along the foreshore, J.A. Elix 23779, 11.i.1990 (holotype – CANB; isotype – HO).

*Thallus* crustose, rimose-areolate, white to pale grey, dull or glossy, ±continuous in patches up to 2 cm wide and to c. 100 µm thick, esorediate; individual areoles 0.1–0.3 mm wide, angular, ±plane; prothallus conspicuous, black, surrounding the thallus and growing between the areoles, ±forming a mosaic; cortex 10–15 µm thick; medulla white, I–, 75–90 µm thick, lacking calcium oxalate (H<sub>2</sub>SO<sub>4</sub>–). *Apothecia* 0.1–0.4 mm wide, lecideine, scattered to confluent, round, immersed, rarely adnate; disc black, epruinose, plane to weakly concave; proper excipulum of the *aethalea*-type, persistent or rarely excluded with age, black or masked by a necrotic thalline veil, in section 15–30 µm thick, outer part dark brown to brown-black, K–, N+ red-brown to purple-brown, inner part colourless, rather poorly differentiated from the paraphyses. *Epithymenium* 10–15 µm thick, dark brown to brown-black, mostly also with patches of greenish, N+ crimson pigment. *Hypothecium* 20–30 µm thick, red-brown, K–. *Hymenium* 45–70 µm thick, colourless, not interspersed; paraphyses 1.7–2.5 µm wide, simple to moderately branched, capitate, with apices brown, 3–4 µm wide; asci of the *Bacidia*-type, 8-spored. *Ascospores* of the *Buellia*-type, 1-septate, brown, broadly ellipsoid, 7.5–12 × 4.5–7 µm; torus indistinct; outer spore-wall smooth to finely ornamented. *Pycnidia* not seen.

*Chemistry:* Cortex K+ pale yellow, C–, KC–, PD+ pale yellow or PD–; containing atranorin (major), chloroatranorin (minor), ±roccellic acid (minor).

*Etymology:* The varietal name is derived from the geographical distribution of the lichen.

#### Remarks

Morphologically the new variety is identical to *Buellia stellulata* (Taylor) Mudd var. *stellulata*, but can be readily distinguished chemically, because *B. stellulata* var. *stellulata* contains additional 2'-O-methylperlatolic acid (major) and confluent acid (minor). Chemical composition is likewise the most reliable means of distinguishing the new variety from the sometimes superficially similar *Buellia homophyllia* (C.Knight) Zahlbr. and *B. aethalea*.

The new variety is known from several coastal localities in Tasmania, including Flinders Island. Commonly associated species include *Amandinea coniops* (Wahlenb.) M.Choisy ex Scheid. & H.Mayrhofer, *A. pelidna* (Ach.) Fryday & L.Arcadia, *Buellia halonia* (Ach.) Tuck., *B. homophyllia* (C.Knight) Zahlbr., *B. stellulata* (Taylor) Mudd var. *stellulata*, various *Caloplaca* species, *Parmotrema reticulatum* (Taylor) M.Choisy, *Pertusaria xanthoplaca* Müll. Arg., *Tephromela atra* (Huds.) Hafellner, *Xanthoparmelia australasica* D.J.Galloway and *X. tasmanica* (Taylor) Hale.

#### SPECIMENS EXAMINED

*Tasmania:* • Couta Rocks, 13.5 km S of Arthur River township, 41°10'S, 144°41'E, 2 m alt., on rocks in coastal heath, J.A. Elix 40246 & G. Kantvilas, 9.xii.1993 (CANB); • Flinders Island, summit of Mt Killiecrankie, 39°49'S, 147°52'E, 310 m alt., on exposed granite rock plates, G. Kantvilas 34/06, 22.i.1956 (HO); • Bicheno, 41°53'S, 148°18'E, sea level, on granite, R.G. Spencer 2133, ii.1965 (HO); • The Blade, Cape Pillar, 43°14'S, 148°00'E, 250 m alt., in sheltered crevices of dolerite boulders along cliff edge, G. Kantvilas 277/12, 5.iv.2012 (HO); • c. 0.75 km SW of Point des Galets, 42°41'S, 147°57'E, 20 m alt., on highly weathered dolerite coastal rocks, G. Kantvilas 302/12, 27.v.2012

(HO); • Cockle Bay Lagoon, 42°42'S, 147°56'E, 1 m alt., on dolerite cobbles on sea-shore, G. Kantvilas 736/12, 16.xii.2012 (HO).

9. *Buellia testaceina* Elix & Kantvilas, sp. nov. Fig. 9 MB 804238

*Buelliae schaeereri* aliquantum admonens sed ascis singularibus, *Lecanora*-typi accedentibus, conidiis maioribus, 3–7 µm longis, 1–1.5 µm latis, et testaceinum continententi differt.

*Type:* Australia, Tasmania, Skullbone Plains property, c. 2 km S of Kenneth Lagoon, 42°04'S, 146°19'E, 990 m alt., on trunk of old eucalypt at edge of woodland fringing a *Sphagnum* bog, G. Kantvilas 211/12, 1.iii.2012 (holotype – HO; isotype – CANB).

*Thallus* crustose, rimose-areolate to verruculose, white to pale grey, in places tinged olive-brown, forming irregular, rather discontinuous, diffuse patches to c. 10 cm wide and 100–300 µm thick; prothallus absent; cortex indistinct and discontinuous, to c. 10 µm thick; medulla I–; photobiont cells 10–15 µm wide. *Apothecia* 0.1–0.4 mm wide, lecideine, adnate to sessile, at times markedly basally constricted; disc black, plane to convex, epruinose; proper excipulum distinct, persistent, in section 15–20 µm thick, dark olive-brown, K–, N–. *Epithymenium* 5–10 µm thick, dark brown, K–, N–. *Hypothecium* 40–60 µm thick, yellow-brown to olive-brown. *Hymenium* 40–50 µm thick, colourless, interspersed with minute oil droplets; paraphyses 1.7–2.5 µm wide, simple to sparsely branched, capitate, with apices 3–5 µm wide, dark brown; asci approximating the *Lecanora*-type, with a well-developed amyloid tholus, penetrated entirely or almost so by a weakly amyloid masse axiale with parallel flanks, 8-spored. *Ascospores* approximating the *Rinodinella*-type, 1-septate, olive to brown, broadly fusiform to ellipsoid, 7–12 × 2.5–5 µm, uniformly thin-walled; outer wall smooth. *Pycnidia* emergent, globose, black, 50–70 µm diam.; conidia bacilliform to fusiform, 3–7 × 1–1.5 µm.

*Chemistry:* thallus K+ pale yellow, P+ pale yellow, C–, UV–; containing testacein (major).

*Etymology:* The specific epithet refers to the presence of the substance testacein in this species.

#### Remarks

With its whitish thallus, black lecideine apothecia and lignicolous habitat, at first sight this new lichen resembles a species of *Buellia* in the strict sense, a member of the *Hafellia* group. Anatomically, however, it is clearly unrelated to that complex of taxa, and the small, thin-walled, small *Rinodinella*-type ascospores are diagnostic. Also unusual are the asci, which are difficult to interpret but are tentatively referred to the *Lecanora*-type. The *masse axiale* is relatively narrow and mostly penetrates the tholus entirely, although in some asci it does not, and has a thin, rounded apex, somewhat similar to that seen in *Lecidella*; no darker-staining inner border is evident. The combination of ascus- and spore-types suggest that the species occupies at best a peripheral position in *Buellia*, although we are unaware of another genus of better fit.

Also unusual is the presence of testacein, a phenolic metabolite of unknown structure, first reported as occurring in *Parmelia testacea* Stirt. (Hale 1987 – as unknown #27). In the Physciaceae, testacein was previously known from a number of species of *Pyxine* (Elix 2009b) and *Heterodermia* (Elix 2011). This is the first report of the substance in a crustose member of the family.

The new species is morphologically similar to the European species *B. schaeereri* De Not., which differs in having *Bacidia*-type asci with 8 or 16 *Buellia*-type ascospores, smaller conidia (1.5–3.0 × 0.5–1.0 µm), and either traces of atranorin or no lichen substances.

*Buellia testaceina* is known only from the type locality, where it occurs on the bleached wood of an old eucalypt at the margins of a high-altitude *Sphagnum* bog. Associated species include *Calicium abietinum* Pers., *C. adpersum* Pers. subsp. *australe* Tibell, *C. salicinum* Pers., *Cladia schizopora* (Nyl.) Nyl., *Cladonia rigida* (Hook.f. & Taylor) Hampe var. *rigida*, *Hypocenomyce australis* Timdal, *H. foveata* Timdal, *Ramboldia stuartii* (Hampe) Kantvilas & Elix, *Trapeliopsis granulosa* (Hoffm.) H.T.Lumbsch and *T. flexuosa* (Fr.) Coppins & P.James.

10. *Buellia yilliminningensis* Elix & Kantvilas, sp. nov. MB 804239

Fig. 10

Primo aspectu *Trapeliopsis flexuosam* vel *Buelliam griseovirentem* admonens sed thallo sorediato, acida gyrophoricum thiophanicumque continenti et ascosporis brunneis, uniseptatis, 15–28  $\mu\text{m}$  longis, 7–10  $\mu\text{m}$  latis manifeste differt.

