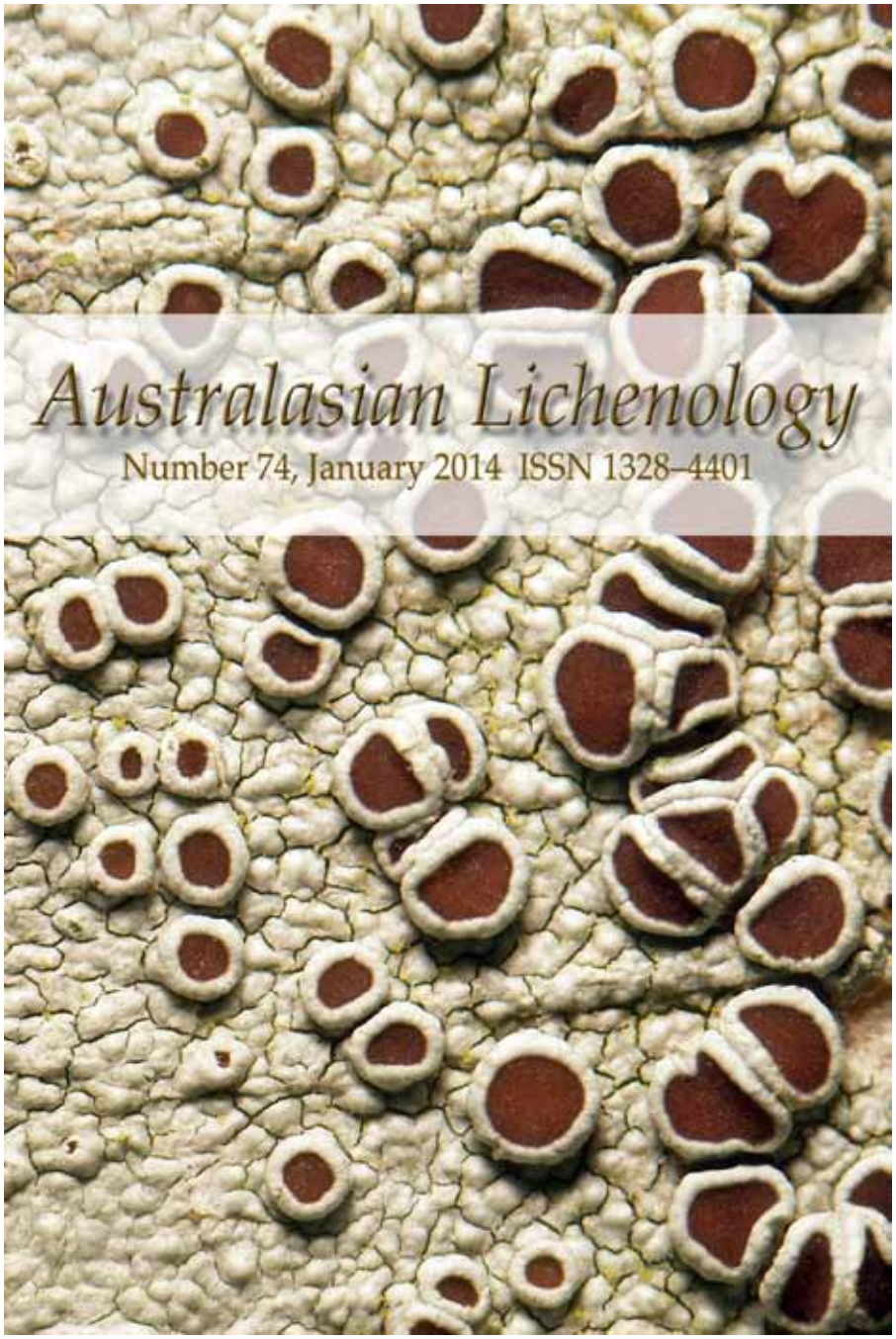

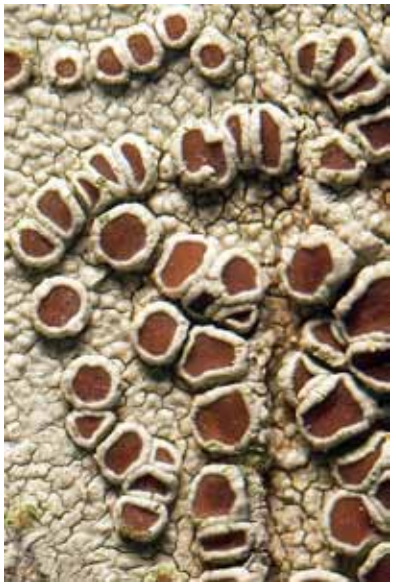

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Lecanora argentata is widespread in both hemispheres, mostly on the bark of deciduous trees. Its distinctive traits include crowded red-brown apothecial discs, a clear red-brown epithecium, and thallus and apothecial margins containing gangaleoidin and atranorin as major components, plus californin in trace amounts.

1 mm

CONTENTS

Additional lichen records from Subantarctica III. Marion Island

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Abstract
Twelve species are recorded as additions to the lichen flora of subantarctic Marion Island (47°S, 38°E): *Acarospora impressula*, *Buellia tristiuscula*, *Cladonia gracilis* subsp. *turbinata*, *Coenogonium* cf. *weberi*, *Eiglera flavida*, *Megalaria* sp., *Parmotrema perlatum*, *Peltigera lepidophora*, *Thelidium pyrenophorum*, *Tremolecia atrata*, *Verrucaria bubalina* and *Verrucaria subdiscreta*.

Introduction
The lichen mycobiota of the subantarctic Prince Edward Islands (47°S, 38°E) is still incompletely known (Øvstedal & Gremmen 2007, 2008). Therefore, when in 2013 NJMG was invited to do fieldwork on Marion Island, the larger of the two islands of the group, the opportunity was taken to make another lichen collection. That collection was subsequently studied by DOØ.

Methods
The collection was made in the north-eastern part of Marion Island, roughly between Albatross Lakes, Long Ridge, and First Red Hill, and consisted of *c.* 110 specimens. Morphology was examined using a Zeiss Stemi 2000C microscope and a Zeiss Axiolab compound microscope. Microscopical details were obtained by examining hand-cut sections or squashed material. The sections were mounted in dilute lactophenol cotton blue. Measurements were made on sections mounted in 10% KOH. All specimens are housed in BG.

The species

1. Acarospora impressula Th. Fr., *Lichenogr. Scand.* **1**, 214 (1871)
Thallus crustose, *c.* 2 cm wide, mostly composed of adpressed apothecia, with a thin border of thallus at the margin, brown-black. Apothecia up to 0.5 mm diam.; angular margin distinct, raised; disc concave, in sheltered places red-brown. Hymenium 70–80 µm high, colourless. Paraphyses *c.* 1 µm wide at the base. Ascospores numerous, subglobose, *c.* 3 µm diam.
Chemistry: negative.

Ecology: on grey lava rock, in feldmark vegetation, close to the coast, within reach of salt spray.

Distribution: *Acarospora impressula* is known from Europe and North America. It is found in coastal areas (Jørgensen & Nordin 2009, Dobson 2000), as well as in high mountains (Wirth 1980). This is the first record in the Southern Hemisphere.

SPECIMEN EXAMINED
Marion Island: • edge of Fault, close to coast, 46°53′18.8″S, 37°52′24.4″E, 24 m alt., growing on grey lava rock in wet feldmark vegetation. *NJM Gremmen M2013-0160*, 20.iv.2013.

Comments: the specimen has been compared with others from Norway (BG), and found similar in all essential details, except that the ascospores in the Norwegian material are more ellipsoid. The Scandinavian populations grow on limestone (specimens in BG, Foucard 1990), as do most of the central European ones (Wirth 1980), but some central European thalli as well as the British and Irish colonies grow on hard siliceous rock (Wirth 1980, Purvis *et al.* 1992, Dobson 2000), just like the Marion Island specimen; thus there could be more than one taxon under this name. Øvstedal & Gremmen (2001) listed *Acarospora* cf. *otagensis* from Marion Island. That species has elongate, pale grey-brown lobes, smaller apothecia and ellipsoid ascospores.

2. Buellia tristiuscula (Nyl. in Cromb.) Zahlbr., *Cat. Lich. Univ.* **7**, 424 (1931)
Thallus crustose, thin, grey-brown. Apothecia dark brown, up to 0.2 mm diam., flat, with a thin, regular margin; disc flat, sessile. Hymenium *c.* 60 µm high; uppermost part brown. Hypothecium brown. Ascospores 8 in asci, broadly ellipsoid, 11–13 × 7–9 µm. Paraphyses end-cells clavate, *c.* 4 µm diam.

Ecology: on coastal rocks, influenced by salt spray and animals, together with *Caloplaca sublobulata* and *Thelenella kerguelense*.

Distribution: now known from Heard Island, Kerguelen (Øvstedal & Gremmen 2008) and Marion Island.

SPECIMENS EXAMINED
Marion Island: • N of Tom Dick and Harry, 46°53′41.6″S, 37°51′29.5″E, 59 m alt., growing on black lava rock, in open fernbrake. *NJM Gremmen M2013-0229*, 3.v.2013; • Trypot Beach, rock near the trypot in middle of beach, 46°53′05.2″S, 37°52′05.8″E, 16 m alt., *NJM Gremmen M2013-0288*, 6.v.2013; • same locality and date, *NJM Gremmen M2013-306*.

3. Cladonia gracilis (L.) Willd. subsp. **turbinata** (Ach.) Ahti, *Ann. Bot. Fenn.* **17**, 212 (1980)
Primary squamules forming dense cushions 4–5 cm wide; squamules ascending, up to 6 × 5 mm, irregular in outline, often fan-shaped and incised. Lower side white, at base coal-grey and with shallow ridges. Upper side smooth, pale greenish to green-brown. Podetia numerous, simple, up to 11 × 2 mm, with regular scyphi, surface faintly tessellated, smooth, brown-green, lacking granules or plates, but with a few small squamules perpendicular to surface, with 1–3 vertical fissures, and some blackening in upper part of podetia. Scyphi 1.1–4 mm wide, gradually flaring, with brown pycnidia along margin, apparently proliferating from margins. When old, inner surface of scyphi with small squamules. In transverse section the medulla is 15% of the total diameter, medulla with algae 22% and the irregular stereome *c.* 63%.
Chemistry: fumarprotocetraric acid complex.

Ecology: on disturbed, eroded peaty soil.

Distribution: North America, Europe, Asia, New Zealand, Marion Island.

