

Australasian Lichenology

Number 79, July 2016 ISSN 1328-4401



Australasian Lichenology

Number 79, July 2016 ISSN 1328-4401

Strigula delicata is an endemic New Zealand foliicole that colonizes the living leaves of several trees and shrubs, among them tawa (*Beilschmiedia tawa*) and titoki (*Alectryon excelsus*). The heavily branched thallus often forms a miniature network, with perithecia dotted here and there on thalline islands at the tips of the lobes. Because the thallus is subcuticular, its spread sometimes is halted by prominent veins in the host leaf, as seen in both of these close-up images.

1 mm 

CONTENTS

ARTICLES

- Elix, JA—New species of *Gassicurtia* and *Stigmatochroma* (Physciaceae, Ascomycota) from Queensland, Australia 3
- Elix, JA; Mayrhofer, H—Two new species of *Buellia sens. lat.* (Ascomycota, Physciaceae) from New Zealand with 1-septate ascospores 10
- McCarthy, PM; Kantvilas, G—A new species of *Anisomeridium* (Monoblastiaceae) from Kangaroo Island, South Australia 16
- McCarthy, PM; Elix, JA—A new species of *Megalalaria* (lichenized Ascomycota, Ramalinaceae) from north-eastern Queensland, Australia 20
- Elix, JA; Kantvilas, G—New species and new records of buellioid lichens (Ascomycota, Physciaceae) in Tasmania 26
- Blaha, J; Mayrhofer, H; Elix, JA—Five new saxicolous species of *Amandinea* (Ascomycota, Physciaceae) from New Zealand and southern Australia 35
- RECENT LITERATURE ON AUSTRALASIAN LICHENS 58

**New species of *Gassicurtia* and *Stigmatochroma*
(Physciaceae, Ascomycota) from Queensland, Australia**

John A. Elix

Research School of Chemistry, Building 137
Australian National University, Canberra, A.C.T. 2601, Australia
e-mail: John.Elix@anu.edu.au

Abstract

Gassicurtia blencoensis Elix, *G. capricornica* Elix and *Stigmatochroma maccarthyi* Elix are described as new to science. In addition, *Amandinea efflorescens* var. *pseudohypopelidna* is reported for the first time for Australia.

This paper is a continuation of investigations into *Buellia*-like lichens in Australia, following on from the first accounts of *Buellia* and related genera (Elix 2009, 2011, 2015b, 2016; Elix & Kantvilas 2013b, 2014a, 2015) and revisions to *Amandinea* (Elix & Kantvilas 2013a, 2016), *Baculifera* (Elix & Kantvilas 2014b), *Cratiria* (Elix 2014) and *Monerolechia* (Elix 2015a). In this paper I describe further new species of *Gassicurtia* and *Stigmatochroma*. Methods are as described in the papers cited above.

The new species

1. *Gassicurtia blencoensis* Elix, sp. nov.
MycoBank number: **MB 816605**

Fig. 1

Similar to *Gassicurtia coccinoides*, but differs in having an isidiate upper surface and larger ascospores.

Type: Australia, Queensland, Kennedy North district, Blencoe Creek, Cardwell Range, 48 km NW of Cardwell, 18°03'S, 145°39'E, 740 m alt., on canopy branches of felled tree in Lauraceae-*Syzygium-Prunus*-dominated forest, *J.A. Elix 20085*, 17.vii.1986 (CANB – holotype; BRI – isotype).

Thallus crustose, continuous, verrucose to isidiate, white to yellow-white or pale tan, to 35 mm wide; isidia cylindrical but soon becoming coralloid and dominating the thallus, to 1 mm high, 0.05–0.08 mm diam.; prothallus not apparent; photobiont cells 8–12 µm wide; medulla in part intense red, K+ crimson, I-. *Apothecia* 0.4–2 mm wide, lecideine, scattered or crowded, ±round, broadly adnate to sessile and constricted at the base; disc black, epruinose, weakly concave to plane or weakly convex, becoming undulate and tuberculate with age; proper exciple distinct, glossy, black, initially elevated above disc, excluded in older convex apothecia, in section 45–55 µm thick, the outer part dark olive-brown, K-, paler within. *Hypothecium* brown to brown-black, 150–180 µm thick, K-, N+ orange-brown. *Epithymenium* 8–10 µm thick, brown to dark olive-brown, K-. *Hymenium* 50–65 µm thick, colourless, interspersed with small oil droplets; subhymenium 50–70 µm thick, pale olive-brown; paraphyses 1.5–2.0 µm wide, simple to sparsely branched, with brown caps, the apices to 3 µm wide; *asci* of the *Bacidia*-type, with 8 or fewer spores. *Ascospores* of the *Buellia*-type, 1-septate, brown, narrowly ellipsoid, 11–[14.7]–20 × 4–[5.6]–7 µm, ±constricted at the septum; outer spore-wall smooth to finely ornamented. *Pycnidia* not seen.