*Type:* Australia, Western Australia, Yilliminning Rock, 17 km E of Narrogin, 32°56'35"S, 117°22'15"E, 330 m alt., on base of *Acacia* in dry *Eucalyptus-Acacia* woodland surrounding large, exposed granite outcrop, *J.A. Elix 39129*, 5.iv.2006 (holotype – CANB; isotype – PERTH).

*Thallus* crustose, areolate to verruculose, pale grey-green to yellow-green, forming patches 2–6 cm wide, 0.1–0.8 mm thick; verruculae convex, 0.2–0.5 mm wide, smooth and generally esorediate, or becoming sorediato, with the soralia mostly discrete, 0.15–0.4 mm diam., often crowded and occasionally confluent, pale grey-green to yellow-green; soredia 15–25  $\mu\text{m}$  diam.; prothallus not apparent; cortex c. 10  $\mu\text{m}$  thick; photobiont cells 8–12  $\mu\text{m}$  wide. *Apothecia* 0.2–0.8 mm wide, lecideine, broadly adnate to sessile; disc black, epuriose, weakly concave at first, then  $\pm$ plane, soon convex, scattered; proper excipulum thin, black, excluded in convex apothecia, in section 30–50  $\mu\text{m}$  thick, dark red-brown to black-brown, paler within, K+ yellow-brown. *Epithemium* 8–12  $\mu\text{m}$  thick, dark red-brown, K+ olive-brown to yellow-brown. *Hypothecium* 35–45  $\mu\text{m}$  thick, pale brown, K-. *Hymenium* 70–80  $\mu\text{m}$  thick, colourless, not interspersed; paraphyses 1.5–1.7  $\mu\text{m}$  wide, simple to weakly branched, capitate, with apices 4–5.5  $\mu\text{m}$  wide, dark brown; asci of the *Bacidia*-type, 8-spored. *Ascospores* at first of the *Pachysporaria*-type, then of the *Buellia*-type, 1-septate, grey-green to brown, ellipsoid to pyriform, 15–28  $\times$  7–10  $\mu\text{m}$ ,  $\pm$ constricted at the septum, often pointed at one apex, mature spores with uniformly thickened walls; outer spore-wall strongly ornamented. *Pycnidia* not seen.

*Chemistry:* thallus K-, C+ red, P-, UV-; containing gyrophoric acid (major), thiophanic acid (minor), lecanoric acid (minor) and hiascic acid (trace).

*Etymology:* The specific epithet is derived from the name of the type locality.

#### Remarks

The new species is characterized by the crustose, pale grey-green to yellow-green thallus, which is sorediato in part, the relatively large, 1-septate, *Pachysporaria*- and then *Buellia*-type, ellipsoid to pyriform ascospores, the non-interspersed hymenium and the presence of gyrophoric and thiophanic acids. In gross morphology, the sorediato thallus containing gyrophoric acid recalls a species of *Trapeliopsis*, notably *T. flexuosa* (Fr.) Coppins & P.James. Among the Australian species of *Buellia*, it closely resembles *B. griseovirens* (Turner & Borrer ex Sm.) Almborn, but the latter differs in having submuriform ascospores and in containing atranorin (major), norstictic acid (minor or trace) and  $\pm$ connorstictic acid (trace).

At present *B. yilliminningensis* is known from only the type locality. Associated species include *Austroparmelia pseudorelicina* (Jatta) A.Crespo, Divakar & Elix, *Buellia reagenella* Elix, *B. tetrapla* (Nyl.) Müll.Arg., *B. xanthonica* Elix, *Caloplaca haematommoma* Elix & S.Y.Kondr., *Ramboldia bullata* Kalb & Elix, *R. sorediata* Kalb and *Usnea scabrida* Taylor subsp. *scabrida*.

#### New records for Australia

1. *Buellia macularis* Zahlbr., *Denkschr. Akad. Wiss. Wien math.-naturwiss. Kl.* **104**, 375 (1941) This species was previously known from New Zealand (Galloway 2007). It is characterized by the very closely attached, grey-white, minutely areolate thallus (appearing maculate), the prominent and often dominant black prothallus, which is usually stellate at the margins, the centrally clustered, innate to sessile, black apothecia and the ellipsoid to ovoid ascospores, 12–16  $\times$  6–8  $\mu\text{m}$ . It is distinguished from *B. aethalea* by the rounded, lecideine, often coalescent apothecia that ultimately become  $\pm$ adnate (comma-shaped, cryptolecanorine, "hooded", and remaining immersed in *B. aethalea*), and the thin, persistent,  $\pm$ conspicuous true exciple (reduced in *B. aethalea*).

#### SPECIMENS EXAMINED

*Western Australia:* • John Forrest National Park, Darling Ranges, 26 km E of Perth, 31°53'S, 116°05'E, on laterite rocks in open *Eucalyptus* woodland, *J.A. Elix 10482 & L.H. Elix*, 20.x.1982 (CANB); • Near summit of Mt Observation, Mount Observation National Park, 20 km W of York, 31°53'45"S, 116°33'26"E, 365 m alt., on laterite rocks in *Eucalyptus* woodland with scattered *Dryandra*, *Casuarina* and *Xanthorrhoea*, *J.A. Elix 38134*, 3.iv.2006 (CANB); • Yilliminning Rock, 18 km NE of Narrogin, 32°57'S, 117°22'E, 320 m alt., on large, exposed granite outcrop surrounded by dry sclerophyll forest, *J.A. Elix 41077*, *H.T. Lumbsch & H. Streimann*, 12.ix.1994 (CANB).

2. *Buellia saxorum* A.Massal., *Ric. Auton. Lich. Crost.*: 82 (1852)

This species was previously known from Europe and Asia (Coppins *et al.* 2009). It is characterized by the moderately thick, white to pale yellow-grey thallus delimited by a thin, black prothallus, an I+ blue medulla, broadly adnate black apothecia with a prominent proper margin, a brown, N- epihymenium, ellipsoid, *Buellia*-type ascospores, 10–18  $\times$  5–9  $\mu\text{m}$ , fusiform to bacilliform conidia, 4–9  $\times$  1  $\mu\text{m}$  and the presence of atranorin and gyrophoric acid. Coppins *et al.* (2009) give a detailed description.

#### SPECIMEN EXAMINED

*New South Wales:* • Bodalla State Forest, Mummaga Lake Walk, 7 km SSE of Bodalla, 36°09'03"S, 150°05'46"E, 4 m alt., on sandstone in wet *Eucalyptus* woodland along inlet, *J.A. Elix 45698*, 17.ix.2008 (CANB, HO).

#### New State and Territory records

1. *Buellia aeruginosa* A.Nordin, Owe-Larsson & Elix, *Mycotaxon* **71**, 400 (1999)

This species has a scattered coastal distribution in South Australia (Kangaroo Island) and southern New South Wales (Elix 2011; McCarthy 2013). It is noteworthy for its muriform ascospores, unusual in the genus *Buellia*.

#### SPECIMENS EXAMINED

*Tasmania:* • Penguin, on rocks just above high tide mark, *W.A. Weber & D. McVean L-49695*, 23.ii.1968 (HO); Maingon Blowhole, Tasman Peninsula, 42°12'S, 147°51'E, 40 m alt., on sheltered dolerite boulders in coastal heathland, *G. Kantvilas 361/06*, 14.x.2006 (HO).

2. *Buellia aethalea* (Ach.) Th.Fr., *Lichenogr. Scand.* **2**, 604 (1874)

This species occurs on siliceous rocks and ranges from coastal to alpine altitudes. It was hitherto recorded from southern and eastern Australia (Western Australia, South Australia and New South Wales), as well as from Europe, Macaronesia, North and South America, Africa, Asia, New Zealand and Antarctica. It is characterized by a thallus containing norstictic acid, immersed apothecia with a highly reduced exciple, a colourless hypothecium, and ascospores of the *Buellia*-type, 11–18  $\times$  6–10  $\mu\text{m}$ , with minutely ornamented walls when old (see Elix 2011 for a full description).

## SPECIMENS EXAMINED

*Tasmania*: • track to Mt Faulkner, 42°48'S, 147°12'E, on mudstone, *G.C. Bratt & J.A. Cashin 71/1606*, 27.xi.1971 (HO); • Lake Kaye, 41°54'S, 146°13'E, 1140 m alt., on basalt boulders in alpine heathland, *G. Kantvilas 94/00 p.p.*, 8.iii.2000 (HO); • Shag Bay, 42°50'S, 147°20'E, 3 m alt., on mudstone outcrops along sea-shore, *G. Kantvilas 337/09*, 22.viii.2009 (HO); • Lake Hwy near Projection Bluff, 41°44'S, 146°43'E, 1100 m alt., on dolerite boulder along roadside at edge of rainforest, *G. Kantvilas 317/12*, 5.vii.2012 (HO); • Cherry Tree Hill, 41°58'S, 148°08'E, 180 m alt., on dolerite boulders in dry sclerophyll forest, *G. Kantvilas 321/12*, 25.vii.2012 (HO); • Espies Craig, 42°34'S, 147°01'E, 600 m alt., on vertical dolerite tor in open eucalypt forest, *G. Kantvilas 362/12*, 14.viii.2012 (HO).

3. *Buellia bogongensis* Elix, *Australas. Lichenol.* 65, 10 (2009)

This endemic species was previously known from Victoria (Elix 2011; McCarthy 2013). It is characterized by containing norstictic acid, having an intensely amyloid medulla, as well as immersed, rather angular apothecia, and submuriform, 4–6-celled ascospores, 15–23 × 7–10 µm (Elix 2009c).