SPECIMENS EXAMINED
Marion Island: • near Meteorological Station, growing on wet peat, forming extensive patches in an erosion patch-rubbish dump, 46°52′41.2″S, 37°51′28.2″E, 44 m alt., *NJM Gremmen M2013-0324*, 7.v.2013; • same date and locality, *NJM Gremmen M2013-315*; • same date and locality, *NJM Gremmen M2013-0320*.

Comments: this taxon belongs to *Cladonia gracilis* sens. lat., and we have tentatively determined it as *C. gracilis* subsp. *turbinata*, which regularly has scyphi. It is rather similar to specimens of the subspecies in the herbarium BG, but it differs in that the primary squamules are dominant and all podetia have vertical fissures.

4. Coenogonium cf. **weberi** Vězda, *Folia Geobot. Phytotax.* **8**, 311 (1973)
Thallus a very thin, whitish crust, often absent. Apothecia up to 1.0 mm diam (mean 0.76 mm) pale orange-brown, concave, with thin proper margin. Margin slightly darker than the disc when young, concolorous when old. No algae in exciple or subhymenium. Hymenium 70–80 μm high. Paraphysis end cell enlarged to 2.5 μm diam. Ascospores uniseriate in asci. Ascospores 1-septate, 15–16 × 5–6.5 μm.

Ecology: on bryophytes.

Distribution: the species has been described from the subalpine zone of Papua New Guinea's Bismarck Range (Vězda 1973), and this seems to be the first record outside that area.

SPECIMEN EXAMINED
Marion Island: • near Junior's Kop, growing on *Hypnum cypressiforme* and *Plagiochila heterodonta* bryophyte mat in small cave in black lava, 46°52′45.8″S, 37°49′54.3″E, 157 m alt., *NJM Gremmen M2013-0273*, 18.iv.2013.

Comments: this specimen keys out as *Dimerella weberi* Vězda in Rivas Plata *et al*. (2006). It conforms with the description in Vězda (1973), except that the hymenium is shallower (70–80 μm, compared to 140–160 μm in the description).

5. Eiglera flavida (Hepp) Hafellner, *Beih. Nova Hedwigia* **79**, 276 (1984)
Thallus crustose, *c.* 2 cm wide, smooth to cracked, ecorticate, thin, pale yellow-grey. Apothecia immersed in thallus, up to 0.3 mm wide, blackish, without a thalline margin. Hymenium 60–80 μm high; epithecium blue-green. Hymenium colourless. Ascospores simple, colourless, 12–15 × 7–9 μm.
Chemistry: negative.

Ecology: on rock.

Distribution: *Eiglera flavida* is recorded from Europe, Siberia, Iceland, Greenland, the Northwest Territories of Canada, Alaska and Antarctica (Thomson 1997, Øvstedal & Lewis Smith 2001).

SPECIMEN EXAMINED
Marion Island: • between Hendrik Fister Kop and Junior's Kop, growing on grey lava rock in upland feldmark, 46°53′06.7″S, 37°49′10.3″E, 227 m alt., *NJM Gremmen M2013-0128*, 25.iv.2013.

6. Megalaria sp.
Thallus crustose, thin, *c.* 3 cm wide, pale yellowish grey, with no distinct prothallus. Apothecia sessile, up to 1.1 mm wide, blackish, when wet red-blackish, when young with thin, protruding proper margin, when old convex with an excluded margin. Hymenium *c.* 70 μm high; epithecium pale greenish. Exciple and hypothecium greenish black, K+ blue-green; exciple with a red pigment. Asci of *Bacidia*-type. Ascospores 8 in asci, colourless, 1-septate, 10–12 × 6–7 μm. Paraphyses simple, *c.* 1 μm diam.; apices clavate, *c.* 2 μm diam.
Chemistry: negative.

Ecology: on lower side of rock.

SPECIMEN EXAMINED
Marion Island: • Tafelberg, plateau on top, 46º51′11.9″S, 37º52′E, *NJM Gremmen M2013-0136*, 25.iv.2013.

Comments: the specimen is similar to *Megalaria obludens* (Nyl.) Fryday & Lendemer, known from southernmost South America and Campbell Island (Fryday & Lendemer 2010), but the latter differs in having smaller ascospores and a red pigment in the exciple (A. Fryday pers. com.)

7. Parmotrema perlatum (Huds.) M.Choisy, *Bull. Mens. Soc. Linn. Lyon* **21**, 174 (1952)
Thallus foliose, grey-white, 2–3 cm wide. Lobes 2–3 mm wide; ends inrolled, sorediate. Lower side black, brownish near the margins, with simple black rhizinae. Very few fibrils in the lobe sinuses.
Chemistry: stictic acid.

Ecology: on grey lava basaltic rock, especially abundant in sheltered hollows among large rocks.

Distribution: *Parmotrema perlatum* is a cosmopolitan species (Jabłońska *et al.* 2009); it is reported here for the first time from the Subantarctic.

SPECIMEN EXAMINED
Marion Island: • Fault Cliff, inland of ladder, growing on grey lava rock, on cliff faces, a large number of individuals in a sheltered hollow among large rocks, 46°53′18.1″S, 37°52′22.0″E, 23 m alt., *NJM Gremmen M2013-0281*, 6.v.2013.

8. Peltigera lepidophora (Vain.) Bitter, *Ber. Deutsch. Bot. Ges.* **22**: 251 (1904)
Thallus foliose, 2 cm wide; lobes 3 mm wide. Upper side grey-brown, smooth, with squamulose isidia. Lower side pale, with narrow brown veins.
Chemistry: negative.

Ecology: among bryophytes.

Distribution: a cosmopolitan species (Øvstedal *et al*. 2009), reported here for the first time from the Subantarctic.

SPECIMEN EXAMINED
Marion Island: • near Rooks Bay, growing on moss in mesic fellfield, in *Breutelia* cushion, 46°57′52.7″S, 37°37′15.6″E, 100 m alt., *NJM Gremmen M2013-0203*, 25.iv.2013.

9. Thelidium pyrenophorum (Ach.) Mudd, *Syst. Lich. Germ.* 353 (1855)
Thallus crustose, pale grey-ochre, up to 10 mm diam. Perithecia semi-immersed, 0.3 mm diam., black. Involucrellum extending halfway down; exciple dark in uppermost part. Ascospores 8 in asci, 1-septate, *c.* 20 × 9 μm.

Ecology: on lava rock, affected by salt spray and animals.

Distribution: found in Europe, North America, Antarctica (Øvstedal & Lewis Smith 2001), and Marion Island.

SPECIMEN EXAMINED
Marion Island: • Trypot Beach, rock near the trypot in middle of beach, 46°53′05.2″S, 37°52′05.8″E, 16 m alt., *NJM Gremmen M2013-0290*, 6.v.2013.

10. Tremolecia atrata (Ach.) Hertel, *Khumbu Himal* **6**, 351 (1977)
Thallus crustose, effuse, to 5 mm diam., rust-coloured; prothallus scarcely visible. Apothecia immersed, black, to 0.5 mm diam.; margin distinct. Hymenium 90–100 μm high; uppermost part colourless to grey-green. True exciple blackish. Hypothecium dark brown. Apothecia ellipsoid, 10–14 × 6–8 μm. Medulla K/I–.
Chemistry: negative.

Distribution: more or less cosmopolitan in colder areas.

SPECIMENS EXAMINED
Marion Island: • between Hendrik Fister Kop and Junior's Kop, 227 m alt., growing on grey lava rock, in upland feldmark (with *Eilera flavida*), *NJM Gremmen M2013-0128*, 25.iv.2013; • Skua Ridge, growing on grey lava rock, in feldmark, 46°52′06.7″S, 37°50′24.2″E, 99 m alt., *NJM Gremmen M2013-0122*, 24.iv.2013; • Skua Ridge, growing on grey lava flat rock slabs, in wet feldmark, 46°52′05.7″S, 37°50′10.7″E, 108 m alt., *NJM Gremmen M2013-0148*, 27.iv.2013; • between Hendrik Fister Kop and Junior's Kop, growing on grey lava rock, in upland feldmark, 46°53′06.7″S, 37°49′10.3″E, 227 m alt., *NJM Gremmen M2013-0125*, 25.iv.2013; • between Hendrik Fister Kop and Junior's Kop, growing on grey lava rock, in upland feldmark, 46°53′06.7″S, 37°49′10.3″E, 227 m alt., *NJM Gremmen M2013-0126*, 25.iv.2013; • Skua Ridge, growing on grey lava rock, in feldmark, a small colony on rock with many other lichens, 46°52′06.7″S, 37°50′24.2″E, 99 m alt., *NJM Gremmen M2013-0120*, 24.iv.2013.

11. Verrucaria bubalina P.M.McCarthy, *Muelleria* **7**, 344 (1991)
Thallus dark brown, up to 10 cm wide but mostly smaller, finely secondary-cracked. Perithecia 1/4–1/2 immersed in the thallus, protruding part black, sometimes with fine striae. Involucrellum entire to subentire. Exciple brown. Ascospores 8 in asci, 15–16 × 8–10 μm.

Ecology: growing in the upper littoral zone, together with *Caloplaca sublobulata*, *C. lucens* and *Lecanora disjugenda*.

Distribution: previously known from Macquarie Island (McCarthy 1991b) and New Zealand.

SPECIMEN EXAMINED
Marion Island: • Fault Point, growing on grey lava, in coastal rock pool, at water level, 46°53′19.1″S, 37°52′28.1″E, 13 m alt., *NJM Gremmen M2013-0159*, 20.iv.2013.

Comments: compared with a specimen from Macquarie Island (MEL 2281308) and found to be similar in all essential details.

12. Verrucaria subdiscreta P.M.McCarthy, *Muelleria* **7**, 327 (1991)
Thallus olive-green, in patches up to 4 cm wide, smooth, thin, with small black punctulae. Apothecia sessile, up to 0.3 mm diam.; ostiole partly depressed. Involucrellum extending halfway down; exciple pale brown. Ascospores 8 in asci, 9–11 × 4.5–6 μm.

Ecology: on rock close to sea, regularly splashed by sea water; growing with *Verrucaria durietzii* and *V. maura*.

Distribution: Australia, New Zealand, Macquarie Island (McCarthy 1991a), Marion Island.

SPECIMEN EXAMINED
Marion Island: • Trypot Beach, growing on coastal rocks, just above sea level, a large band low on the rocks, 3 m alt., *NJM Gremmen M2013-286*, 6.v.2013.