Chemistry: Cortex K-, C-, P-, UV+ orange; medulla K+ crimson; containing 4,5-dichlor-olichexanthone (major), chiodectonic acid (minor) and an unknown secalonic acid derivative (major).

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

Notes

Morphologically, the new species resembles *Gassicurtia elizae* (Tuck.) Marbach, in that both have thalli with a coralloid-isidiate upper surface and similar sized, *Buellia*-type ascospores. However, the isidia of *G. elizae* are minute and granular-coralloid (0.05–0.1 mm high), whereas those of *G. blencoensis* are much better-developed (non-granular, to 1 mm high). In addition, the medulla of *G. elizae* lacks red pigments (that of *G. blencoensis* contains chiodectonic acid), although the epihymenium of *G. elizae* contains an amorphous orange pigment (soluble in K, yielding an orange-red solution), and the discs are red-pruinose. Furthermore, *G. elizae* contains barbatic and obtusatic acids, substances not present in *G. blencoensis*. Chemically, *G. blencoensis* closely resembles *G. coccinoides* Marbach, a corticolous montane-tropical species known from the Caribbean, South America and East Africa (Marbach 2000). Both species are characterized by the presence of 4,5-dichlorolichexanthone, chiodectonic acid and unknown secalonic acid derivatives, but *G. coccinoides* contains additional boryquinone, is granular rather than coralloid-isidiate, and has smaller ascospores, 9–11(–12) × 3.5–4.5(–5) μm. In addition, *G. coccinoides* differs in having a brown-black hypothecium and subhypothecium containing a red, K+ violet pigment and a brown-black excipulum that gives a yellow-green solution in C (C– in *G. blencoensis*).

At present, the new species is known only from the type locality. Associated species include *Coccocarpia palmicola* (Spreng.) Arv. & D.J.Galloway, *Myelorhiza jenjiana* Verdon & Elix, *Parmeliella nigrocincta* (Mont.) Müll.Arg., *Usnea baileyi* (Stirt.) Zahlbr. and *Varicellaria velata* (Turner) Schmitt & Lumbsch.

2. *Gassicurtia capricornica* Elix, sp. nov.

Fig. 2

Mycobank number: **MB 816606**

Similar to *Gassicurtia nordinii* Kalb & Elix, but differs in having shorter ascospores and in containing norstictic and connorstictic acids in addition to chiodectonic acid.

Type: Australia, Queensland, 8 km E of Mount Morgan, 23°29'S, 150°28'E, 340 m alt., on dead tree in low monsoon scrub grazed by cattle, on gentle slope, J.A. Elix 34648C, 26.viii.1993 (holotype – CANB).

Thallus crustose, continuous, smooth to verruculose or granular in part, white to pinkish white, to 10 mm wide; prothallus prominent, black, in part surrounding the thallus; photobiont cells 7–12 μm wide; medulla white in part, intense red in part (K+ crimson), I–. *Apothecia* 0.1–0.4 mm wide, lecideine, scattered, round, immersed then broadly adnate; disc black, epruinose, plane; proper exciple thick, persistent, black, raised above the disc, in section 50–60 μm thick, outer part brown-black, K–, paler brown within. *Hypothecium* 120–160 μm thick, dark brown, K+ yellow then forming red, needle-like crystals. *Epihymenium* 12–14 μm thick, dark brown, K–. *Hymenium* 100–120 μm thick, colourless, not interspersed but with oil paraphyses; subhymenium pale brown, 25–30 μm thick; paraphyses 1.5–2.0 μm wide, simple to sparsely branched subapically, apices 3–4 μm wide, with brown caps; *asci* of the *Bacidia*-type, 8-spored. *Ascospores* usually 3-septate, rarely of the *Buellia*-type and 1-septate, brown, ellipsoid, 13–[15.6]–19 × 5–[6.4]–8 μm, not constricted at the septum; outer spore-wall smooth. *Pycnidia* not seen.

Chemistry: Cortex K–, C–, KC+ orange, P–, UV–; containing norstictic acid (major), connorstictic acid (minor) and chiodectonic acid (minor).

Etymology: The specific epithet reflects the distribution of the species (the federal electorate of Capricornia).