## SPECIMEN EXAMINED

*Tasmania*: • summit of Sandbanks Tier, 41°51'S, 146°52'E, 1400 m alt., on exposed, alpine, windswept, dolerite rocks, *G. Kantvilas 338/00B*, 24.vi.2000 (HO).

4. *Buellia cranfieldii* Elix, *Austral. Lichenol.* 66, 45 (2010)

This species was previously known only from south-western Western Australia. It is characterized by a whitish to pale grey, areolate thallus containing atranorin and chloroatranorin, a conspicuous black prothallus, and rather immersed, lecideine apothecia. It could be confused with several other species, from which it is best separated by its chemistry, notably *B. homophylia* (atranorin, norstictic acid), *B. stellulata* (atranorin, ±confluent acid, ±roccellic acid) and *B. aethalea* (norstictic acid).

## SPECIMEN EXAMINED

*Tasmania*: • Alum Cliffs, near the lookout, 41°32'S, 146°26'E, 350 m alt., on sheltered rock outcrops in dry sclerophyll forest, *G. Kantvilas 230/05*, 13.viii.2005 (HO).

5. *Buellia halonia* (Ach.) Tuck., *Lich. Californ.*, 26 (1866)

This species was previously known from North America, South America, and South Africa, and in Australia from South Australia, New South Wales and Tasmania (Bungartz *et al.* 2007; Elix 2011; McCarthy 2013). It is characterized by a yellowish thallus containing xanthonones (C+ orange), sessile apothecia with an occasionally pruinose disc, and ascospores of the *Physconia*-type, 11.5–19 × 6–9 µm.

## SPECIMENS EXAMINED

*Victoria*: • Western Plains region, Port Fairy quarry (by sea), 38°22'S, 142°15'15"E, 100 m alt., on bluestone (basalt), *W.H. Ewers s.n.*, 29.iii.1986 (CANB).

*Western Australia*: • Cape Naturaliste, Sugarloaf Rock, on granite outcrops, *W.A. Weber L-49930*, 10.v.1968 (HO).

6. *Buellia kimberleyana* Elix, *Australas. Lichenol.* 65, 11 (2009)

This endemic species was previously known from Western Australia and the Northern Territory (McCarthy 2013).

## SPECIMENS EXAMINED

*Queensland*: • Near the summit of Mt Leswell, 32 km S of Cooktown, 15°46'S, 145°15'E, 440 m alt., on granite rocks in *Eucalyptus*-dominated woodland, *J.A. Elix 17352 & H. Streimann*, 5.vii.1984 (CANB); • Robinson Gorge, Expedition National Park, 73 km NW of Taroom, 25°17'S, 149°09'E, 400 m alt., on sandstone rocks in steep gorge with palms and *Callistemon* shrubs, *J.A. Elix 35241*, 1.ix.1993 (CANB).

7. *Buellia mamillana* (Tuck.) W.A. Weber, *Mycotaxon* 27, 493 (1986)

This species is known from North, Central and South America, southern Africa, India, and Norfolk Island, and in Australia from the Northern Territory, Queensland and New South Wales (Elix 2011; McCarthy 2013).

## SPECIMENS EXAMINED

*Western Australia*: • Mt Cockburn South, Cockburn Range, 45 km S of Wyndham, 15°55'S, 128°09'E, 300 m alt., on sandstone rocks on steep, rocky ridge with SW aspect, *J.A. Elix 22433 & H. Streimann*, 21.v.1988 (CANB); • Rock Creek Falls, 18 km NW of Kununurra, 15°38'S, 128°40'E, 70 m alt., on shaded rocks in remnant evergreen forest at base of falls, *J.A. Elix 22452 & H. Streimann*, 22.v.1988 (CANB).

8. *Buellia molonglo* U.Grube & Elix, in U. Grube, H. Mayrhofer & J.A. Elix, *Biblioth. Lichenol.* 88: 164 (2004)

This Australian endemic was previously known only from the type locality in the Australian Capital Territory (Grube *et al.* 2004; Elix 2011; McCarthy 2013).

## SPECIMENS EXAMINED

*New South Wales*: • Warrumbungles National Park, Split Rock Track, 36 km W of Coonabarabran, 31°16'49"S, 148°58'42"E, 430 m alt., on sandstone in *Eucalyptus-Callitris* woodland, *J.A. Elix 45451*, 12.v.2005 (CANB).

*Victoria*: • Mount Eccles National Park, Lake Surprise, 8 km SW of Macarthur, 38°04'S, 141°56'E, 160 m alt., on basalt rocks in dry sclerophyll forest, *J.A. Elix 25990*, 15.xii.1990 (CANB); • Stony Rises, Pomborneit East Road, 17 km ESE of Camperdown, 38°18'S, 143°20'E, 150 m alt., on basalt rocks in dry sclerophyll forest, *J.A. Elix 26032*, 16.xii.1990 (CANB).

*South Australia*: • Marble Range, 28 km SW of Cummins, 34°25'S, 135°30'E, 400 m, on quartz rocks on rocky ridge with scattered shrubs, *J.A. Elix 41783*, 22.ix.1994 (CANB).

9. *Buellia ocellata* (Flot.) Körb., *Syst. Lich. German.* 224 (1855)

This species is known from Europe, North America, Macaronesia, Asia and Africa; in Australia, it was previously recorded from Victoria (McCarthy 1991). It is characterized by a rather dispersed, areolate to subsquamulose, yellowish to grey thallus containing arthothelin (C+ orange), rather innate apothecia occurring one per areole, and *Physconia*- to *Buellia*-type ascospores, 12–24 × 7–10 µm. It occurs on rock at high elevations, typically forming tiny islands a few millimetres wide among other lichens.

## SPECIMENS EXAMINED

*New South Wales*: • Great Dividing Range, Rocky Pic, 5.5 km E of Captains Flat, 35°35'23"S, 149°30'13"E, 1250 m alt., on shale rock in open *Eucalyptus-Tasmannia* woodland, *J.A. Elix 45851*, 10.iii.2004 (CANB); • Tinderry Range, 9 km ESE of Michelago, 35°44'32"S, 149°15'50"E, 1220 m alt., on granite in open *Eucalyptus* woodland with granite boulders, *J.A. Elix 45871*, 45875 10.iii.2004 (CANB); • Mt. Kosciuszko, Snowy Mountains, 36°28'S, 148°15'E, 2220 m alt., on quartz rock, *D. McVean 67204*, xi.1967 (CANB).

*Tasmania*: • Hounslow Heath, 42°38'S, 145°56'E, 1140 m alt., on Precambrian metamorphosed outcrops in alpine heathland, *G. Kantvilas 552/02*, 14.x.2002 (HO); • Johnsons Lagoon, 41°59'S, 146°23'E, 1040 m alt., on dolerite boulders in low subalpine heathland, *G. Kantvilas 396/07*, 9.xii.2007 (HO); • Bisdee Tier, 42°26'S, 147°17'E, 640 m alt., on dolerite boulder in rocky grassland, *G. Kantvilas 127/09A*, 11.iii.2009 (HO); • Chimney Pot Hill, 42°55'S, 147°17'E, 495 m alt., on dolerite boulders in open eucalypt forest, *G. Kantvilas 320/12*, 15.vii.2012 (HO); • Espies Craig, 42°34'S, 147°01'E, 600 m alt., on vertical dolerite tor in eucalypt forest, *G. Kantvilas 364/12*, 14.viii.2012 (CANB, HO).

10. *Buellia polyxanthonica* Elix var. *polyxanthonica*, *Australas. Lichenol.* 64, 31 (2009)

This endemic species was previously known from Western Australia and the Northern Territory (McCarthy 2013).

#### SPECIMENS EXAMINED

Queensland: • Cooktown road, 35 km WNW of Mount Carbine, 16°28'S, 144°49'E, 500 m alt., on quartz outcrop in *Eucalyptus*-dominated grassland, *J.A. Elix* 17202, 17206 & *H. Streimann*, 3.vii.1984 (CANB); • Razorback Range, 3 km NW of Mount Morgan, 23°28'S, 150°22'E, 280 m alt., on metamorphic rocks in dry sclerophyll forest on steep slope with *Cycas* and *Macrozamia*, *J.A. Elix* 34632, 34638, 26.viii.1993 (CANB); • 36 km E of Mount Isa, 20°43'S, 139°51'E, 430 m alt., on rock outcrop in *Eucalyptus* woodland with *Triodia*, *H. Streimann* 37270, 24.vi.1986 (CANB).

#### 11. *Buellia psoromica* Elix, *Australas. Lichenol.* 65, 13 (2009)

This endemic species was previously known from Western Australia, Northern Territory and the Australian Capital Territory (McCarthy 2013). Its chemical composition (atranorin and psoromic acid) is unique for the genus in Australia.

#### SPECIMENS EXAMINED

New South Wales: • Tianjara Falls, 35°07'S, 150°20'E, on sandstone at upper edge of escarpment in dry *Eucalyptus* forest, *G. Kantvilas* 607/12, 17.xi.2012 (HO).

South Australia: • Flinders Ranges, Nooltana Creek, 12 km N of Hawker, 31°49'S, 138°23'E, 550 m alt., on rocks in chenopod shrubland, *J.A. Elix* 17941 & *L. H. Elix*, 29.x.1984 (CANB).