Comments: compared with a specimen from Tasmania (MEL 40233, *det*. McCarthy) and found to be similar in all essential details.

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NJMG thanks Prof. V.R. Smith, Department of Botany and Zoology, University of Stellenbosch, South Africa, for the opportunity to work on Marion Island again. The project was funded by the South African National Research Foundation (Grant SNA2011112200001) and supported logistically by the South African Department of Environment Affairs. A. Fryday (East Lansing) and H. Sipman (Berlin) are thanked for comments on the *Megalaria* species.

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The chemical diversity of *Dimelaena elevata* (Physciaceae, lichenized Ascomycota)

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Abstract
Dimelaena elevata has been shown to comprise five chemotypes, all of which contain xanthone chemosyndromes. The chemotypes differ in the array of depsidones and xanthones present.

The endemic Australian lichen *Dimelaena elevata* Elix, Kalb & Wippel is widespread and common on siliceous rocks in tropical Western Australia, Northern Territory and Queensland (Mayrhofer *et al.* 1996; Elix 2011). It is characterized by the thick, loosely attached, yellowish or more rarely off-white or brownish, crustose thallus with radiate-plicate margins, lecideine apothecia, ellipsoidal, 1-septate ascospores 10–16 × 5–9 μm, bacilliform conidia 5–8 × 1 μm, and the presence of chloroxanthones. A detailed description of the species is given in Mayrhofer *et al.* (1996) and Elix (2011).

In the present work, representatives of *D. elevata* were shown to occur in five distinct chemical races that differ in the presence or absence of depsidones and in the array of xanthones present. Three of the chemotypes contain norstictic acid in combination with alternative xanthones, one chemotype with stictic acid and xanthones, and one with xanthones alone. 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.

Dimelaena elevata Elix, Kalb & Wippel, *in* H.Mayrhofer, M.Matzer, A.Wippel & J.A.Elix, *Mycotaxon* **58**, 298 (1996)

Chemotype 1 [the type race]
Chemotype 1 contains norstictic acid [major], 6-*O*-methylarthothelin [major], connorstictic acid [minor], thiophanic acid [minor or trace], arthothelin [trace], 4,5-dichloro-6-*O*-methylnorlichexanthone [trace], ± atranorin [minor], and ± chloroatranorin [minor]. It occurs in Queensland, Northern Territory and Western Australia.

SELECTED SPECIMENS EXAMINED
Western Australia: • Lake Argyle Road, 31 km SE of Kununurra, 15°59′S, 128°56′E, 160 m alt., on sandstone rocks in *Eucalyptus*-dominated grassland, *J.A. Elix 27786, H.T. Lumbsch & H. Streimann*, 8.vii.1991 (CANB); • Gibb River Road, 69 km SW of Wyndham, 15°50′S, 127°35′E, 280 m alt., on sandstone rocks in *Triodia* grassland, *J.A. Elix 27786, H.T. Lumbsch & H. Streimann*, 8.vii.1991 (CANB).
Northern Territory: • Umbrawarra Gorge, 22 km SW of Pine Creek, 13°59′S, 131°41′E, 220 m alt., on sandstone rocks along *Melaleuca*-dominated creekside, *J.A. Elix 22526 & H. Streimann*, 23.v.1988 (CANB); • Litchfield National Park, Lost City, 37 km SW of Batchelor, 13°13′S, 130°44′E, 150 m alt., on sandstone rocks among large sandstone outcrops with *Eucalyptus* and *Calophyllum*, *J.A. Elix 27676, H.T. Lumbsch & H. Streimann*, 4.vii.1991 (CANB).
Queensland: • Dawson Highway, Staircase Range, 18 km SE of Springsure, 24°13′S, 148°13′, 380 m alt., on weathered granite rocks in *Eucalyptus* woodland, *J.A. Elix 34265*, 23.viii.1993 (CANB); • Main Range, Carr Creek, between Mareeba and Mount Molloy, 16°50′S, 145°22′30″E, 420 m alt., on chert outcrops in dry sclerophyll forest, *H.Mayrhofer 11356 & E. Hierzer*, 14.viii.1993 (CANB).

Chemotype 2
Chemotype 2 contains stictic acid [major], 6-*O*-methylarthothelin [major], cryptostictic acid [minor], norstictic acid [minor], arthothelin [trace], 6-*O*-methylthiophanic acid [trace], 4,5-dichloro-6-*O*-methylnorlichexanthone [trace], ± atranorin [minor], and ± chloroatranorin [minor]. It occurs in Queensland, Northern Territory and Western Australia.

SELECTED SPECIMENS EXAMINED
Western Australia: • King Leopold Range, Ferny Creek, 61 km NE of the Lennard River Crossing along the Gibb River Road, 17°10′S, 125°10′E, 400 m alt., on sheltered sandstone rocks along escarpment among dense *Eucalyptus*, *Ficus* and palms, *J.A. Elix 22205, 22213, H. Streimann & D.J. Galloway*, 13.v.1988 (CANB); • Donkey Escarpment, head of Donkey Creek, 27 km S of Drysdale River Station, 15°58′S, 126°22′E, 420 m alt., on sandstone rocks in *Eucalyptus* woodland, *J.A. Elix 28019, H.T. Lumbsch & H. Streimann*, 15.viii. 1991 (CANB, PERTH).
Northern Territory: • Macdonnell Range, Alice Springs, Carmichaels Tourist Camp, 23°42′S, 133°52′E, 600 m alt., on weathered granite in arid shrubland, *J.A. Elix 11278 & L.A. Craven*, 17.ix.1983 (CANB); • Newcastle Range, 8 km SSW of Timber Creek, 13°43′S, 130°28′E, 210 m alt., on semi-exposed rock outcrop, *H. Streimann 42015*, 11.iv.1989 (CANB).
Queensland: • Dawson Highway, Staircase Range, 18 km SE of Springsure, 24°13′S, 148°13′E, 380 m alt., on weathered granite rocks in *Eucalyptus* woodland, *J.A. Elix 34265*, 23.viii.1993 (CANB).

Chemotype 3
Chemotype 3 contains norstictic acid [major], arthothelin [major], connorstictic acid [minor], thiophanic acid [minor], and 4,5-dichloronorlichexanthone [trace]. It occurs in north-eastern Queensland.

SPECIMENS EXAMINED
Queensland: • slopes of Bishop Peak, 26 km SE of Cardwell, 18°28′S, 146°09′E, 320 m alt., on rocks in open *Eucalyptus* woodland, *J.A. Elix 16730 & H. Streimann*, 28.vi.1984 (CANB); • Gillies Highway, 13 km SW of Gordonvale, 17°09′S, 145°43′E, 300 m alt., on granite rocks in *Eucalyptus* woodland, *J.A. Elix 16730 & H. Streimann*, 28.vi.1984 (CANB); • 5 km W of Irvinebank on Petford Road, 17°24′01″S, 145°10′50″E, 705 m alt., on sandstone rocks in open *Eucalyptus* woodland, *J.A. Elix 44799 pr.p.*, 9.viii.2006 (CANB).

Chemotype 4
Chemotype 4 contains norstictic acid [major], 4,5-dichlorolichexanthone [minor] and connorstictic acid [minor]. It occurs in south-eastern Queensland.

SPECIMENS EXAMINED
Queensland: • Noosa Heads National Park, Devils Kitchen Track, 26°23′S, 153°06′E, 15 m alt., on rocks on exposed headland, *J.A. Elix 10351,* 29.viii.1982 (CANB); *loc. id.*, *J.A. Elix 10389*, 2.ix.1982 (CANB).

Chemotype 5
Chemotype 5 contains 3-*O*-methylthiophanic acid [major], thiophanic acid [minor], 2,5,7-trichloro-3-*O*-methylnorlichexanthone [trace], demethylchodatin [trace] and thuringione [trace]. It occurs in central Queensland.

SPECIMEN EXAMINED
Queensland: • Dawson Highway, Dawson Range, 17 km WSW of Moura, 24°38′S, 149°49′E, 170 m alt., on weathered rocks in dry sclerophyll forest, *J.A. Elix 34961*, 29.viii.1993 (CANB).

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Validation of the name *Pertusaria hossei* A.W.Archer & Osorio

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Abstract
The combination *Pertusaria hossei* A.W.Archer & Osorio was invalidly published in 1999; this note corrects that error.

In the course of his examination of lichens collected by the German botanist Dr Carl C. Hosseus in Uruguay, Räsänen published the variety *Pertusaria reducta* Stirt. var. *hossei* Räsänen (1939). However, in 1970 Laundon reported that *Pertusaria reducta* Stirt. was a later name for *Phlyctis argena* (Ach.) Flot. (Laundon 1970); thus Räsänen's "*Pertusaria*" variety was incorrectly named, so the new combination *Pertusaria hossei* A.W.Archer & Osorio was published (Osorio 1999). Unfortunately, that name was invalidly published, because no direct reference to the basionym was made (Article 41.5, Melbourne Code, 2012). The combination is validated here with full details of the basionym.

Pertusaria hossei A.W.Archer & Osorio, *comb. et stat. nov.*
Mycobank No.: **MB 807932**
Basionym: *Pertusaria reducta* Stirt. var. *hossei* Räsänen, *Borbásia* **1**, 128 (1939)

Type: Uruguay, Est[ancia] Siete Cerros, *C.C. Hosseus s.n.*, 20.iii.1935 (H-holotype). [packet labelled "Typus"]

Pertusaria hossei is characterized by the saxicolous habitat, disciform apothecia with asci containing a single ascospore, 95–165 × 30–40 μm, and the presence of lichexanthone, hypothamnolic acid and picrolichenic acid. It is chemically similar to *P. subventosa* Malme var. *hypothamnolica* A.W.Archer & Elix (Archer & Elix 1993), but that variety, which occurs in eastern Australia and Papua New Guinea, lacks apothecia. A second specimen of *P. reducta* Stirt. var. *hossei* Räsänen in H lacked apothecia, and contained only lichexanthone and picrolichenic acid; it was identified as *P. subventosa* Malme var. *deficiens* A.W.Archer & Elix (Archer 1997).

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Tylothallia verrucosa, a new name for a common Australasian lichen

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Abstract
The new combination *Tylothallia verrucosa* (Müll.Arg.) Kantvilas is introduced for the widespread temperate Australasian lichen previously known as *Tylothallia pahiensis* (Zahlbr.) Hertel & Kilias. *Catillaria rimosa* (Müll.Arg.) Zahlbr. is a further synonym for this taxon. A description of the species is provided, as well as a discussion of its diagnostic features, distribution and ecology.