Notes

Morphologically, the new species closely resembles *Gassicurtia nordinii*, a corticolous montane-tropical species known from Réunion (Kalb *et al.* 2009). Both species are characterized by having 3-septate ascospores, but *G. nordinii* has longer spores, (17–23 versus 13–19 μm), and lacks an intensely red medulla and oil paraphyses in the hymenium. Also, *G. nordinii* contains barbatic acid and 2-chlorolichexanthone rather than the norstictic and connorstictic acids of *G. capricornica*. *Gassicurtia capricornica* is also similar to *Buellia rubroreagens* A.Nordin, a tropical species from Brazil and the Caribbean. However, *Buellia rubroreagens* has 3-septate ascospores and an excipulum and hypothecium that contain a yellow, K+ reddish pigment (Nordin 2000), but it lacks oil paraphyses in its hymenium. Also, *B. rubroreagens* lacks thalline pigments, and has longer ascospores, 19–[21.6]–25 × 6.5–[7.1]–8 μm.

At present, the new species is known only from the type locality. Associated species include *Buellia bahiana* Malme, *Dirinaria sekikaica* Elix, *Haematomma africanum* (J.Steiner) C.W.Dodge, *Lecanora tropica* Zahlbr., *Pertusaria thiospoda* C.Knight and *P. thwaitesii* Müll.Arg.

3. *Stigmatochroma maccarthyi* Elix, sp. nov.

Figs 3 and 4

Mycobank number: **MB 816607**

Similar to *Stigmatochroma metaleptodes* (Nyl.) Marbach, but differs in having asci containing up to 16 smaller ascospores.

Type: Australia, Queensland, Magnetic Island, Picnic Bay, track to Hawkings Point Lookout, 19°10'40"S, 146°50'39"E, c. 55 m alt., on trunk of moderately sheltered track-side tree, P.M. McCarthy 4469, 21.viii.2014 (holotype – CANB).

Thallus crustose, rimose-areolate, pale yellow-grey to yellow-green, continuous, 1–2 cm wide, esorediate; individual areoles contiguous, 0.1–0.3 mm wide and up to 0.05 mm thick; upper surface minutely verruculose to granular; prothallus black, marginal, 0.1–0.5 mm wide; medulla with angular crystals soluble in K, I–; photobiont cells 7–11 μm diam. *Apothecia* 0.1–0.5 mm wide, common, lecideine, broadly adnate to sessile; disc black, densely white- or yellow-pruinose, weakly concave to more or less flat; proper exciple black, distinct, raised above the disc, persistent, in section 30–50 μm thick, outer zone dark brown, K+ deep orange-red with the formation of red, needle-like crystals, inner zone yellow. *Epihymenium* 10–15 μm thick, yellow-green to pale olive-brown, K–, N–, with angular crystals that dissolve in K. *Hypothecium* 50–125 μm thick, dark brown, pigmented yellow-orange, K+ deep orange with the formation of red, needle-like crystals. *Hymenium* 75–85 μm thick, colourless, not interspersed; subhymenium 35–50 μm thick, pale brown to brown, not interspersed; paraphyses 1.5–1.7 μm wide, simple to sparsely branched, apices 3–3.5 μm wide with colourless caps; asci of the *Bacidia*-type, (8–)16-spored. *Ascospores* of the *Buellia*-type, 1-septate, olive-green to brown, ellipsoid, 10–[12.8]–16 × 4–[4.9]–6 μm, ±curved, becoming constricted with age; outer spore-wall finely ornamented. *Pycnidia* not seen.

Chemistry: Thallus K+ yellow then red, P+ orange, C+ orange, UV+ orange; containing norstictic acid (major), connorstictic acid (minor), thiophaninic acid (minor).

Etymology: The species is named in honour of the collector, my colleague and friend Dr Patrick McCarthy.

Remarks

Stigmatochroma maccarthyi is a distinctive species, readily recognized by the yellow-grey to yellow-green, UV+ orange crustose thallus, the sessile apothecia with white- or yellow-pruinose, UV+ orange discs, the K+ orange-red excipulum and hypothecium, the mainly 16-spored asci and the presence of norstictic and thiophaninic acids.

Superficially, it resembles *Stigmatochroma metaleptodes*, which has similar chemistry but differs in having a yellow-pigmented hypothecium that reacts K+ purple, 8-spored asci and larger ascospores, 16–21 × 6.5–9 µm. *Stigmatochroma adauca* (Malme) Marbach has 16-spored asci similar to those of *S. maccarthyi*, but that species differs chemically in having a grey-white, UV– thallus, pruinose discs that are UV+ bright yellow (traces of lichexanthone) and contains atranorin, norstictic acid and pigmentosin derivatives (Marbach 2000).

At present the new species is known only from the type collection. Associated species include *Anthracothecium* aff. *toowoombense* (Müll.Arg.) Aptroot, *Buellia bahiana* Malme, *Lecanora helva* Stizenb., *L. kauaiensis* H.Magn., *Pertusaria thiospoda* C.Knight and several species of *Pyrenula*.