#### 12. *Buellia subalbula* (Nyl.) Müll.Arg., *Rev. Mycol.* 2, 79 (1880)

This species was previously known from southern Africa and South America, and in Australia from Tasmania and the Australian Capital Territory (Bungartz *et al.* 2007; Elix 2011; McCarthy 2013). Like the closely related *B. albula*, this species has a chalky white thallus, contains norstictic acid and occurs on limestone. It differs from that species in having a greenish, N+ crimson epithecium.

#### SPECIMENS EXAMINED

South Australia: • 48 km W of Nullarbor Homestead, *G.C. Bratt* 67/192, 4.x.1967 (AD, HO); 16 km W of Ivy Tank, *G.C. Bratt* 67/179, 4.x.1967 (HO); • Flinders Ranges, 4.5 km S of Beltana, 30°50'S, 138°24'E, 230 m alt., on rocks of rocky ridge in chenopod shrubland, *J.A. Elix* 17981 & *L.H. Elix*, 30.x.1984 (CANB); • Brookfield Conservation Park, Sturt Highway, 13 km W of Blanchetown, 34°23'09"S, 139°29'19"E, 80 m alt., on limestone in remnant mallee *Eucalyptus* woodland, *J.A. Elix* 45143, 15.v.2010 (CANB).

Victoria: • Port Fairy, 38°23'S, 142°15'E, 1 m alt., on basalt rocks along rocky foreshore, *J.A. Elix* 25961, 15.xii.1990 (CANB).

#### The new combination

*Amandinea falklandica* (Darb.) Elix & Kantvilas comb. nov.

MB 804242

Basionym: *Buellia falklandica* Darb., *Wissenschaftliche Ergebnisse der schwedischen Südpolar-Expedition 1901-1903*, 4, Lf. 11, 14 (1912)

#### Acknowledgment

The support of the Australian Biological Resources Study through the award of a Bush-Blitz Applied Taxonomy Grant to GK is gratefully acknowledged.

#### References

- Bungartz, F; Nordin, A; Grube, U (2007): *Buellia* De Not. – In: Nash III, TH; Gries, C; & Bungartz, F (eds) *Lichen Flora of the Greater Sonoran Desert Region* 3, 113–179.
- Coppins, BJ; Scheidegger, C; Aptroot, A (2009): *Buellia* de Not. – In: Smith, CW; Aptroot, A; Coppins, BJ; Fletcher, A; Gilbert, OL; James, PW; Wolseley, PA (eds) *Lichens of Great Britain and Ireland* 228–238.

Elix, JA; Ernst-Russell, KD (1993): *A Catalogue of Standardized Thin-Layer Chromatographic Data and Biosynthetic Relationships for Lichen Substances*, 2nd Edn, Australian National University, Canberra.

Elix, JA; Wardlaw, JH; Archer, AW; Lumbsch, HT; Plümper, M (1997): Four new depsidones from *Pertusaria* and *Lecanora* lichens. *Australasian Lichenology* 41, 22–27.

Elix, JA; Giralt, M; Wardlaw, JH (2003): New chloro-depsidones from the lichen *Dimelaena radiata*. *Bibliotheca Lichenologica* 86, 1–7.

Elix, JA (2009a): New crustose lichens (lichenized Ascomycota) from Australia. *Australasian Lichenology* 64, 30–37.

Elix, JA (2009b): *Pyxine*. *Flora of Australia (Lichens 5)* 57, 517–533.

Elix, JA (2009c): New saxicolous species and new records of *Buellia sens. lat.* and *Rinodina* (Ascomycota, Physciaceae) in Australia. *Australasian Lichenology* 65, 10–19.

Elix, JA (2011): *Australian Physciaceae (Lichenised Ascomycota)*. Australian Biological Resources Study, Canberra. Version 18 October 2011. <http://www.anbg.gov.au/abrs/lichenlist/PHYSICIACEAE.html>

Elix, JA; Kantvilas, G (2013): New taxa and new records of *Amandinea* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* 72, 3–19.

Galloway, DJ (2007): *Flora of New Zealand Lichens*. Revised 2nd Edn, Manaaki Whenua Press, Lincoln.

Grube, U; Mayrhofer, H; Elix, JA (2004): Two new *Buellia*-species (Physciaceae, Lecanorales) with red pigments from Australia. *Bibliotheca Lichenologica* 88, 163–173.

Hale, ME (1987): A monograph of the lichen genus *Parmelia* Acharius *sensu stricto* (Ascomycotina: Parmeliaceae). *Smithsonian Contributions to Botany* 66, 1–55.

Marbach, B (2000): Corticole und lignicole Arten der Flechtengattung *Buellia* sensu lato in den Subtropen und Tropen. *Bibliotheca Lichenologica* 74, 1–384.

McCarthy, PM (1991): *Checklist of Australian Lichens*, 4th edn: 15. National Herbarium of Victoria, Melbourne.

McCarthy, PM (2013): *Checklist of the Lichens of Australia and its Island Territories*. ABRs, Canberra: <http://www.anbg.gov.au/abrs/lichenlist/introduction.html> (version 28 March 2013).

Moberg, R; Nordin, A; Scheidegger, C (1999): Proposal to change the listed type of the name *Buellia* nom. cons. (Physciaceae, Ascomycota), *Taxon* 48, 143.

Plomley, NJB (1976): *A Word-list of the Tasmanian Aboriginal Languages*. Privately published. Launceston.



Fig. 1. *Buella amandineaeformis* (holotype in HO).

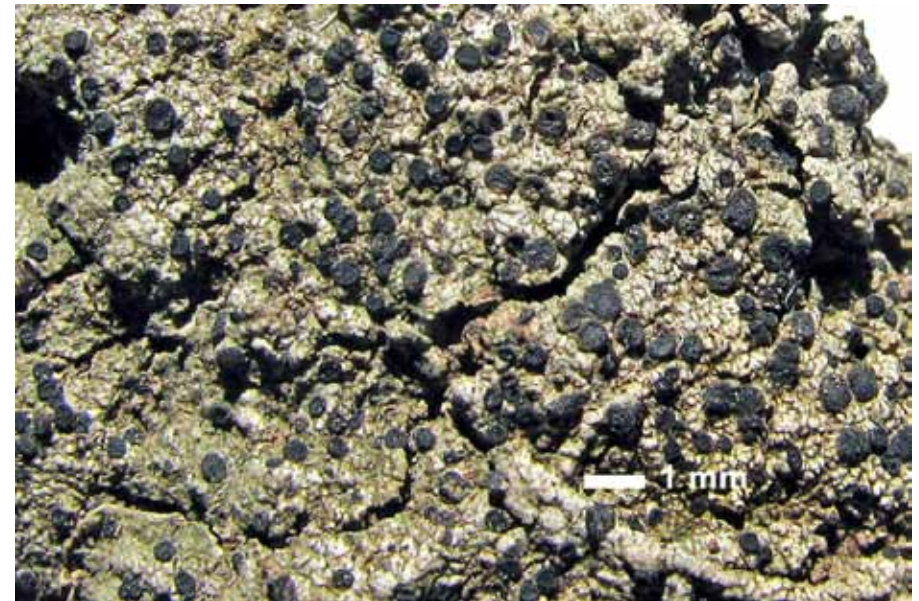


Fig. 3. *Buellia epigaella* (isotype in CANB).

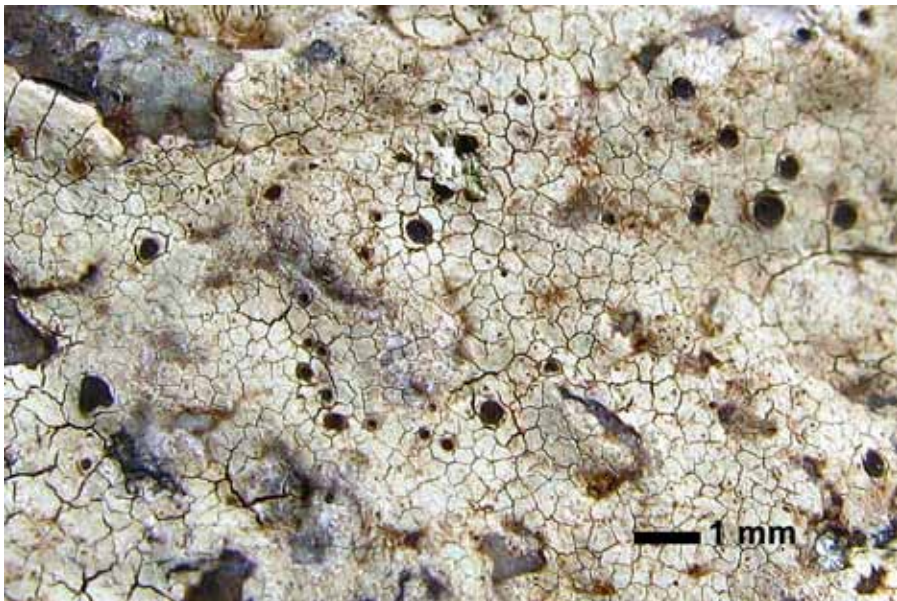


Fig. 2. *Buellia austroalpina* (holotype in HO).



Fig. 4. *Buellia extenuatella* (holotype in HO).