Introduction
One of the more common and easily recognized lichens on the coast of southern Australia and Tasmania is known as *Tylothallia pahiensis* (Zahlbr.) Hertel & Kilias. The whitish crustose thallus and the black, biatorine apothecia of this attractive species contrast sharply with the many brightly orange- or yellow-coloured species of *Caloplaca*, and dark-coloured *Rinodina*, *Catillaria* and *Verrucaria* species with which it grows.

The genus *Tylothallia* was introduced by P. James and H. Kilias (Kilias 1981) as a segregate of the form genus *Catillaria* A.Massal. It is characterized by a crustose thallus with a unicellular green photobiont, basally constricted apothecia with a proper excipulum constructed of richly branched, coherent hyphae in a gelatinous matrix, branched and anastomosing paraphyses with somewhat swollen apices, 8-spored *Bacidia*-type asci, 1-septate or simple, non-halonate, hyaline ascospores, and immersed pycnidia with simple, small, ovoid-oblong conidia (Kilias 1981, Rambold 1989, Ekman 1996, James 2009). Initially *Tylothallia* comprised the single temperate Northern Hemisphere species *T. biformigera* (Leighton) P.James & Kilias, but a second species, *T. pahiensis*, based on a New Zealand type, was soon added by Hertel (1983). This name has since seen wide application in Australia and New Zealand (Galloway 1985, 2007; McCarthy 2013; Kantvilas 1994).

Given its abundance, it is rather surprising that the species had seemed to have eluded lichenologists until being described by Zahlbruckner (1941), who coined the epithet '*pahiensis*' and described the species as a *Lecidea*. A review of some old *Catillaria* taxa cited in the Australian lichen checklist (McCarthy 2013) has revealed earlier names, and the necessary new combination is introduced here.

Material and Methods
The study is based chiefly on Australian collections housed in the Tasmanian Herbarium (HO) and on type specimens sourced from the Conservatoire et Jardin Botanique in Geneva (G). Observations of the thallus and apothecia are based on hand-cut sections mounted in water, 15% KOH (K), Lugol's Iodine (I) after pre-treatment with K, and lactophenol cotton blue. Pigments were characterized using K and 50% HNO_3 (Meyer & Printzen 2000). Chemical constituents were examined by thin-layer chromatography using standard methods (Orange *et al.* 2001) and comparison with a range of reliable reference specimens; solvent A was the preferred medium. Dimensions of ascospores are based on at least 60 observations and are presented in the format: 5th percentile–*average*–95th percentile, with outlying values given in parentheses. The description presented below has been compiled *de novo*, and is not derived from observations and dimensions presented in other publications.

Tylothallia verrucosa (Müll.Arg.) Kantvilas comb. nov.
Mycobank No. MB 807725

Patellaria verrucosa Müll.Arg., *Bull. Herb. Boissier* **4**, 94 (1896); *Catillaria verrucosa* (Müll. Arg.) Zahlbr., *Cat. Lich. Univers.* **4**, 84 (1926). Type: Victoria, Sandringham, on maritime rock at high water mark, *Rev. F.R.M. Wilson 1743,* 1893 (holo: G!).

Patellaria rimosa Müll.Arg., *Bull. Herb. Boissier* **1**, 48 (1893) *nom. illegit.*; *Catillaria rimosa* (Müll.Arg.) Zahlbr., *Cat. Lich. Univers.* **4**, 69 (1926). Type: Victoria, Lorne, on sandstone, *Rev. F.R.M. Wilson 1402,* 1892 (holo: G!).

Tylothallia pahiensis (Zahlbr.) Hertel & Kilias, in H. Hertel, *Mitt. Bot. Staatssamml. München* **19**, 446 (1983); *–Lecidea pahiensis* Zahlbr., *Akad. Wiss. Wien, Math.-Naturwiss. Kl., Denkschr.* **104**, 303 (1941). Type: New Zealand, South I., Southland, Foveaux Strait, Pahia Point, on granitic coastal rocks, *J.S. Thomson T2242,* viii.1935 (holo: W; iso: BM!); for location of additional isotypes, see Galloway 2007).

Thallus crustose, ecorticate, rimose-areolate to verruculose, sometimes rather lumpy, esorediate, whitish grey to pale greenish grey, rarely rather pale brownish grey, to 1.5 mm thick, forming extensive irregular patches; prothallus marginal, black to bluish black. *Photobiont* a unicellular green alga with ± globose cells 6–15 μm wide. *Ascomata* apothecia, 0.4–1.2(–1.7) mm wide, biatorine, sessile, basally constricted; disc black, plane to undulate, sometimes becoming convex, epruinose or occasionally slightly greyish-pruinose. *Proper excipulum* concolorous with the disc or pale greyish or brownish at the outer edge, persistent except in the oldest, most convex apothecia, in section cupular, 40–110 μm thick laterally, composed of short-celled, reticulately branched hyphae in a gel matrix, bluish green at the outer edge, colourless within, densely inspersed with clusters of large and small crystals that fluoresce in polarized light, the former rod-shaped, *c.* 2–3 μm long, pale brown and insoluble in KOH, the latter colourless, minute and soon dissolving in KOH. *Hypothecium* 60–120 μm thick, sometimes becoming massive, colourless. *Hymenium* 50–65 μm thick, not inspersed, colourless or with a faint yellowish or pinkish tinge intensifying in K, overlain by a greenish black, K–, N+ crimson epithecial layer. *Asci* clavate, eight-spored, 40–50 × 11–17 μm, approximating the *Bacidia*-type: tholus well-developed, with a conical, non-amyloid masse axiale, lacking an ocular chamber. *Paraphyses* sparsely branched and anastomosing, 1–2 μm thick, with apices 3–4 μm wide, coated with blue-green pigment. *Ascospores* (0–)1-septate, hyaline, ellipsoid, non-halonate, thin-walled, (8–) 8.5–*10.3*–12.5(–16) × 4–*4.9*–5.5(–6) μm. *Conidiomata* pycnidia, immersed, abundant, visible as black speckles; conidia oblong to ellipsoid, 3–3.5 × 1.5–2 μm. Figs 1–2.
Chemistry: atranorin, with either lecideoidin (appearing as a pale or colourless spot on developed t.l.c. plates) or gangaleoidin (a pale yellow, faster-moving spot), sometimes only in trace concentrations. No correlation between chemical composition and morphology, anatomy or ecology was observed. However, all Tasmanian specimens analyzed contain gangaleoidin, whereas all those from Kangaroo Island, King Island and New South Wales contain lecideoidin. Lecideoidin occurs in the type specimen of *Patellaria verrucosa*, whereas gangaleoidin occurs in the type specimen of *P. rimosa* (both from Victoria).

Remarks
Although *Patellaria rimosa* is the older of the two names introduced by J. Müller Argoviensis for this taxon, that name is illegitimate (Article 53.1), on account of there being the earlier name, *Patellaria rimosa* (Sowerby) Gray, introduced in 1821 and based on the non-lichenized fungus *Peziza rimosa* Sowerby. Consequently, *Patellaria verrucosa* becomes the oldest legitimate name for this lichen.

In coastal situations, *Tylothallia verrucosa* is easily recognized in the field by its whitish, typically rather lumpy-verruculose thallus with abundant, black apothecia and scattered, black, speck-like pycnidia. In this habitat, there are few potentially confusing lichens, and most associated species are morphologically markedly different. They include bright yellow or orange species of *Caloplaca*, the lemon-yellow *Lecanora subcoarctata* (C.Knight) Hertel, dark-coloured *Catillaria austrolittoralis* Kantvilas & van den Boom, *Rinodina blastidiata* Matzer & H.Mayrhofer and species of *Verrucaria*, or whitish crustose lichens with lecanorine apothecia: *Lecanora subfarinacea* Fée, *Ochrolechia* cf. *parella* (L.) A.Massal. and *Pertusaria parathallassica* Kantvilas & Elix. *Amandinea coniops* (Wahlenb.) M.Choisy has a pale thallus and black apothecia, but it has brown, 1-septate ascospores. The species that is most easily mistaken for *Tylothallia verrucosa*, and one which occurs in identical habitats albeit with a much more restricted geographical range (Tasmania, southern New Zealand), is *Lecanora austro-oceanica* Hertel & Leuckert. That species has similarly pigmented apothecia, but differs in having a rather cream-coloured thallus containing xanthones, an excipulum of loosely interwoven, anastomosing hyphae, *Lecanora*-type asci and exclusively simple ascospores.

Tylothallia verrucosa shares with *T. biformigera*, the type species of the genus, the critical features of exciple anatomy and ascus type. The former character can be harder to appreciate in *T. biformigera*, because the exciple is relatively thin and becomes excluded with age. The hymenium in this species is also more coherent in water and KOH. The ascus of *Tylothallia* has been referred to (incorrectly) as *Lecanora*-type (e.g. by Galloway 2007). Hafellner (1984) included the genus in the Biatoraceae, but its asci lack the more intensely amyloid layer in the tholus adjacent to the masse axiale that characterizes the *Biatora*-type ascus. Lumbsch & Huhndorf (2010) classify the genus in the Lecanoraceae, which also seems out-of-place. On the basis of the *Bacidia*-type asci, inclusion in the Ramalinaceae could be more appropriate.

Tylothallia verrucosa is widespread and common along the coast of south-eastern Australia, Tasmania and associated islands. An extensive list of mainland Australian localities is provided by Rambold (1989). It colonizes a very wide range of non-calcareous rock types, including granite, dolerite, sandstone and mudstone. It is best developed on exposed rock surfaces within the first few metres of the high tide mark, where the influence of the sea through wind and spray is very prevalent. On steeper coasts and cliffs, it can occur much higher, but nevertheless within the littoral zone. Associated species are given above.

SELECTED SPECIMENS EXAMINED

New South Wales: • Baragoot Point, 36°24′S, 150°05′E, *J.A. Elix 4583* [*H. Hertel*: *Lecideaceae Exsiccatae* 140] 1978 (HO); • near Melville Point, 35°50′S, 150°12′E, *G. Kantvilas s.n.*, 2000 (HO); • Boulder Bay, 36°44′51″S, 149°58′53″E, 2012, *L.H. Cave* 1797 (HO).

Victoria: • Barrys Beach, Phillip Island, 38°31′S, 145°12′E, 6 m alt., *G.C. Bratt 3574 & R.C. Weeks*, 1966 (HO).