New record

Amandinea efflorescens* var. *pseudohypopelidna Marbach, *Biblioth. Lichenol.* **74**, 64 (2000)
This taxon was previously known from New Caledonia. It is characterized by the yellow-green crustose thallus with a sorediate upper surface, small lecideine apothecia, 0.3–0.4 mm wide, with epruinose discs, *Buellia*-type ascospores, 10–15 × 4.5–6.5 µm with strongly ornamented outer walls, and the presence of arthothelin (major), thuringione (major), 3-*O*-methylthiophanic acid (minor) and thiophanic acid (trace). A detailed description is given in Marbach (2000).

SPECIMENS EXAMINED

Queensland: • Mt Archer Environmental Park, 8 km NE of Rockhampton, 23°20'S, 150°34'E, 780 m alt., on dead wood in dry sclerophyll forest on moderately steep slope, J.A. Elix 34493, 24.viii.1993 (CANB).

New South Wales: • Washpool National Park, Gibraltar Range, Hakea Walk, 78 km E of Glen Innes, 29°28'10"S, 152°21'01"E, 895 m alt., on dead tree in mixed rainforest with scattered *Eucalyptus*, J.A. Elix 37278, 2.v.2005 (CANB).

Acknowledgements

I thank Dr Alan W. Archer (Sydney) for photographs of *Gassicurtia blencoensis* and *Stigmatochroma maccarthyi*, and Dr Patrick McCarthy (Canberra) for bringing the new *Stigmatochroma* to my attention and for photographing it.

References

- Elix, JA (2009): *Buellia*. *Flora of Australia (Lichens 5)* **57**, 495–507.
Elix, JA (2011): *Australian Physciaceae (Lichenised Ascomycota)*. Australian Biological Resources Study, Canberra. Version 18 October 2011.
<http://www.anbg.gov.au/abrs/lichenlist/PHYSCIACEAE.html>
Elix, JA (2014): New species and new records of the lichen genus *Cratiria* (Physciaceae, Ascomycota) in Australia. *Telopea* **16**, 141–148.
Elix, JA (2015a): A new species of the lichen genus *Monerolechia* (Ascomycota, Physciaceae) from Australia. *Telopea* **18**, 91–95.
Elix, JA (2015b): New species of *Buellia sens. lat.* (Physciaceae, Ascomycota) from tropical Australia. *Australasian Lichenology* **77**, 42–51.
Elix, JA (2016): New species of *Buellia sens. lat.* (Physciaceae, Ascomycota) from southern mainland Australia. *Australasian Lichenology* **78**, 32–45.
Elix, JA, Kantvilas, G (2013a): New taxa and new records of *Amandinea* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **72**, 3–19.
Elix, JA, Kantvilas, G (2013b): New taxa and new records of *Buellia sensu lato* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **73**, 24–44.
Elix, JA; Kantvilas, G (2014a): New taxa and new records of *Buellia sens. str.* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **74**, 17–25.
Elix, JA; Kantvilas, G (2014b): New species and new records of the lichen genus *Baculifera* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **75**, 28–37.

- Elix, JA; Kantvilas, G (2015): New taxa and new records of crustose lichens in the family Physciaceae (Ascomycota) in Australia. *Australasian Lichenology* **76**, 16–23.
Elix, JA; Kantvilas, G (2016): *Amandinea conioops* (Physciaceae, Ascomycota) and its mimics in Tasmania and New Zealand. *Australasian Lichenology* **78**, 22–31.
Kalb, K; Buaruang, K; Paping, K; Boonpragob, K (2009): New or otherwise interesting lichens from the tropics, including the lichen genus *Ramboldia* in Thailand. *Mycotaxon* **110**, 109–123.
Marbach, B (2000): Corticole und lignicole Arten der Flechtengattung *Buellia sensu lato* in den Subtropen und Tropen. *Bibliotheca Lichenologica* **74**, 1–384.
Nordin, A (2000): Taxonomy and phylogeny of *Buellia* species with pluriseptate spores (Lecanorales, Ascomycotina). *Symbolae Botanicae Upsaliensis* **33**, 1–117.



Figure 1. *Gassicurtia blencoensis* (holotype in CANB). Scale = 1 mm.



Figures 3 and 4. *Stigmatochroma macCarthyi* (holotype in CANB). Scale = 1 mm.



Figure 2. *Gassicurtia capricornica* (holotype in CANB). Scale = 1 mm.

Two new species of *Buellia sens. lat.* (Ascomycota, Physciaceae) from New Zealand with 1-septate ascospores

John A. Elix

Research School of Chemistry, Building 137
Australian National University, Canberra, A.C.T. 2601, Australia
e-mail: John.Elix@anu.edu.au

Helmut Mayrhofer

Institut für Pflanzenwissenschaften, NAWI-Graz
Karl-Franzens-Universität Graz, Holteigasse 6, 8010 Graz, Austria
e-mail: helmut.mayrhofer@uni-graz.at

Abstract

Buellia hypostictella Elix & H.Mayrhofer and *B. malcolmii* Elix are described as new to science. In addition, *Baculifera macromera* Elix & Kantvilas, *Buellia halonia* (Ach.) Tuck. and *Rinodinella fertilis* (Körb.) Elix are reported for the first time from New Zealand.