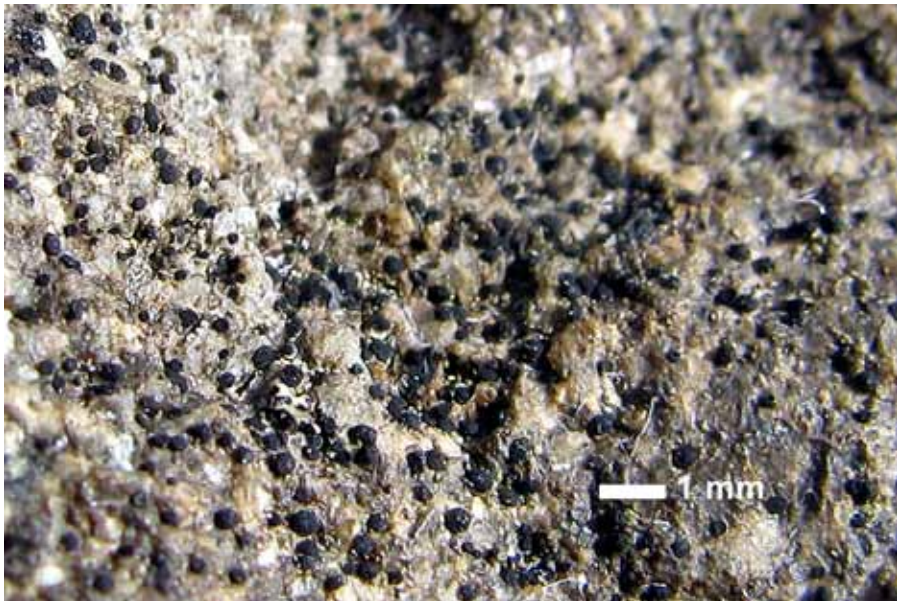


Fig. 5. *Buellia nebulosa* (holotype in HO).



Fig. 7. *Buellia polyxanthonica* var. *isidiata* (holotype in CANB).



Fig. 6. *Buellia poimena* (holotype in HO).



Fig. 8. *Buellia stellulata* var. *tasmanica* (holotype in CANB).



Fig. 9. *Buellia testaceina* (holotype in HO).



Fig. 10. *Buellia yilliminningensis* (isotype in CANB).

## New crustose lichen taxa (lichenized Ascomycota) from Australia

John A. Elix

Research School of Chemistry, Building 33  
Australian National University, Canberra, A.C.T. 0200, Australia  
email: John.Elix@anu.edu.au

**Abstract:** *Lepraria alternata* Elix, *Tephromela bourgeanica* Elix, *Trapeliopsis granulosa* var. *australis* Elix, *T. gyrocarpa* Elix and *T. thermophila* Rambold & Elix are described as new to science.

During an ongoing effort to describe and document the biodiversity of Australian lichens (McCarthy 2013 and references therein), I have encountered a number of new taxa, five of which are described in the present paper. Chemical constituents were identified by thin-layer chromatography (Elix & Ernst-Russell 1993), high-performance liquid chromatography (Elix *et al.* 2003) and comparison with authentic samples.

### The new species

1. *Lepraria alternata* Elix, sp. nov. MB 804247

Fig. 1

Similar to *Lepraria yunnaniana*, but differs in having an inconspicuous hypothallus and in containing atranorin and fragilin.

*Type:* Australia, Western Australia, Boyagin Rock, Boyagin Nature Reserve, 20 km NW of Pingelly, 32°28'S, 116°53'E, 350 m alt., on sheltered granite ledge on granite monolith with scattered *Allocasuarina* and *Eucalyptus*, J.A. Elix 38935, 5.iv.2006 (holotype – PERTH; isotype – CANB).

*Thallus* leprose-soresiate, powdery, white, creamy white, grey-white, pale yellow-grey or brownish grey, forming irregularly spreading patches to 5 cm wide, or in small, irregularly roundish colonies 0.5–1 cm wide that eventually coalesce; usually with well-defined marginal lobes, 1–2 mm wide, ±raised at margins, covered with granules, thick (up to 250 µm); medulla white, distinct; hyphae 2.0–3.5 µm thick; soredia farinose, dispersed or forming a thick, continuous layer, ±roundish, 25–40 µm wide, commonly aggregated in roundish to irregular clumps (consoredia) up to 100–250 µm wide; with long projecting hyphae along the margins (80–100 µm long), shorter projecting hyphae within (10–20 µm long), or not apparent; photobiont chlorococcoid, with individual cells 7–14 µm wide. *Hypothallus* thin, dispersed, pale brown to white or orange-brown in part, sometimes not apparent.

*Chemistry:* Thallus surface K+ yellow, C–, KC–, PD+ pale yellow; containing atranorin (minor), divaricatic acid (major), stenosporic acid (minor), fragilin (minor), ±di-O-methylstrepsilin (trace), ±perlatolic acid (trace), ±sekikaic acid (trace), norbaeomycesic acid (trace), ±AO-1 anthrone (trace), ±AO-2 anthrone (trace).

*Etymology:* The specific epithet derives from the Latin *alternatim* (alternatively), referring to the alternative chemistry of this species compared with other divaricatic acid-containing species of *Lepraria*.

**Notes.** Chemically this new species resembles *Lepraria yunnaniana* (Hue) Zahlbr., *L. crassissima* (Hue) Lettau, *L. cryophila* Lendemer, *L. hodkinsoniana* Lendemer, *L. incana* (L.) Ach. and *L. pacifica* Lendemer, in that all contain divaricatic acid as the major secondary metabolite. However, they can be readily distinguished chemically because *L. crassissima*, *L. hodkinsoniana*, *L. pacifica* and *L. incana* all contain additional zeorin (major), whereas *L. yunnaniana* and *L. cryophila* lack atranorin. All six lack anthraquinone pigments (i.e., fragilin) in the hypothallus apart from a rare, possibly aber-

rant, corticolous population of *L. pacifica* from California (Lendemer 2011). *Lepraria yunnaniana* also differs from *L. alternata* in having a much more prominent and often black hypothallus.

The new species is known from south-western Western Australia, Victoria and inland New South Wales, where it occurs on rocks and soil in sheltered rock ledges and at the base of trees. Species commonly associated with saxicolous and terricolous specimens include various *Cladonia* species, *Diploschistes muscorum* (Scop.) R.Sant. subsp. *bartlettii* Lumbsch, *Lepraria corienseis* (Hue) Sipman, *L. lobificans* Nyl., *L. sekikaica* Elix, *Leprocaulon microscopicum* (Vill.) Gams ex D.Hawksw., *Paraporpidia glauca* (Taylor) Rambold and *Psora decipiens* (Ach.) Ach.

#### SPECIMENS EXAMINED

**Western Australia:** • near summit of Mount Brown, 3 km SE of York, 31°53'16"S, 116°47'07"E, 295 m alt., on sheltered granite ledges, *J.A. Elix* 38218, 38220, 3.iv.2006 (CANB); • Wallaby Hills Nature Reserve, 20 km E of York on Goldfield Road, 31°50'48"S, 116°59'16"E, 280 m alt., on sheltered soil bank in *Eucalyptus salmonophloia* woodland, *J.A. Elix* 38574, 4.iv.2006 (CANB, HO); • Yilliminning Rock, 17 km E of Narrogin, 32°56'35"S, 117°22'15"E, 330 m alt., on soil in sheltered granite ledges, *J.A. Elix* 39605, 39606, 6.iv.2006 (CANB, PERTH); • Donnelly Well, along Donnelly River, 21 km N of Manjimup, 34°04'16"S, 116°10'37"E, 285 m alt., on base of *Banksia* in swampy area with *Banksia* and *Melaleuca*, *J.A. Elix* 39464, 7.iv.2006 (CANB, PERTH).  
**New South Wales:** • Mount Kaputar National Park, "The Ginns", 30°06'30"S, 150°04'E, 1100 m alt., on soil under rock overhang in open forest and heath, *P. Merrotsy* 262, 13.vii.1986 (BRI, CANB).  
**Victoria:** • Bemm River Scenic Reserve, 45 km E of Orbost, 37°37'30"S, 148°53'12"E, 65 m alt., on base of *Eucalyptus* at margin of warm temperate rainforest and *Eucalyptus* woodland, *J.A. Elix* 43426, 43433, 10.ix.2008 (CANB); • *loc. id.*, on base of *Cyathea*, *J.A. Elix* 43442, 43443, 10.ix.2008 (CANB, HO); • Errinundra National Park, Errinundra Saddle Rainforest Walk, 24 km SE of Bonang, 37°19'03"S, 148°50'19"E, 910 m alt., on trunk of *Telopea* in cool temperate rainforest, *J.A. Elix* 38968, 16.iv.2008 (CANB).

***Tephromela bourgeanica*** Elix, sp. nov. Fig. 2  
MB 804248

Similar to *Tephromela brisbanensis* but differs in containing bourgeanic acid.

**Type:** Australia. New South Wales, Cullendulla Creek Nature Reserve, 3 km NE of Batemans Bay, 35°42'04"S, 150°11'56"E, 1 m alt., on *Casuarina* in coastal mangroves and strand vegetation, *J.A. Elix* 45665, 17.ix.2008 (holotype – CANB; isotypes – HO, NSW).