Tasmania: • Flinders Island, Cave Beach, 40°01′S, 147°53′E, sea level, *G. Kantvilas 307/97*, 1997 (HO); • Cape Barren Island, The Corner, 40°22′S, 148°15′E, *J.S. Whinray s.n.*, 1969 (HO); • King Island, Fitzmaurice Bay, 40°03′S, 143°53′E, *J. Wangarek s.n.*, 1969 (HO); • Don Heads, 41°10′S, 146°20′E, *G.C. Bratt 978 & J.A. Cashin*, 1963 (HO); • Penguin, *W.A. Weber & D. McVean L-49696*, 1968 (HO); • Maatsuyker Island, 43°39′S, 146°17′E, 30 m alt., *A. Moscal s.n.*, 1976 (AD, HO); • Point Hibbs, 42°37′S, 145°16′E, 20 m alt., *A. Moscal 5576*, 1984 (HO); • Sleepy Bay, 42°08′S, 148°19′E, sea-level, *G. Kantvilas 129/94 & P. James*, 1984 (BM, HO); • Little Beach, 41°37.5′S, 148°19′E, *H. Mayrhofer 11220 & E. Hierzer*, 1992 (GZU, HO); • Couta Rocks, 41°10′S, 144°41′E, sea level, *G. Kantvilas 292/93*, 1993 (HO); • Granville Harbour, 41°49′S, 145°02′E, 1 m alt., *G. Kantvilas 174/97*, 1997 (HO); • Curio Bay, 43°11′S, 147°42′E, 20 m alt., *G. Kantvilas 161/01*, 2001 (HO); • Blowhole Point, Marion Bay, 42°45′S, 147°54′E, 5 m alt., *G. Kantvilas 346/12*, 2012 (HO); • Lion Rock, 43°36′S, 146° 49′E, 1 m alt., *G. Kantvilas 35/13*, 2013.

South Australia: • Kangaroo Island, Antechamber Bay, 35°47′S, 138°05′E, *G. Kantvilas 334/08*, 2008 (AD, HO); • Kangaroo Island, Stokes Bay, 35°37′S, 137°13′E, 50 m alt., *G. Kantvilas 516/12 & B. de Villiers* 2012 (AD, HO).

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Fig. 1. Habit of *Tylothallia verrucosa*. The whitish thallus forms a mosaic with *Catillaria austrolittoralis* (dark brown-grey), *Caloplaca cribrosa* and *C. sublobulata*. Bar = 5 mm.

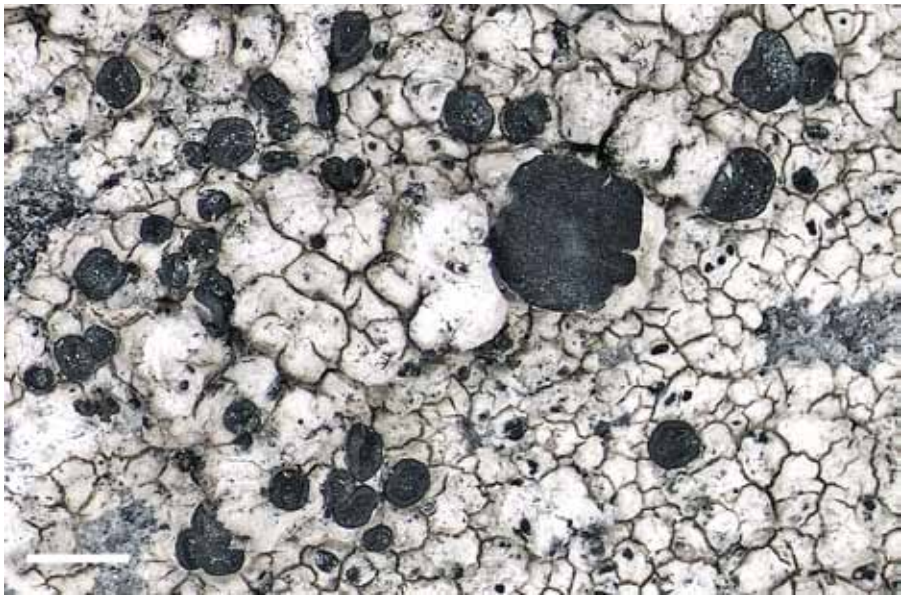

Fig. 2. *Tylothallia verrucosa* detail, showing the whitish, rimose thallus and black, biatorine apothecia. Bar = 1 mm.

New species and new records of *Buellia sens. str.* (Physciaceae, Ascomycota) in Australia

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Abstract
Buellia claricollina Elix & Kantvilas, *B. mesospora* Elix & Kantvilas and *B. pigmentosa* Elix & Kantvilas are described as new to science. In addition, new state records are reported for three additional species. A key to *Buellia sens. str.* in Australia is given.

Introduction
We continue our investigation of *Buellia*-like lichens in Australia, following on from the first account of the family (Elix 2011) and our additions and revisions to *Amandinea* (Elix & Kantvilas 2013a) and *Buellia sens. lat.* (Elix & Kantvilas 2013b). In this paper, we deal with *Buellia* in the strict sense, that is, species with *Callispora*-type ascospores, short, bacilliform or weakly clavate conidia and a hymenium usually inspersed with oil droplets (Marbach 2000, Bungartz *et al.* 2007). The last two characters in particular serve to distinguish *Buellia sens. str.* from the superficially similar genus *Baculifera*, which will be treated in a separate paper. We describe three species new to science, report several new State records for Australia, and provide a revised key to the group.

Material and methods
The study is based on collections and observations by the authors, and on specimens held in the Tasmanian Herbarium (HO) and the Australian National Herbarium (CANB). Observations of thallus and apothecial anatomy were made on hand-cut sections mounted in water, 15% KOH and 50% HNO_3. 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. Buellia claricollina Elix & Kantvilas, sp. nov. Fig. 1
Mycobank No. **MB 808088**

Buelliae bahianae similis et item acidum norsticticum continens et epihymenium in KOH violascens sed thallo saxicola, areolato tessellatoque, prothallo prominenti, nigro, arachnoidei, asci 3–8-spori et ascosporis 14–23 μm longi, 6–10 μm lati, parietibus subapicalibus modo leviter incrassatis differt.

Type: Australia, Tasmania, track to Clear Hill, 42°41'S, 146°17'E, *c.* 750 m alt., on sheltered faces and crevices of conglomerate boulders in buttongrass moorland, *G. Kantvilas 11/00*, 12.i.2000 (holotype – HO).

Thallus crustose, rimose-areolate, smooth to slightly uneven, white to yellowish white or pale grey-white, esorediate, continuous, 3–3.5 cm wide, *c.* 150–250 μm thick; individual areoles irregular, 0.05–0.3 mm wide; prothallus black, prominent, to 1.0 mm wide and rather spidery at the margins, also apparent between adjacent areoles and forming a mosaic-like pattern; cortex *c.* 10 μm thick; photobiont cells 8–12 μm

wide. *Apothecia* 0.1–0.4 mm wide, lecideine, sessile, scattered; disc black, epruinose, weakly concave at first, then ± plane to weakly convex; proper excipulum prominent, persistent, black, in section 35–50 µm thick, dark brown to black-brown but becoming paler within. *Epihymenium* 8–15 µm thick, dark greenish brown, K+ violet, C+ violet. *Hypothecium* 45–55 µm thick, pale brown, rarely almost colourless. *Hymenium* 70–90 µm thick, colourless, densely inspersed with oil droplets; paraphyses 1.2–1.8 µm wide, simple to weakly branched, capitate, with apices 4–5 µm wide, dark greenish brown. *Asci* of the *Bacidia*-type, 3–8-spored. *Ascospores* of the *Callispora*-type, 1-septate, grey-green to brown, ellipsoid, 14–23 × 6–10 µm, not constricted, with slight medial and subapical wall-thickenings; outer spore wall smooth. *Pycnidia* immersed to slightly emergent, pyriform; conidia bacilliform 4–6 × 1 µm.
Chemistry: Thallus K+ red, P+ yellow or yellow-orange; containing norstictic acid (major), connorstictic acid (minor or trace).

Etymology: The specific epithet is derived from the Latin *clarus* (clear) and *collinus* (relating to a hill), in reference to the type locality.

Remarks
Buellia claricollina is characterized by its saxicolous habit, the closely attached, minutely areolate thallus with a prominent, black, arachnoid, marginal prothallus which is also evident among the areoles, the asci that often contain fewer than 8 ascospores, and the relatively small, *Callispora*-type ascospores with only slight subapical wall-thickenings and a smooth outer wall. Because of its K+ violet epihymenium and the presence of norstictic acid, the species is superficially similar to *B. bahiana*, a common corticole in tropical and subtropical Australia. However, the latter differs in having consistently 8-spored asci, somewhat smaller ascospores (13–20 × 5.5–8 µm) with pronounced subapical wall-thickenings, and a darker brown hypothecium. Furthermore, in *B. bahiana* the prothallus is only apparent when abutting other species, and is then strictly marginal and never observed between adjacent areoles.

Buellia claricollina is known only from Tasmania's south-west wilderness, where it grows in sheltered niches on conglomerate outcrops in buttongrass (*Gymnoschoenus*) moorland and shrubby heathland. Associated species include as yet unidentified species of *Buellia sens. lat.* and *Rhizocarpon*, *Ropalospora lugubris* (Sommerf.) Poelt, *Rimularia umbratilis* Kantvilas & Coppins, *Fuscidea subasbolodes* Kantvilas, *Chiodecton montanum* Thor and several usually corticolous species including *Megalospora lopadioides* Sipman, *Mycoblastus campbellianus* (Nyl.) Zahlbr. and *M. dissimulans* (Nyl.) Zahlbr.

ADDITIONAL SPECIMEN EXAMINED
Tasmania: • summit of Tim Shea, 42°43′S, 146°28′E, 950 m alt., on conglomerate in a damp, sheltered overhang, *G. Kantvilas 403/13*, 15.xii.2013 (HO).

2. Buellia mesospora Elix & Kantvilas, sp. nov. Fig. 2
Mycobank No. **MB 808089**

Buelliae bahianae similis sed ascosporis maioribus, 18–30 µm longis, 8–14 µm latis, parietibus subapicalibus leviter incrassatis et non modo acidum norsticticum sed etiam 4,5-dichlorolichexanthonum continenti differt.

Type: Australia, Tasmania, Sidmouth, at the Olde Kirk cemetery, 41°13′S, 146°54′E, 1 m alt., on dead *Acacia mearnsii* on river bank, *G. Kantvilas 15/93*, 3.i.1993 (holotype – HO).