In his revised second edition of the *Flora of New Zealand Lichens*, Galloway recorded a total of 16 species of *Buellia* (Galloway 2007). Two of those species have since been transferred to *Amandinea* (Elix *et al.* 2015). Among the remaining 14 taxa were three species of *Buellia* in the strict sense, now limited to those with *Callispora*-type ascospores, bacilliform or weakly clavate conidia and a hymenium interspersed with oil droplets (Bungartz *et al.* 2007), the balance representing unrelated taxa that are classified as *Buellia* in the broad sense. Subsequently, seven additional taxa of *Buellia s. lat.* were reported from New Zealand (Elix *et al.* 2015, Elix 2016a). In this paper, we describe two new species of *Buellia* in the broad sense, both with 1-septate ascospores.

Methods

Observations and measurements of photobiont cells, thallus and apothecium anatomy, asci, ascospores and conidia were made on hand-cut sections mounted in water and 10% KOH (K). Asci were also observed in Lugol's Iodine (I), with and without pre-treatment in K. Medullary sections were treated with 10% sulfuric acid (H₂SO₄) and apothecial sections with 50% nitric acid (N). Chemical constituents were identified by thin-layer chromatography (Elix 2014) and comparison with authentic samples.

The new species

1. *Buellia hypostictella* Elix & H.Mayrhofer, sp. nov. Fig. 1
Mycobank number: **MB 816608**

Similar to *Buellia leptina* J.Steiner, but differs in having a pruinose upper surface, larger ascospores, longer conidia and in containing calcium oxalate in the medulla.

Type: New Zealand, South Island, Nelson, Tata Beach, NE of Pohara, 40°49'S, 172°55'E, on coastal rocks, *H. Mayrhofer* 10784, 28.viii.1992 (GZU – holotype).

Thallus crustose, continuous, verrucose-ridged to rimose-areolate, to 40 mm wide and 1 mm thick; individual areoles-verrucae 0.5–1.2 mm wide, becoming elevated; upper surface white, grey-white or pale grey, dull, very uneven, becoming cracked, white-pruinose in depressions; prothallus not apparent; photobiont cells 7–15 µm wide; medulla white, containing calcium oxalate, (H₂SO₄), I–. *Apothecia* 0.4–1 mm wide, lecideine, separate and ±round to crowded and distorted by mutual pressure, broadly

adnate or rarely sessile; disc black, often white-pruinose, plane to convex; proper exciple thick, persistent, in section 30–50 µm thick, the outer part dark brown to deep olive-brown, K+ yellow solution, N+ violet-brown, paler brown within. *Hypothecium* 180–250 µm thick, brown to brown-black, K–, N+ violet-brown. *Epithymenium* 10–12 µm thick, dark brown to deep olive-brown, K–, N+ pale red-brown. *Hymenium* 75–95 µm thick, colourless, not interspersed; subhymenium 50–60 µm thick, pale reddish brown to brown, interspersed with oil droplets; paraphyses 1.5–2.0 µm wide, simple to sparsely branched, with apices 5–6 µm wide and with dark brown caps; *asci* of the *Bacidia*-type, 8-spored. *Ascospores* of the *Buellia*-type, 1-septate, brown, ellipsoid, 10–[12.4]–16 × 5–[6.5]–8 µm, rarely constricted at the septum; outer spore-wall smooth to finely ornamented. *Pycnidia* immersed, punctiform; conidia bacilliform, 5–9 × 1–1.5 µm.

Chemistry: Thallus K+ yellow, P–, UV–; containing hypostictic acid (major) hyposalazinic acid (minor).

Etymology: The specific epithet is derived from the unusual chemistry of the species.

Notes

In many respects the new species resembles *B. leptina*, known from coastal rocks in the Canary Islands (Giralt & van den Boom 2011). Both are characterized by the presence of hypostictic acid, a non-amyloid medulla, pruinose discs and similar apothecial anatomy, including similar reactions of the hypothecium and epithymenium. However, *B. hypostictella* differs in having a pruinose upper surface, a medulla that contains calcium oxalate, larger ascospores [9–11(–12) × (5–)6–6.5 µm in *B. leptina*] and longer conidia (3–4 × 1–1.2 µm in *B. leptina*). Superficially, *B. hypostictella* resembles *B. cranwelliae* Zahlbr., a common species on coastal rocks in New Zealand. However, the latter differs in having epruinose discs, longer ascospores, (10–)11–16(–18) µm long, shorter conidia (3–5 µm long), a N– epithymenium and in lacking lichen substances (Elix 2015). *Buellia hypostictella* also resembles the North American species *B. sheardii* Bungartz (Bungartz *et al.* 2007). Both have pruinose discs, bacilliform conidia and *Buellia*-type ascospores, and both occur on coastal siliceous rocks, but *B. sheardii* has smaller ascospores, 8–[10.2]–13.5 × 4–[4.8]–6 µm, and it contains atranorin and norstictic acid.