**Thallus** corticolous, crustose, creamy white or pale grey, continuous, smooth or becoming rugulose or verrucose with age, c. 0.2 mm thick, up to 5 cm wide, lacking isidia and soredia; *verrucae* 0.2–1.5 mm wide, upper surface smooth and weakly to markedly convex. *Prothallus* not apparent. *Apothecia* common, lecideine, immersed to broadly adnate, 0.1–2 mm wide; disc flat or weakly convex, roundish to irregular, black, shiny, epruinose, sometimes coalescing to form irregular black patches up to 5 mm wide; thalline exciple reduced or absent; proper exciple poorly defined, narrow, to 50 µm thick; epihymenium dark violet-brown, 12–17 µm thick; hymenium pale violet-brown, 90–120 µm tall; hypothecium orange-brown to red-brown, 90–120 µm thick. *Paraphyses* 3–5 µm wide, simple or sparingly branched, thick-walled, apices swollen to 7 µm wide, pigmented dark violet-brown. *Asci* clavate, *Bacidia*-type, 8-spored. *Ascospores* simple, broadly ellipsoid to subglobose, thick-walled, 7–13 × 5–8 µm. *Pycnidia* rare, immersed; conidia filiform, straight, 9–13 × 1–1.4 µm.

**Chemistry:** Cortex K+ yellow, P+ pale yellow; medulla K+ yellow then red, C–, P+ orange-red, UV–; containing atranorin (minor), bourgeanic acid (major).

**Etymology:** the specific epithet refers to the chemistry of the species.

**Notes.** The growth habit, apothecial anatomy, conidia and ascospores of this species closely resemble those of *Tephromela brisbanensis* (Zahlbr.) Kalb, but the latter can be distinguished by its chemistry (Kalb 2004). Whereas *T. brisbanensis* contains only atranorin, *T. bourgeanica* contains bourgeanic acid as the major component. Bourgeanic acid has previously been reported as an accessory substance in *T. atra* (Huds.) Hafellner (Rambold 1989).

This species is known only from the Eurobodalla coast in southern New South Wales. Associated species include *Buellia demutans* (Stirt.) Zahlbr., *Canoparmelia texana* (Tuck.) Elix & Hale, *Diploicia canescens* subsp. *australasica* Lumbsch & Elix, *Dirinaria applanata* (Fée) D.D.Awasthi, *Flavoparmelia rutidota* (Hook.f. & Taylor) Hale, *Hypotrachyna osseocalba* (Vain.) Y.S.Park & Hale, *Lecanora symmicta* (Ach.) Ach., *Parmotrema reticulatum* (Taylor) M.Choisy, *Relicina sydneyensis* (Gyeln.) Hale and *Usnea dasaea* Stirt.

#### SPECIMENS EXAMINED

**New South Wales:** • Surf Beach, Batehaven, 35°44'S, 150°13'E, 3 m alt., on *Casuarina* along coastal lagoon, *J.A. Elix* 412, 15.ix.1974 (CANB); • Tomago River Estuary, 14 km SSE of Batemans Bay, 35°49'25"S, 150°10'47"E, 1 m alt., on *Casuarina glauca* in strand vegetation, *J.A. Elix* 6395, 21.ix.1979 (CANB), *J.A. Elix* 30188, 16.ix.1993 (CANB), *J. Johnston* 2616, 4.viii.1988 (CANB), *J. Johnston* 2783, 2784, 2785, 29.xi.1989 (CANB).

***Trapeliopsis granulosa*** (Hoffm.) Lumbsch var. ***australis*** Elix, var. nov. Fig. 3  
MB 804251

Resembles *Trapeliopsis granulosa* var. *granulosa*, but differs in having a subsquamulose thallus, compound apothecia, smaller ascospores and additional confriesic acid.

**Type:** Australia. Western Australia, Mt Chudalup, 17 km SSE of Northcliffe, 34°46'S, 116°05'E, 165 m alt., on base of *Eucalyptus* in mixed *Eucalyptus* forest at base of large rocky outcrops, *J.A. Elix* 41223, 14.ix.1994 (PERTH – holotype; CANB, HO – isotypes).

**Thallus** crustose-areolate to subsquamulose near margins, white, yellow-white to pale greenish white, continuous, spreading, to 10 cm wide, but generally much less, with an inconspicuous, white prothallus at the margins; areoles and microsquamules crowded, round to irregular, appressed, 0.1–0.5 mm wide; upper surface sorediate, soredia originating at margins of areoles or from laminal, erumpent pustules, soon spreading over the surface; soredia 35–75 µm wide; upper cortex poorly developed, 5–15 µm thick; medulla white, I–; lower cortex absent, the thallus attached to the substratum by medullary hyphae. *Photobiont* green, of the *Chlorella*-type, with individual cells irregularly roundish or rhomboid, 6–10 × 5–9 µm, occurring singly or in pairs, triads or tetrads. *Apothecia* common, 0.2–1.6 mm wide, roundish or flexuose in outline, immersed at first but soon becoming emergent and broadly adnate, rarely sessile; proper margin paler than disc, conspicuously elevated above the level of the disc, smooth; disc weakly concave, to ±flat or convex with age, flesh-coloured to brownish pink or darkening to brown-black, epruinose; older apothecia often compound, conglomerate to tuberculate. *Excipulum* pale grey-brown, unchanged or intensifying orange in K, 30–80 µm thick. *Epihymenium* 10–16 µm thick, pale yellow-brown, K–. *Hypothecium* 50–65 µm thick, pale yellow-brown, K–, poorly differentiated from the hymenium. *Hymenium* 50–70 µm thick, I+ blue, colourless. *Paraphyses* sparingly branched, mostly at the base and near the apices, slender, 1–2 µm thick, flexuose, tangled, separating readily in K, apices not markedly expanded. *Asci* 8-spored, of the *Trapelia*-type, with an amyloid wall and prominent, non-amyloid tholus lacking any discernible internal structures. *Ascospores* simple, non-halonate, thin-walled, ovate to ellipsoid, sometimes with one end rather pointed, 8–12 × 3.5–5



$\mu\text{m}$ . *Pycnidia* rare, visible as minute specks on the upper surface of the thallus; conidia bacilliform,  $6\text{--}8 \times 0.7 \mu\text{m}$ .

**Chemistry:** Thallus K<sup>-</sup>, C<sup>+</sup> red, KC<sup>+</sup> red, P<sup>-</sup>, UV<sup>-</sup>; containing gyrophoric acid (major or minor), lecanoric acid (minor), confriesiiic acid (minor or major), friesiic acid (minor), friesiic acid C (trace).

**Etymology:** The varietal epithet refers to the Australian distribution of the lichen.

**Notes.** This corticolous or lignicolous variety is characterized by its whitish grey to greenish grey subsquamulose to areolate-crustose, granular-soeridiate thallus, the prominent pinkish to red-brown congested apothecia, and the presence of gyrophoric and confriesiiic acids. Although very similar to *T. granulosa* var. *australis*, var. *granulosa* has a crustose thallus, lacks confriesiiic acid, has larger ascospores ( $9\text{--}15 \times 4\text{--}7 \mu\text{m}$ ), and rarely develops tuberculate apothecia. *Trapeliopsis colensoi* (C.Bab.) Gotth.Schneid. has a chemistry very similar to that of *T. granulosa* var. *australis*, in that it contains confriesiiic acid (major), gyrophoric acid (minor or trace), skyrin (minor), friesiic acid C (minor) and friesiic acid (trace). However, it differs in having a thallus consisting of swollen, overlapping squamules, a grey-green to fawn-grey, rather scabrid upper surface, pale green to whitish, marginal, labriiform soralia, an orange-brown to yellowish lower surface and purplish black, confluent apothecia. It is also most commonly terricolous, although corticolous specimens are known.

The new variety occurs on bark and old wood in wet *Eucalyptus* woodland in Western Australia and Victoria. Commonly associated species include *Hertelidea pseudobotryosa* R.C.Harris, Ladd & Printzen, *Hypocenomyce australis* Timdal, *Ochrolechia africana* Vain., *Parmelina pseudorelicina* (Jatta) Kantvilas & Elix, *Ramboldia subnixa* (Stirt.) Kantvilas & Elix, *Trapeliopsis flexuosa* (Fr.) Coppins & P.James and *Usnea inermis* Motyka.

#### SPECIMENS EXAMINED

**Western Australia:** • Type locality, on dead log, *J.A. Elix 71176*, 11.ix.1994 (CANB); • Brookton Highway Nature Reserve, Darling Plateau, 25 km W of Brookton,  $32^{\circ}23'50''\text{S}$ ,  $116^{\circ}44'03''\text{E}$ , 285 m alt., on base of *Eucalyptus* in *Eucalyptus* woodland with laterite outcrops, *J.A. Elix 38731*, 5.iv.2006 (CANB).

**Victoria:** • Chiltern-Mount Pilot National Park, 2 km N of Chiltern,  $36^{\circ}07'47''\text{S}$ ,  $146^{\circ}36'42''\text{E}$ , 200 m alt., on dead wood in open *Eucalyptus* woodland, *J.A. Elix 36926*, 5.v.2006 (CANB).

***Trapeliopsis gyrocarpa* Elix, sp. nov.**  
MB 804250

Fig. 4

Resembles *Trapeliopsis colensoi*, but differs in having compound, gyrose apothecia, in containing 5-*O*-methylhiassic acid, and in lacking confriesiiic acid.