Thallus crustose, smooth to rimose-areolate, or uneven to occasionally verrucose,

white, grey-white or pale grey, esorediate, continuous, 1–2.5 cm wide, 50–100 µm thick; prothallus black, marginal, not apparent except occasionally when abutting other species; cortex *c.* 10 µm thick; photobiont cells 8–14 µm wide. *Apothecia* 0.1–0.7 mm wide, lecideine, broadly adnate to sessile, scattered or crowded; disc black, epruinose, weakly concave at first, then ± plane to weakly convex; proper excipulum distinct, persistent, black, in section 25–40 µm thick, dark brown to black-brown, paler within. *Epihymenium* 10–20 µm thick, olive- to blue-green or dark olive-green, K+ violet, C+ violet. *Hypothecium* 50–120 µm thick, dark olive-brown to dark red-brown. *Hymenium* 65–85 µm thick, colourless, inspersed with oil droplets; paraphyses 1.7–2.5 µm wide, simple to weakly branched, capitate, with apices 3–5 µm wide, dark brown. *Asci* of the *Bacidia*-type, (2–)4(–8)-spored. *Ascospores* of the *Callispora*-type, usually 1-septate, olive-green to brown, ellipsoid to broadly fusiform, 18–30 × 8–14 µm, ± constricted at the septum, often pointed at the apices, with slight medial and subapical wall-thickenings; outer spore wall smooth. *Pycnidia* immersed, pyriform; conidia bacilliform 4–6 × 1 µm.
Chemistry: Thallus K+ red, P+ yellow or yellow-orange; containing 4,5-dichlorolichexanthone (major or minor), norstictic acid (major), connorstictic acid (minor or trace).

Etymology: The specific epithet derives from the Greek *mesos* (middle) and *spora* (a seed or spore), referring to the medium-sized ascospores of this representative of *Buellia sens. str.*

Remarks
This new species is characterized by a thin, crustose, white to pale grey thallus, asci that often contain fewer than eight ascospores, medium-sized, *Callispora*-type ascospores with slight subapical wall-thickenings and a smooth outer wall, an inspersed hymenium, the K+ violet epihymenium, and the presence of norstictic acid together with 4,5-dichlorolichexanthone. *Buellia mesospora* is superficially similar to *B. bahiana*, a common corticolous species in tropical and subtropical Australia. However, *B. bahiana* differs in having consistently 8-spored asci, somewhat smaller ascospores (13–22 × 5.5–8 µm) with pronounced subapical wall-thickenings and lacking 4,5-dichlorolichexanthone. Another superficially similar species, *Buellia ventricosa* Müll. Arg., is chemically identical to *B. mesospora* but has a K– epihymenium and shorter ascospores, 12–14 × 10–11 µm.

Buellia mesospora is known from twigs and bark of forest trees in Tasmania, Victoria, southern New South Wales and the Australian Capital Territory. Associated species include *Megalaria grossa* (Pers. ex Nyl.) Hafellner, *Menegazzia subpertusa* P.James & D.J.Galloway, *Mycoblastus coniophorus* (Elix & A.W.Archer) Kantvilas & Elix, *Pertusaria novaezelandiae* Sžatala and *P. pertractata* Stirt. Whereas in mainland Australia the species is mostly restricted to wet forests, in Tasmania it is widespread and occurs equally in cool-temperate rainforest, wet sclerophyll forest and dry open woodland. Species of *Acacia* appear to be a favoured host. All Tasmanian specimens previously cited as *B. bahiana* (Elix 2009) are now included in *B. mesospora*.

SELECTED SPECIMENS EXAMINED
New South Wales: • Rutherfords Creek, 19 km SE of Nimmitabel, 36°34′29″S, 149°26′36″E, 850 m alt., on fallen twigs in rainforest beside stream, *J.A. Elix 43064*, 17.iv.2008 (CANB).
Australian Capital Territory: • Brindabella Range, Namadgi National Park, Blundells Creek Road, 27 km WSW of Canberra, 35°21′S, 148°50′E, 900 m alt., on wood in wet sclerophyll forest with *Pomaderris* and *Acacia melanoxylon*, *S.H.J.J. Louwhoff AL/30*, 17.iv.1994 (CANB).
Victoria: • Bulga National Park, Lyrebird-Ash Tracks, 26 km ESE of Traralgon, 38°26′S, 146°34′E, 500 m alt., on fallen *Acacia* in disturbed *Eucalyptus* forest, *J.A. Elix 29723A*,

14.iv.1993 (CANB); • Strzelecki State Forest, N of Grand Ridge Road, 24.5 km SSE of Traralgon, 38°24′S, 146°35′E, 500 m alt., on base of *Pomaderris* in regenerating *Eucalyptus regnans* forest, *J.A. Elix 29798*, 14.iv.1993 (CANB); • Morwell National Park, Fosters Gully Nature Walk, 16 km S of Morwell, 38°21′24″S, 146°23′27″E, 230 m alt., on dead twigs of *Pomaderris* in wet forest *Eucalyptus* forest, *J.A. Elix 39326*, 12.iv.2008 (CANB); • Mt Erica Trail, Baw Baw National Park, 34 km N of Morwell, 37°53′35″S, 146°21′18″E, 1050 m alt., on *Acacia dealbata* in montane wet forest, *J.A. Elix 39203*, 13.iv.2008 (CANB).
Tasmania: • Lisle Road, Little Forester River, 41°12′S, 147°21′E, 300 m alt., on *Atherosperma moschatum*, *G.C. Bratt 3128 & M.H. Bratt*, 31.i.1966 (HO); • Warners Sugarloaf, 18.5 km S of Deloraine, 41°42′S, 146°39′E, 760 m alt., on rotting wood in wet *Eucalyptus* forest, *J.A. Curnow 2015*, 26.xi.1988 (CANB); • Moores Hill, 41°14′S, 146°52′E, 80 m alt., on *Acacia dealbata*, *G. Kantvilas 222/80*, 23.v.1980 (HO); • Trevallyn State Recreation Area, Launceston, 41°27′S, 147°06′E, 200 m alt., on *Acacia dealbata*, *A.V. Ratkowsky s.n.*, 22.viii.1992 (HO 301665); • Hummocky Hills, 41°44′S, 147°14′E, *AV. Ratkowsky s.n.*, 20.ix.1992 (HO); • *c.* 7 km E of Lake Leake, 42°01′S, 147°55′E, 400 m alt., on *Acacia dealbata* in dry forest, *G. Kantvilas s.n.*, 24.iv.1996 (HO); • Tower Hill Road, 41°37′S, 147°56′E, 455 m alt., on *Acacia dealbata* in *Eucalyptus sieberi* open forest, *G. Kantvilas 214/02*, 4.v.2002 (HO); • southern slope of South Sister, 41°32′S, 148°10′E, 640 m alt., on *Acacia melanoxylon* in wet sclerophyll forest, *G. Kantvilas 375/04*, 10.xi.2004 (HO); • summit of Mt Murray, 42°28′S, 147°59′E, 315 m alt., on *Acacia melanoxylon* in dry sclerophyll woodland, *G. Kantvilas 189/06*, 14.iv.2006 (HO).

3. Buellia pigmentosa Elix & Kantvilas, sp. nov. Fig. 3
Mycobank No. **MB 808090**

Buelliae xanthonicae similis sed medullo inferno flavi-pigmentoso et atranorinum et acidum secalonicum B vice 4,5-dichlorolichexanthoni continenti differt.

Type: Australia, Queensland, Tully Falls National Park, Charmillin Creek, 10 km S of Ravenshoe, 17°41′09″S, 145°31′34″E, 960 m alt., on canopy branch in remnant montane rainforest, *J.A. Elix 44761*, 7.viii.2006 (holotype – CANB).

Thallus crustose, continuous, smooth or verruculose, white to grey-white or pale olive-brown, 1.5–2 cm wide, up to 0.15 mm thick; prothallus not apparent or marginal and black when bordering other lichens; medulla white, yellow to ochre, K+ intensely yellow in the lower part, lacking calcium oxalate (H_2SO_4–), I–; photobiont cells 7–12 μm diam. *Apothecia* 0.4–1.2 mm wide, scattered, lecideine, sessile, constricted at base; disc black, epruinose, wrinkled, weakly concave then plane or becoming convex, turbinate, ± tuberculate; proper excipulum prominent, persistent, in section 35–55 μm thick, outer zone dark brown to brown-black, K+ intensely yellow, inner zone yellow-brown. *Epihymenium* 10–13 μm thick, brown, K–. *Hypothecium* 70–120 μm thick, dark yellow-brown to dark brown, K+ intensely yellow. *Hymenium* 70–100 μm thick, colourless, inspersed with oil droplets; paraphyses 1.4–1.8 μm wide, simple to branched, capitate, with apices 4–5 μm wide, brown. *Asci* of the *Bacidia*-type, 8-spored, often with fewer spores. *Ascospores* of the *Callispora*-type, 1-septate, grey-green then brown, ellipsoid then fusiform, 20–28 × 9–12 μm, ± constricted at the septum, with marked medial and subapical wall-thickenings; outer spore wall ornamented. *Pycnidia* not seen.
Chemistry: Thallus K+ yellow, P+ pale yellow, C–, UV–; pigmented medulla K+ intense yellow, P–, C–, UV–; containing atranorin (minor), secalonic acid B (major), unknown eumitrin derivatives (minor).

Etymology: The specific epithet refers to the pigmented lower medulla and proper excipulum of this species.

Remarks
Buellia pigmentosa is characterized by the smooth to verruculose, white to grey-white or pale olive-brown thallus, the yellow- to ochre-pigmented medulla (K+ intense yellow), the brown hypothecium, the ascospores with thickened inner walls and the presence of atranorin, secalonic acid B and a chemosyndrome of eumitrin derivatives. In some respects, the thallus and ascospore morphology of this new species resembles that of *B. xanthonica* Elix, both having ascospores of similar morphology and size. However, the latter lacks a pigmented medulla, has a K– hypothecium and differs chemically in containing 4,5-dichlorolichexanthone.

At present the 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.

New State Records

1. Buellia bahiana Malme, *Ark. Bot.* **21A**, 17 (1927)
This species is characterized by the presence of norstictic acid only, the 8-spored asci, and the smooth-walled ascospores, 13–20 × 5.5–8 μm, with prominent subapical and septal wall thickenings. In Australia, it is common on bark and wood in moist coastal and hinterland forests in Queensland. All earlier records of the species from Tasmanian are now transferred to the related species *B. mesospora* (see above). It is also known from Africa, North, Central and South America and the Pacific, including Hawaii, Tahiti and New Caledonia (Elix 2009).