At present, this lichen is known from coastal rocks at two localities in New Zealand. Associated species include *Amandinea conioops* (Wahlenb.) M.Choisy ex Scheid. & H. Mayrhofer, *A. decedens* (Nyl.) Blaha, H.Mayrhofer & Elix, *A. pelidna* (Ach.) Fryday & L.Arcadia, *Buellia cranwelliae* Zahlbr., *Caloplaca circumlutosa* Zahlbr., *C. cribrosa* (Hue) Zahlbr., *Pertusaria xanthoplaca* Müll.Arg. and *Xanthoria ligulata* (Körb) P.James & D.J.Galloway.

SPECIMENS EXAMINED

New Zealand: • North Island, South Auckland, Coromandel Peninsula, Fletchers Bay, N of Coromandel, N of Port Jackson, 36°28'35"S, 175°23'25"E, 0–3 m alt., on greywacke rocks, *J. Blaha* 0194, 0204, 17.iv.2001 (GZU).

2. *Buellia malcolmii* Elix, sp. nov. Fig. 2
Mycobank number: **MB 816609**

Similar to *Buellia halonia* (Ach.) Tuck., but differs in having pustulate ridges on the upper surface, cryptolecanorine apothecia, *Buellia*-type ascospores and in lacking atranorin.

Type: New Zealand, South Island, Nelson, Mount Street hair-pin bend, NZMS 260 027:333921, 41°16'42"S, 173°16'36"E, 40 m alt., on rock, *W. Malcolm* 1961, 19.vi.1994 (CANB – holotype).

Thallus crustose, continuous, rimose-areolate to wrinkled-ridged in part, to 90 mm wide and 0.15 mm thick; individual areoles 0.2–0.5 mm wide, becoming elevated; upper surface pale yellowish white, dull, granular, in places elevated, wrinkled and ridged, the ridges becoming cracked, eroded and pustulate-sorediate; prothallus not apparent; photobiont cells 8–16 μm wide; medulla white, H_2SO_4 –, I–. *Apothecia* 0.1–0.4 mm wide, cryptolecanorine or eventually lecideine, separate to crowded and distorted, \pm round, immersed or rarely broadly adnate; disc black, epruinose or grey-white-pruinose, plane to rarely weakly convex; initially with a thin, entire thalline margin that is excluded with age; proper exciple poorly developed, thin, obscure, in section 25–30 μm thick, the outer part pale brown, K–, colourless within. *Hypothecium* 125–150 μm thick, deep red-brown, K–, N–. *Epithymenium* 8–10 μm thick, brown to olive-brown, K–, N– or N+ pale red-violet. *Hymenium* 55–65 μm thick, colourless, not interspersed with oil droplets; subhymenium 25–50 μm thick, pale reddish brown; paraphyses 1.5–2.0 μm wide, simple to sparsely branched, with apices to 3 μm wide and with pale brown caps; *asci* of the *Bacidia*-type, with 8 or fewer spores. *Ascospores* of the *Buellia*-type, 1-septate, brown, ellipsoid, 13–[17.6]–21 \times 6.5–[8.5]–11 μm , becoming constricted at the septum; outer spore-wall finely ornamented. *Pycnidia* not seen. *Chemistry*: Cortex K–, C+ yellow-orange, KC+ orange, P–, UV+ dull orange; containing arthothelin (major) 4,5-dichloronorlichexanthone (minor).

Etymology: This species is named after the New Zealand cryptogamist, botanical photographer and collector of the type specimen, Dr W.M. (Bill) Malcolm.