**Type:** Australia, Northern Territory, Litchfield National Park, Tabletop Range, trail to Tolmer Falls, 56 km SW of Batchelor,  $13^{\circ}11'54''\text{S}$ ,  $116^{\circ}05'\text{E}$ , 130 m alt., on sheltered rock ledge in open monsoon savannah with numerous sandstone boulders, *J.A. Elix 27554*, 3.vii.1991 (CANB – holotype; DNA, HO – isotypes).

**Thallus** squamulose, grey, dark grey or dark grey-green, continuous, spreading, to 10 cm wide, *prothallus* not apparent; squamules crowded, contiguous or becoming densely imbricate and mat-forming or dispersed, round to irregular, appressed, 0.1–1.2 mm wide, larger squamules with dissected margins that ultimately form mini-squamules, lacking soredia and pustules; upper cortex poorly developed, 10–15  $\mu\text{m}$  thick; medulla white, I<sup>-</sup>; lower cortex absent, the thallus attached to the substratum by medullary hyphae but often blackening below. *Photobiont* green, of the *Chlorella*-type, with individual cells irregularly roundish or rhomboid,  $6\text{--}10 \times 5\text{--}9 \mu\text{m}$ , occurring

singly or in pairs, triads or tetrads. *Apothecia* common, 0.5–1.6 mm wide, roundish to irregular in outline, immersed at first but soon becoming emergent and broadly adnate, rarely sessile; proper margin concolorous with disc, conspicuously elevated above the level of the disc, smooth, sometimes with a flat, flexuose,  $\pm$ discontinuous thalline rim; disc  $\pm$ flat then weakly to strongly convex with age, brown-black to black, epruinose, appearing gyrose or lirellate, more rarely densely tuberculate,  $\pm$ with distorted, compressed disclets. *Excipulum* brown-black, 60–100  $\mu\text{m}$  thick, N<sup>+</sup> orange-brown, I<sup>+</sup> red. *Epithemium* 12–18  $\mu\text{m}$  thick, dark brown, K<sup>-</sup>. *Hypothecium* 35–50  $\mu\text{m}$  thick, dark brown, K<sup>-</sup>. *Hymenium* 50–75  $\mu\text{m}$  thick, colourless, I<sup>+</sup> blue. *Paraphyses* sparingly branched, mostly at the base and near the apices, slender, 1–1.6  $\mu\text{m}$  thick, flexuose, tangled, separating readily in K, apices not markedly expanded. *Asci* 8-spored, of the *Trapelia*-type. *Ascospores* simple, non-halonate, thin-walled, typically conspicuously vacuolate, ellipsoid to subglobose,  $10\text{--}15 \times 5\text{--}9 \mu\text{m}$ . *Pycnidia* not seen.

**Chemistry:** Thallus K<sup>-</sup>, C<sup>+</sup> red, KC<sup>+</sup> red, P<sup>-</sup>, UV<sup>-</sup>; containing gyrophoric acid (minor), 5-*O*-methylhiassic acid (major), lecanoric acid (minor), hiassic acid (trace).

**Etymology:** The epithet refers to the appearance of the apothecia.

**Notes.** This saxicolous species is characterized by the grey, dark grey or dark grey-green squamulose thallus, the black, convex, gyrose apothecia, and the presence of gyrophoric and 5-*O*-methylhiassic acids. *Trapeliopsis colensoi* (C.Bab.) Gotth.Schneid. shows some morphological similarities, but differs in its terricolous or corticolous habit, in the presence of whitish soralia at the margins of the squamules, in having purplish black, confluent apothecia, an orange-brown to yellowish lower surface and the presence of confriesiiic acid (major), gyrophoric acid (minor or trace), skyrin (minor), friesiic acid C (minor) and friesiic acid (trace).

This species is known only from the type locality, where it is common. Associated species include *Australiaena streimannii* Matzer, H.Mayrhofer & Elix, *Buellia kimberleyana* Elix, *B. polyxanthonica* Elix, *B. spuria* (Schaer.) Anzi var. *spuria*, *Caloplaca leptozona* (Nyl.) Zahlbr., *Dimelaena elevata* Elix, Kalb & Wippel, *D. tenuis* (Müll.Arg.) H.Mayrhofer & Wippel, *Diploschistes actinostomus* (Pers.) Zahlbr., *Lecanora austrosorediosa* (Rambold) Lumbsch, *Lepraria coriensis* (Hue) Sipman, *Parmotrema praesorediosum* (Nyl.) Hale, *Pertusaria remota* A.W.Archer and *Tephromela arafurensis* Rambold.

***Trapeliopsis thermophila* Rambold & Elix, sp. nov.**  
MB 804249

Fig. 5

Similar to *Trapelia lilacea*, but with a pruinose upper surface, much thinner hymenium, smaller ascospores and longer conidia.

**Type:** Australia, Northern Territory, Stuart Highway, 1 km N of South Australian border,  $25^{\circ}59'\text{S}$ ,  $133^{\circ}12'\text{E}$ , 550 m alt., on exposed sandstone rocks with a southerly aspect in *Triodia* grassland, *J.A. Elix 11054* & *L.A. Craven*, 9.ix.1983 (CANB – holotype).

**Thallus** crustose, pale brown to grey-brown, to 5 cm wide and 0.4–0.5 mm thick, smooth at first, soon becoming deeply and irregularly cracked to areolate, not sorediate; areoles 0.2–1.3 mm wide, angular to irregular, plane to undulate, becoming convex, contiguous, grey-white-pruinose in patches and at margins, or often white-pruinose in the centre, sometimes developing fissures with raised ecorticate margins; margins entire, not thickened, appressed to the substratum or upturned; upper cortex 15–25  $\mu\text{m}$  thick; medulla white, I<sup>-</sup>; lower cortex absent, the thallus attached to the substratum by medullary hyphae. *Photobiont* green, of the *Chlorella*-type, with individual cells irregularly roundish or rhomboid,  $8\text{--}10 \times 7\text{--}9 \mu\text{m}$ , occurring singly or in pairs, triads or tetrads. *Apothecia* scattered, 0.1–0.5 mm wide, often in clusters of 2

becoming broadly adnate, then sessile and basally constricted; margin very thin, brownish, frequently with a vestigial, discontinuous, rather ragged, white thalline rim; disc concave or undulate, brown to black-brown, epruinose. *Excipulum* in section cupular, pale orange-brown, unchanged or intensifying orange in K, 10–30  $\mu\text{m}$  thick. *Epithemium* 10–25  $\mu\text{m}$  thick, pale red-brown or orange-brown, unchanged or intensifying orange in K. *Hypothecium* 50–75  $\mu\text{m}$  thick, colourless, poorly differentiated from the hymenium. *Hymenium* 50–75  $\mu\text{m}$  thick, I+ blue, colourless. *Paraphyses* sparingly branched, not capitate, 1–1.5  $\mu\text{m}$  wide. *Asci* 8-spored, of the *Trapelia*-type. *Ascospores* simple, non-halonate, thin-walled, typically conspicuously vacuolate, ovate to ellipsoid, sometimes with one end rather pointed, 8–15  $\times$  4.5–6  $\mu\text{m}$ . *Pycnidia* rare, weakly immersed, pale brown; conidia filiform, straight or often curved, 17–27  $\times$  0.5  $\mu\text{m}$ . *Chemistry*: Thallus K–, KC+ reddish, C+ reddish, P–, UV–; containing 5-*O*-methylhiascic acid (major), gyrophoric acid (minor), lecanoric acid (minor) and 5-methoxylecanoric acid (minor), and hiascic acid (trace).

*Etymology*: The name refers to the environmental preference of the species, namely the hot, arid areas of central Australia.

**Notes.** This saxicolous species is characterized by the crustose, pale brown to grey-brown, areolate thallus, areoles with a markedly white or grey-white-pruinose upper surface, small, often clustered apothecia with pale brown to grey-brown, epruinose discs, ovate to ellipsoid ascospores, 8–15  $\times$  4.5–6  $\mu\text{m}$ , filiform conidia and the presence of 5-*O*-methylhiascic and gyrophoric acids. *Trapelia lilacea* Kantvilas & Elix is rather similar in overall morphology and chemistry, but it lacks a pruinose upper surface and has a much thicker hymenium (120–160  $\mu\text{m}$  thick), larger ascospores (16–23  $\times$  9–15  $\mu\text{m}$ ) and shorter conidia (10–17  $\mu\text{m}$ ).

The species has been collected on acidic rocks at several localities in southern Northern Territory. Associated saxicolous lichens include *Acarospora citrina* (Taylor) Zahlbr. ex Rech., *A. novae-hollandiae* H.Magn., *Buellia desertorum* Müll.Arg., *B. dispersa* A.Massal., *B. inturgescens* Müll.Arg., *Caloplaca aliciae* S.Y.Kondr., Kärnefelt & Elix, *C. australiensis* S.Y.Kondr., Kärnefelt & Filson, *Diploschistes actinostomus* (Pers. ex Ach.) Zahlbr., *Xanthoparmelia aridella* Elix, *X. centralis* Elix & J.Johnst. and *X. cravenii* Elix & J.Johnst.

#### SPECIMEN EXAMINED

Northern Territory: • West face of Uluru (Ayers Rock), 25°20'S, 131°02'E, 630 m alt., on sandstone rock, J.A. Elix 11068 & L.A. Craven, 10.ix.1983 (CANB).