SPECIMEN EXAMINED
New South Wales: • *c.* 1 km W of Mount Banda Banda, 31°10′S, 152°26′E, 1050 m alt., on canopy twigs of *Nothofagus moorei* in rainforest, *G. Kantvilas 480/88*, 6.vi.1988 (HO).

2. Buellia demutans (Stirt.) Zahlbr., *Cat. Lich. Univ.* **7**, 348 (1931)
Like *B. dissa*, *B. pseudotetrapla* and *B. tetrapla*, this species is characterized by containing atranorin and diploicin, and having ascospores with prominent subapical and septal wall thickenings. It differs from those species in having predominantly (4–)8-spored asci and ascospores 22–40 × 9–14 μm (Elix 2009). In Australia, it is known from bark and wood in Western Australia, South Australia, Queensland, New South Wales and Victoria. It is also known from Europe, South America, South Africa, New Zealand, Hawaii and New Caledonia (Elix 2009).

SPECIMEN EXAMINED
Tasmania: • Ringarooma Tier, 40°49′S, 147°59′E, 100 m alt., on *Allocasuarina verticillata*, *G. Kantvilas 45/95*, 5.vii.1995 (HO).

3. Buellia pseudotetrapla (Pusswald) Elix, *Fl. Australia* **57**, 660 (2009)
This species is superficially similar to the very common and widespread *B. dissa*, with which it shares a thallus chemistry of atranorin and diploicin, 2-spored asci and ascospores with prominent septal and subapical wall-thickenings. It differs from that species by having significantly larger ascospores, 38–61 × 15–24 μm (compared to 22–42 × 10–16 μm) (Elix 2009). In Australia, it is known from bark in Western Australia, South Australia, New South Wales, Victoria and Tasmania. It is also known from Central America (Elix 2009).

SPECIMEN EXAMINED
Queensland: • Girraween National Park, 7 km NE of Wallangarra, 28°53′07″S, 151°57′52″E, 900 m alt., on *Callitris* in dry *Eucalyptus*-*Callitris* woodland, *J.A. Elix 43135*, 3.v.2005 (CANB).

Key to Buellia *sensu stricto* in Australia

1 Thallus saxicolous 2
1: Thallus corticolous or lignicolous 3

2 Epihymenium K+ violet; norstictic acid present ..... **B. claricollina**
2: Epihymenium K–; atranorin and diploicin present ..... **B. procellarum**

3 Epihymenium K+ violet 4
3: Epihymenium K– 7

4 Asci with 16 ascospores ..... **B. pleiotera**
4: Asci with 8 or fewer ascospores 5

5 Thallus K–; norstictic acid absent ..... **B. reagenella**
5: Thallus K+ red; norstictic acid present 6

6 Asci 8-spored; ascospores 13–22 × 5.5–8 µm; 4,5-dichlorolichexanthone absent ..... **B. bahiana**
6: Asci (2–)4(–8)-spored; ascospores 18–30 × 8–14 µm; 4,5-dichlorolichexanthone present ..... **B. mesospora**

7 Thallus K+ red; norstictic acid present 8
7: Thallus K+ yellow or K–; norstictic acid absent 13

8 Ascospores more than 22 µm long 9
8: Ascospores less than 22 µm long 10

9 Ascospores smooth, with pronounced subapical wall thickenings ..... **B. fraudans**
9: Ascospores strongly ornamented, with slight subapical wall thickenings ..... **B. subcrassata**

10 Ascospores broad, 8–14 µm wide; epihymenium K–, N– 11
10: Ascospores narrow, 5–8 µm wide; epihymenium K±, N+ 12

11 Ascospores 12–14 µm long; 4,5-dichlorolichexanthone present, hafellic acid absent ..... **B. ventricosa**[1]
11: Ascospores 16–23 µm long; 4,5-dichlorolichexanthone absent, hafellic acid present ..... **B. subtropica**

12 Thallus glossy, thick, warty or subsquamulose; epihymenium K–, N+ pale purple ..... **B. rechingeri**
12: Thallus dull, thin; epihymenium K+ yellow-green, N+ blackish ..... **B. conspirans**[2]

13 Thallus K–; 4,5-dichlorolichexanthone present or all substances absent 14
13: Thallus K+ yellow; atranorin present 15

14 Asci mainly 8-spored; ascospores 30–38 × 12–16 µm; lichen substances absent ..... **B. levieri**
14: Asci 2–8-spored; ascospores 18–30 × 8–14 µm; 4,5-dichlorolichexanthone present but often in low concentrations ..... **B. xanthonica**

15 Medulla yellow or ochre; secalonic acid B and other pigments present ..... **B. pigmentosa**
15: Medulla white; secalonic acid B and other pigments absent 16

16 Diploicin absent 17
16: Diploicin present 18

17 Ascospore wall ornamented; hafellic acid present ..... **B. subtropica**
17: Ascospore wall smooth; hafellic acid absent ..... **B. disciformis**

18 Asci 2-spored 19
18: Asci 3–8-spored 20

19 Ascospores 38–61 × 15–24 µm ..... **B. pseudotetrapla**
19: Ascospores 22–42 × 10–16 µm ..... **B. dissa**

20 Asci 3–4-spored ..... **B. tetrapla**
20: Asci usually 8-spored 21

21 Ascospore wall strongly ornamented; lumina straight ..... **B. demutans**
21: Ascospore wall smooth; lumina curved ..... **B. parastata**

[1] previously included in *Buellia sens. lat.*
[2] *Buellia curatellae* Malme is a later synonym of *B. conspirans* (Nyl.) Vain. (Bungartz *et al.* 2007).

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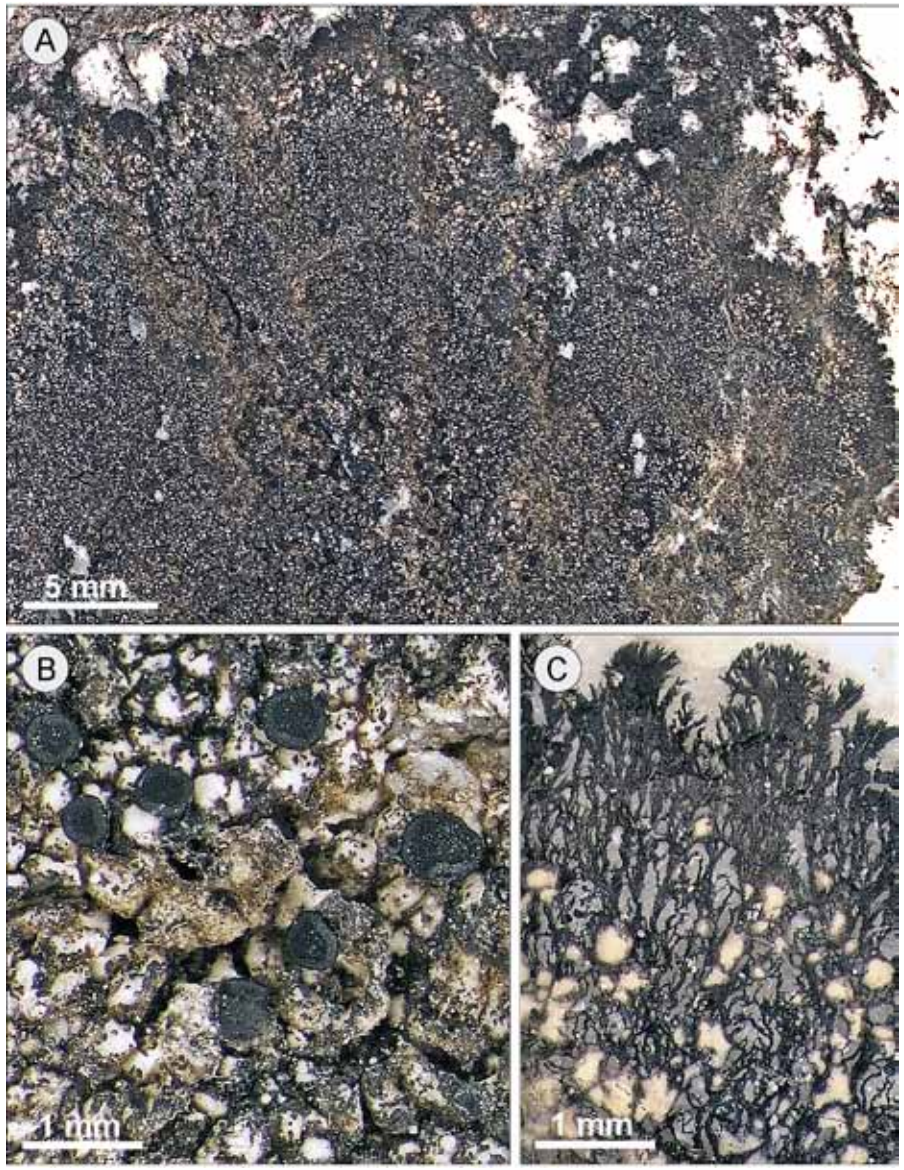

Fig. 1. *Buellia claricollina* (holotype in HO).

Fig. 2. *Buellia mesospora* (*J.A. Elix 39203* in CANB). Bar = 1 mm.

Fig. 3. *Buellia pigmentosa* (holotype in CANB). Bar = 1 mm.

Nordic Lichen Flora. Vol. 5 Cladoniaceae, edited by Teuvo Ahti, Soili Stenroos and Roland Moberg. 117 pp, 1 locality map, 110 distribution maps and colour plates of all taxa, including a separate CD of the images. Published by Museum of Evolution, Uppsala University on behalf of Nordic Lichen Society. Produced by Roland Moberg and Svante Hultengren, Naturcentrum AB, Stenungsund. Printed by Zetterqvist tryckeri, Göteborg. 2013. ISBN 978-91-85221-29-5. Price: 275 SEK. [= $NZ 49.80]. Obtainable from Svenska botaniska föreningen (Swedish Botanical Society), http://www.sbf.c.se

This is the fifth volume published by the Nordic Lichen Society in their series *Nordic Lichen Flora*. The present volume, dealing with the family Cladoniaceae, is edited by Teuvo (Ted) Ahti, Soili Stenroos and Roland Moberg, under the imprimatur of the Editorial Committee Teuvo Ahti, Starri Heiðmarsson, Per Magnus Jørgensen, Roland Moberg and Ulrik Søchting. Ted Ahti and Soili Stenroos are the authors contributing accounts of the family Cladoniaceae which for Fennoscandia amounts to 100 species comprising *Cladonia* (95 species), *Pilophorus* (four species) and *Pycnothelia papillaria*. Their expertise in the family is worldwide in its scope and relevance, and for Ted Ahti as senior author, his scholarship has been at the cutting edge of "Cladoniology" since 1961 when he published his important monograph on taxa in the subgenus *Cladina* in *Annales Botanici Societatis Zoologicae Botanicae Fennicae 'Vanamo'*. This is an astonishing and remarkable continuous record of creative taxonomic endeavour.