Notes

Morphologically, the new species resembles some specimens of *Buellia amandineaeformis* Elix & Kantvilas and *B. alutacea* Zahlbr., in that all three can have a pustulate-granular upper surface (at least in part) and *Buellia*-type ascospores, and also occur in New Zealand. However, *B. amandineaeformis* differs in having significantly smaller ascospores, 10–14 \times 5–8 μm , a brown, N– epithymenium and in lacking lichen substances (Elix & Kantvilas 2013). *Buellia alutacea* has ascospores similar in size to those of *B. malcolmii*, but it has sessile, lecideine apothecia, a thallus composed of markedly convex, dispersed or contiguous areoles, and it contains atranorin and 2,5,7-trichloro-3-O-methylnorlichexanthone and isoarthothelin as the major xanthenes present (Elix 2011a). Chemically, *B. malcolmii* closely resembles *B. halonia*, a widespread saxicolous species known from Australia, New Zealand, North America, South America and South Africa (Elix 2011b). Both species are characterized by the presence of arthothelin or isoarthothelin and have similar sized ascospores and a partially aeruginose epithymenium (N+ red-violet). However, *B. malcolmii* has a granular upper surface, where elevated wrinkles or ridges become cracked, eroded and pustulate-sorediate in part (smooth and esorediate in *B. halonia*), immersed, cryptolecanorine apothecia (lecideine and broadly adnate in *B. halonia*) and *Buellia*-type ascospores (*Physconia*-type in *B. halonia*).

At present, the new species is known from two localities in the South Island of New Zealand. Associated species include *Buellia aethalea* (Ach.) Th.Fr., *B. ocellata* (Flot.) Körb., *Lecanora farinacea* Fée, *Rhizocarpon geographicum* (L.) DC. and *Xanthoparmelia australasica* D.J.Galloway.

ADDITIONAL SPECIMEN EXAMINED

New Zealand: • South Island, Marlborough, St. Arnaud, outside Travers-Sabine Lodge, 41°48'09"S, 172°50'47"E, 636 m alt., on pebbles, A. Knight *pr.*, 11.i.2015 (CANB, OTA).

New records for New Zealand

1. *Baculifera macromera* Elix & Kantvilas, *Australas. Lichenol.* 75, 30 (2014)

This species was previously known from Tasmania. It is characterized by the thin, white to pale grey or greenish grey thallus containing atranorin, the non-interspersed hymenium, 4–8-spored asci and the 1-septate, ellipsoid to broadly fusiform ascospores, (12–)16–30 \times (5–)7–12 μm , \pm constricted at the central septum and developing pointed apices, with moderate subapical wall-thickenings and a smooth outer spore-wall. Rarely, the older spores become 3-septate. The species has straight, bacilliform conidia, 5–6 \times 1 μm . A detailed description is given in Elix & Kantvilas (2014).

SPECIMEN EXAMINED

New Zealand: • South Island, Otago, Rock and Pillar Range, 45°25'05"S, 170°05'08"E, alt. 1219 m, on dead stems and twigs of subalpine *Hebe*, A. Knight, 6.xii.2014 (CANB, OTA).

2. *Buellia halonia* (Ach.) Tuck., *Lich. California* 26 (1866)

This species was previously known from Australia, South Africa and North and South America, where it occurs on siliceous rocks in coastal and hinterland regions (Elix 2011b, 2016b). It is characterized by the continuous to rimose-areolate, pale yellow-grey to yellow-green crustose thallus, often a red-pigmented lower medulla, immersed to broadly adnate or sessile apothecia, \pm yellow-grey-pruinose discs, usually an aeruginose, N+ red-violet epithymenium, *Physconia*- then *Buellia*-type ascospores, 11–19 \times 6–9 μm , bacilliform conidia, 5–7 \times 1 μm and the presence of arthothelin (C+ orange, UV+ orange) and often atranorin. A detailed description is given in Elix (2011b).

SPECIMENS EXAMINED

New Zealand: • North Island, Wellington, Te Rewarewa Point, Hongoeka Bay, NW of Plimmerton, 41°04'S, 174°51'E, on coastal rocks, H. Mayrhofer 12288, D. Glenny, W. Nelson, B. Polly & C. West, 23.viii.1992 (GZU); • South Island, Nelson, Boulder Bank, near oxidation ponds, NZMS 260 O27:370003, 41°12.3'S, 173°19.3'E, alt. 2 m, on exposed rounded cobbles on lee side of bank, W. Malcolm 3318, 10.x.2015 (CANB) [growing together with *Buellia stellulata*].

3. *Rinodinella fertilis* (Körb.) Elix var. *fertilis*, *Australas. Lichenol.* 66, 46 (2010)

This species was previously known from South Africa and southern Australia, where it occurs on siliceous rocks in coastal and hinterland regions (Elix 2011b). It is characterized by the continuous to cracked and areolate, off-white to pale fawn, crustose thallus, immersed to broadly adnate or sessile, lecideine apothecia with epruinose discs, usually a partly aeruginose, N+ violet-brown epithymenium, *Rinodinella*-type ascospores, 10–15 \times 5–8 μm , bacilliform to narrowly ellipsoid conidia, 3–4.5 \times 1–1.5 μm and the presence of norstictic and connorstictic acids. A detailed description is given in Elix (2011b).

SPECIMEN EXAMINED

New Zealand: • South Island, Nelson, Golden Bay, Tata Beach, NE of Pohara, 40°49'S, 172°55'E, on coastal rocks, H. Mayrhofer 10774, 28.viii.1992 (GZU).