#### References

- Elix, JA; Ernst-Russell, KD (1993): *A Catalogue of Standardized Thin-Layer Chromatographic Data and Biosynthetic Relationships for Lichen Substances*, 2nd Edn, Australian National University, Canberra.
- Elix, JA; Giralt, M; Wardlaw, JH (2003): New chloro-depsides from the lichen *Dimelaena radiata*. *Bibliotheca Lichenologica* 86, 1–7.
- Lendemer, JC (2011): A taxonomic revision of the North American species of *Lepraria* s.l. that contain divaricatic acid, with notes on the type species of the genus *L. incana*. *Mycologia* 103, 1216–1229.
- McCarthy, PM (2013): *Checklist of the Lichens of Australia and its Island Territories*. ABRS, Canberra: <http://www.anbg.gov.au/abrs/lichenlist/introduction.html> (version 2 May 2013).
- Rambold, G (1989): A monograph of the saxicolous lecideoid lichens of Australia (excl. Tasmania). *Bibliotheca Lichenologica* 34, 1–345.



Fig. 1. *Lepraria alternata* (isotype in CANB).



Fig. 2. *Tephromela bourgeanica* (holotype in CANB).



Fig. 3. *Trapeliopsis granulosa* var. *australis* (isotype in CANB).



Fig. 5. *Trapeliopsis thermophila* (holotype in CANB).

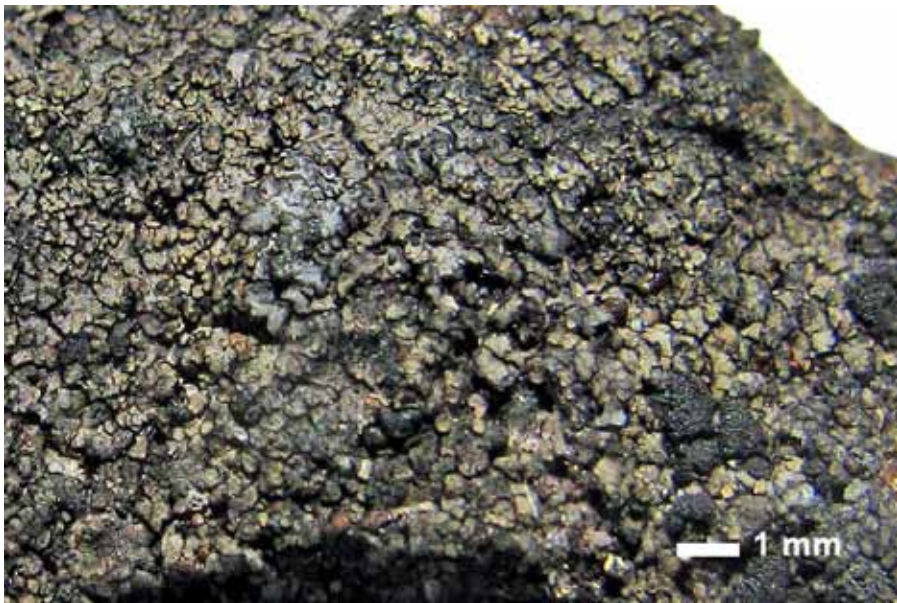


Fig. 4. *Trapeliopsis gyrocarpa* (holotype in CANB).

- Archer, AW; Elix, JA (2013): Additional lichen records from Australia 75, *Pertusaria platystoma*. *Australasian Lichenology* **73**, 2–3.
- Archer, AW; Elix, JA (2013): *Anomalographis tulliensis*, a new species in the Australian Graphidaceae. *Australasian Lichenology* **73**, 10–11.
- Benatti, MN (2012): A worldwide key for the genus *Parmelinopsis* Elix & Hale (Parmeliaceae; lichenized Ascomycetes). *Opuscula Philolichenum* **11**, 304–312.
- Cabrerizo, A; Dachs, J; Barceló, D; Jones, KC (2012): Influence of organic matter content and human activities on the occurrence of organic pollutants in antarctic soils, lichens, grass, and mosses. *Environmental Science and Technology* **46**, 1396–1405.
- Cranfield, RJ; Robinson, RM; Williams, MR; Tunsell, VL (2011): Forestcheck: the response of lichens and bryophytes to silviculture in jarrah (*Eucalyptus marginata*) forest. *Australian Forestry* **74**, 303–314.
- Elix, JA; Archer, AW (2013): A new sorediate variety of *Pertusaria melanospora* (lichenized Ascomycota, Pertusariaceae). *Australasian Lichenology* **73**, 8–9.
- Elix, JA; Kantvilas G (2013): New taxa and new records of *Buellia sensu lato* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **73**, 24–44.
- Elix, JA (2013): New crustose lichen taxa (lichenized Ascomycota) from Australia. *Australasian Lichenology* **73**, 45–53.
- Galloway, DJ; Vitikainen, O (2013): Contributions to a history of New Zealand lichenology 4. Richard Helms (1842–1914). *Australasian Lichenology* **73**, 12–23.
- Green, TGA; Brabyn, L; Beard, C; Sancho, LG (2012): Extremely low lichen growth rates in Taylor Valley, Dry Valleys, continental Antarctica. *Polar Biology* **35**, 535–541.
- Kantvilas, G; Jarman, SJ (2012): Lichens and bryophytes in Tasmanian wet eucalypt forest: floristics, conservation and ecology. *Phytotaxa* **5**, 1–31.
- Kantvilas, G; Divakar, PK (2013): New combinations in *Austroparmelina* (Parmeliaceae). *Australasian Lichenology* **73**, 6–7.
- Olech, M; Singh, SM (2010): Lichens and lichenicolous fungi of Schirmacher Oasis, Antarctica. National Centre for Antarctic and Ocean Research: Ministry of Earth Sciences, Government of India. New Delhi.
- Rogers, RW (2013): Additional lichen records from Australia 76, *Pyrenothrix nigra*. *Australasian Lichenology* **73**, 4–5.
- Strzalka, K; Szymanska, R; Suwalsky, M (2011): Prenyl lipids and pigments content in selected antarctic lichens and mosses. *Journal of the Chilean Chemical Society* **56**, 808–811.
- Wirtz, N; Printzen, C; Lumbsch, HT (2012): Using haplotype networks, estimation of gene flow and phenotypic characters to understand species delimitation in fungi of a predominantly Antarctic *Usnea* group (Ascomycota, Parmeliaceae). *Organisms Diversity and Evolution* **12**, 17–37.
- Zhurbenko, MP; Braun, U (2012): *Cecidiomyces*, a new subantarctic lichenicolous hyphomycete genus. *Lichenologist* **44**, 801–806.

# Australasian Lichenology

Number 73, July 2013 ISSN 1328-4401

## INFORMATION FOR SUBSCRIBERS

*Australasian Lichenology* is published twice a year, in January and July. Because of steadily rising printing and postage costs, copies are e-mailed to most subscribers as electronic .pdf files. Such files can be opened and read on either a PC or Macintosh computer using Adobe's Acrobat® Reader (version 7.0 or later). You can download a free copy of Acrobat Reader from Adobe's website ([www.adobe.com](http://www.adobe.com)). An electronic journal offers the advantage of not only requiring no shelf space but also of being searchable by computer. However, any subscriber who prefers hard-copies can print them out.

The journal is sent free to all electronic subscribers. To meet the requirement of the nomenclatural Code that printed descriptions of new taxa must be lodged in internationally recognized libraries and herbaria, a few selected library and herbaria subscribers will continue to get printed hard-copies

If you wish to subscribe electronically, simply e-mail your current e-mail address to the journal editor at [nancym@clear.net.nz](mailto:nancym@clear.net.nz) If you change your address, be sure to inform the editor by e-mail.

Volumes 58 and later can now be downloaded free from the website Recent Lichen Literature (RLI). The directory is <http://www.nhm.uio.no/botanisk/lav/RLL/AL/> Those same volumes plus searchable scans of Volumes 41–57 can be downloaded free from [http://www.anbg.gov.au/abrs/lichenlist/Australasian\\_Lichenology.html](http://www.anbg.gov.au/abrs/lichenlist/Australasian_Lichenology.html)

## INFORMATION FOR AUTHORS

Research papers submitted to *Australasian Lichenology* must be original and on some aspect of Australasian lichens or allied fungi, and they are refereed. The journal also welcomes newsworthy items on lichenologists who are either studying Australasian lichens or who are visiting the region. A manuscript can be e-mailed to W. Malcolm at [nancym@clear.net.nz](mailto:nancym@clear.net.nz) as a text file saved in cross-platform "rich text format" (.rtf). See a recent issue for a guide to text formatting and reference citations.

Drawings should be inked originals, and photographs should be sharp and clear (prints will do but negatives or transparencies are preferred). Drawings and photographs can be air-mailed or else scanned at 600 dpi and then e-mailed as TIFF (.tif) or highest-quality JPEG (.jpg) files. Scans of photographs must be at least 1.5 MB in size.

*Australasian Lichenology* provides electronic off-prints to authors as .pdf files. The journal does not ordinarily provide hard-copy off-prints, but off-prints of papers with colour plates can be purchased for NZ\$2.00 per copy per A5 plate if they're ordered when the manuscript is accepted for publication.

*Australasian Lichenology* is the official publication of the Australasian Lichen Society, and formerly was named the *Australasian Lichenological Newsletter*. Its Editorial Board is W.M. Malcolm, J.A. Elix, G. Kantvilas, S.H.J.J. Louwhoff, and P.M. McCarthy.