Introductory remarks give a description of the family, notes on its chemistry, a brief overview of relevant literature and a key. Genera are given detailed modern circumscriptions followed by a discussion of chemistry, a listing of relevant literature, and prefaced, when known, by a citing of vernacular names of each taxon in Finnish, Icelandic, Norwegian and Swedish. A similar arrangement pertains for species within genera. A dichotomous key is provided for genera within Cladoniaceae as represented in Fennoscandia. Details of chemistry (with discussion of chemodemes where appropriate), habitat, and distributions, both regional and a worldwide synopsis (including a regional distribution map) are given for every species or subspecific taxon, and informative notes are added for most of the taxa treated. All names are typified, and a concluding Appendix lists four nomenclatural novelties in *Cladonia*. All taxa are illustrated in colour (also on an included CD), mostly from nature, but also from herbarium specimens; most are of high quality, with many being exceptional as identification aids. A very helpful key in 118 couplets is given for the 95 species of *Cladonia* treated, and together with the illustrations should have wide application well beyond the confines of Fennoscandia.

Of the 95 species of *Cladonia* recorded in this volume, 31 are known from Australasia: *C. borealis* (NZ) [NB! taxa identified as either *C. coccifera* or *C. pleurota* in southern herbaria should be checked against this], *C. carneola* (NZ), *C. chlorophaea* (A, NZ) [regarding that name, the authors note on page 16 "…The type material of *C. chlorophaea* actually belongs to this species [*Cladonia albonigra* Brodo & Ahti] and therefore the name *C. chlorophaea* shall be proposed for conservation with another type" and later, on pp. 28–29 "The lectotype proposed by Ahti (1993) represents another species and therefore the basionym *Cenomyce chlorophaea* needs conservation, but the problem has not yet been fully clarified. In a wide sense *C. chlorophaea* includes several species which are treated here separately, although many of them are ambiguous, possibly chemotypes. Their taxonomy and nomenclature is under study"], *C. coccifera* (NZ), *C. cornuta* (A, NZ) *C. crispata* (NZ), *C. crispata* var. *cetrariiformis* (A, NZ), *C. cryptochlorophaea* (A, NZ), *C. deformis* (A, NZ), *C. ecmocyna* (A, NZ), *C. fimbriata* (A, NZ), *C. floerkeana* (A, NZ), *C. furcata* (A, NZ), *C. gracilis* subsp. *turbinata* (NZ), *C. grayi* (NZ), *C. homosekikaica* (A), *C. humilis* (A, NZ), *C. macilenta* (A, NZ), *C. merochlorophaea* (A, NZ), *C. mitis* (A, NZ), *C. novochlorophaea* (NZ), *C. ochrochlora* (A, NZ), *C. pleurota* (ANZ), *C. pocillum* (NZ), *C. pyxidata* (ANZ), *C. ramulosa* (ANZ), *C. scabriuscula* (A, NZ), *C. subulata* (A, NZ), *C. sulphurina* (NZ), *C. uncialis* (NZ) and *C. verticillata* (A, NZ). Thus, this account of *Cladonia* will be of help in identifying Australasian species, and will be warmly welcomed by Australasian lichenologists, many of whom (including me) find *Cladonia* a problem genus both in the field and in the herbarium.

Cladonia is a highly speciose genus in both Australia (76 taxa) and New Zealand (88 taxa) (Archer 1992a, 1992b; Galloway 2007; McCarthy 2013), and re-evaluations of Australian and New Zealand populations are probably now very timely in the light of recent work done on Northern Hemisphere, Neotropical and South American taxa. Certainly for New Zealand, William Martin's wide collections and his published assessments are now over 50 years old, and much of the lowland *Cladonia*-rich habitats have changed or disappeared entirely through extensive changes in land use from North Auckland to Southland. It is therefore time for a keen young local lichenologist to take on a modern study of *Cladonia* as it exists in the 21st century in New Zealand as a whole, a daunting but really worthwhile challenge in my view.

The *Nordic Lichen Flora* strengthens its reputation as a major modern Flora series with the production of this work. All associated with the production—editors, authors, photographers, designers (the excellent Roland Moberg and Svante Hultengren) and printers—deserve warm praise for their efforts with this attractive and useful book. As in earlier volumes, printing is clear, easy to use (opened pages stay open), and errors are few and minor. Thank you Ted and Soili for this splendid new addition to the lichen literature, relevant to the Southern Hemisphere as well as to its home turf.

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Knight, Allison (2014): *Lichens of New Zealand, an Introductory Illustrated Guide*. Botanical Society of Otago, Dunedin. 56 pages, A5 (210 × 148 mm, A4 folded and stapled). ISBN 978-0-473-26516-8. Basic price NZ$20/copy (or $15/copy for 10 or more). Buy in person at the Botany Department Office, University of Otago, 479 Great King St., Dunedin North, NZ, or e-mail the Botanical Society of Otago bso@botany.otago.ac.nz for payment details.

The lichen flora of New Zealand is uncommonly rich, prompting a lively interest in it from not only professional botanists but also "ordinary folk" and increasingly these days a burgeoning class of adventurous world-travellers dubbed eco-tourists. The professionals have been well looked after by the 1985 and 2007 editions of David Galloway's epic lichen *Flora*, with its detailed descriptions of more than 1700 taxa. Everybody else, however, has been left struggling, largely because of a frustrating scarcity of good lichen *illustrations*, which arguably are by far the easiest way for the untrained to get to know lichens. Even the hefty two-volume second edition of the Galloway *Flora* illustrated only 16 species, fewer than 1% of the species known in the lichen flora at the time.

Allison Knight has dramatically begun filling that illustration void with her booklet *Lichens of New Zealand, an Introductory Illustrated Guide*. Priced cheaply at only NZ$20, its 56 pages illustrate over 250 species with high-quality photographs. Most of those species are common and widespread, and many of them are large or colourful, just the sort that everybody is likely to notice on outings to the beach, native forest, or the mountains. Over a tenth of them, for example, are species of *Pseudocyphellaria* and *Sticta*. And, among the more colourful are species of *Caloplaca*, *Candelaria*, *Candelariella*, *Haematomma*, *Porpidia*, *Pyrrhospora, Rhizocarpon, Teloschistes*, and *Xanthoria*.

Because she alone wrote, illustrated, and designed the booklet, she could call on her years of experience as an editor to place on the page to the very best advantage not only her lush photographs but also her highly readable text, which includes interesting introductions to both the lichens and their habitats.

In addition, a glossary defines and illustrates 60 features of lichens that are typically used for identification. To make it easy for readers to compare related terms and phrases, the glossary is arranged not alphabetically but in categories, such as types of fruiting bodies and vegetative propagules. All but a few of the glossary items are illustrated, most of them with more than one photograph. Each of the glossary's 60 close-up illustrations is linked with a species, and in turn all those species have been added to the booklet's alphabetical index. The index is followed by a list of books and web-sites for further reading or finding lichen illustrations on the Internet.

Knight has grouped the lichen habitats into four readily visualized ecosystems that she names urban & pastoral, coastal & freshwater, forest & shrubland, and subalpine & alpine. The lichens themselves she's grouped into the three familiar growth-form categories of crustose, foliose, and fruticose, but she's further divided those using traits such as photobiont, lobe width, type of fruiting body, and surface texture. Confronted with so many categories, her readers could have been overloaded, but she's astutely avoided that problem by colour-coding the growth-forms and the ecosystems. Thus every photograph has a coloured border, a quick but unobtrusive reminder of the lichen's growth-form. Similarly, with a spot of colour in the upper right-hand corner of the pages treating each of the four ecosystems, readers always know what section they're in, and they can rapidly thumb through the pages to find any other section.

To identify a lichen in the wild, readers must of course somehow get the specimen side-by-side with the booklet. Trouble is, unless they've been granted a permanent collecting permit and are a dab hand with a knife, chisel, and hammer, taking the booklet to the specimen will always be easier than the other way around. Hence, readers will surely appreciate two more of the booklet's well-thought-out features—it's small enough to fit into a backpack, and it's rugged enough to survive many trips (its cover is heavy stock, plasticized on both sides, and its water-resistant paper will recover from even a dunking).

The magnification of the booklet's lichen photographs appears to have been chosen to mimic what readers would see through a handlens (loupe) capable of magnifying 5–15 diameters. Magnification on the page has been bumped up helpfully for crustose lichens such as the graphids (e.g. *Graphis librata* and *Leiorreuma exaltatum*) and skewed to the very high end for crustose foliicoles (e.g. *Enterographa bella* and the truly minute *Podotara pilophoriformis*).

Clearly a colossal effort has gone into the booklet. It's skilfully written, edited, and designed, and a joy to read. Proofreading the text must have been robust, but at least two typos have somehow sneaked through. Those two by peculiar coincidence are in adjacent lines in the bottom left-hand corner of page 54—*Smithsonion* for *Smithsonian*, and *occurring* with three r's. However, those flaws are trivial and can easily be fixed before the next printing, which is already a certainty because from the very day of its launch the booklet has enjoyed steady sales.

On that score alone the booklet is a success, and Knight deserves congratulations. Even more to her credit, it was originally intended as nothing more ambitious than a cautionary trial-run for a much larger book. Judging from the excellent quality of this classy "precursor" booklet, we can be sure that the decades-long drought of high-quality illustrations of New Zealand's lichen flora will soon be over.

Bill Malcolm

Illustration from *Lichens of New Zealand, an Introductory Illustrated Guide*, by Allison Knight, showing typical lichen growth-forms—**foliose:** *Xanthoria parietina* and *Physcia jackii*, **fruticose:** *Ramalina* sp., and **crustose:** *Haematomma babingtonii, Lecidella elaeochroma, Caloplaca subpyracea*, and *Lecanora carpinea*.

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