Acknowledgements

H.M. acknowledges financial support from the Austrian Science Fund (FWF-projects P8500-BIO, P10514-BIO and P25237-B16). We also thank Drs W. Malcolm (Nelson) and A. Knight (Dunedin) for generously providing us with key collections.

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. University of Arizona, Tempe.
- Elix, JA (2011a): Lichen phytochemistry III: further additions and amendments. *Australasian Lichenology* **68**, 22–26.
- Elix, JA (2011b): *Australian Physciaceae (Lichenised Ascomycota)*. Australian Biological Resources Study, Canberra. Version 18 October 2011.
<http://www.anbg.gov.au/abrs/lichenlist/PHYSICIACEAE.html>
- Elix, JA (2014): *A Catalogue of Standardized Chromatographic Data and Biosynthetic Relationships for Lichen Substances*, 3rd edn. (Published by the author, Canberra).
- Elix, JA (2015): New species and new records of buellioid lichens from islands of the South Pacific Ocean. *Telopea* **18**, 527–536.
- Elix, JA (2016a): Two new species of *Buellia sens. lat.* (Ascomycota, Physciaceae) from New Zealand with pluriseptate ascospores. *Australasian Lichenology* **78**, 18–21.
- Elix, JA (2016b): Seven new species of *Buellia sens. lat.* (Ascomycota, Physciaceae) from southern mainland Australia. *Australasian Lichenology* **78**, 32–45.
- 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; Kantvilas, G (2014): New species and new records of the lichen genus *Baculifera* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **75**, 28–37.
- Elix, JA; Malcolm, WM; Knight, A (2015): New records and new combinations of buellioid lichens (Physciaceae, Ascomycota) from New Zealand. *Australasian Lichenology* **77**, 36–41.
- Galloway, DJ (2007): *Flora of New Zealand Lichens*. Revised Second Edition. Manaaki Whenua Press, Lincoln.
- Giralt, M; van den Boom, PPG (2011): The genus *Buellia* s.l. and some additional genera of Physciaceae in the Canary Islands. *Nova Hedwigia* **92**, 29–55.



Figure 1. *Buella hypostictella* (holotype in GZU). Scale = 1 mm



Figure 2. *Buellia malcolmii* (holotype in CANB). Scale = 1 mm

**A new species of *Anisomeridium* (Monoblastiaceae)
from Kangaroo Island, South Australia**

Patrick M. McCarthy
64 Broadsmith St, Scullin, A.C.T. 2614, Australia
e-mail: pmcc2614@hotmail.com

Gintaras Kantvilas
Tasmanian Herbarium, PO Box 5058
UTAS LPO, Sandy Bay, Tasmania 7005, Australia
e-mail: Gintaras.Kantvilas@tmag.tas.gov.au

Abstract: *Anisomeridium austroaustraliense* sp. nov. (Monoblastiaceae) is described from *Allocasuarina*-dominated woodland on Kangaroo Island, South Australia. It has an effuse, silvery whitish to pale grey and largely endophloeodal thallus, minute, solitary perithecioid ascomata with a thin involucrellum and a comparatively dark excipulum, and small, hyaline, isolocular, biseriata, 1-septate ascospores.

The cosmopolitan genus *Anisomeridium* (Müll.Arg.) M.Choisy (Monoblastiaceae) includes almost 100 mostly corticolous species with a crustose thallus, a trentepohlioid photobiont, usually solitary, black, perithecioid ascomata, a cellular involucrellum, an apical or excentric ostiole, mainly distally anastomosing pseudoparaphyses, fissitunicate asci with a well-defined ocular chamber and colourless, 1(–3)-septate ascospores (Harris 1975, 1995). Sixteen species are known from Australia (McCarthy 2016), the genus being most diverse in the wet tropics and subtropics.

In this paper, the diminutive *Anisomeridium austroaustraliense* is described as new from the bark of a dead understorey tree in coastal woodland on Kangaroo Island, South Australia.

Methods

Observations and measurements of photobiont cells, ascomatal anatomy, asci and ascospores were made on hand-cut sections mounted in water and 10% KOH (K). Asci were also observed in Lugol's Iodine (I), with and without pre-treatment in K.

Anisomeridium austroaustraliense P.M.McCarthy & Kantvilas, sp. nov. Fig. 1

Mycobank No.: MB817118

Characterized by the effuse, silvery whitish to pale grey, endophloeodal or very thinly epiphloeodal thallus and a trentepohlioid photobiont; solitary perithecioid ascomata 0.18–0.35 mm diam., with a rather thin, black, cellular involucrellum and an apical ostiole; distally anastomosing pseudoparaphyses; asci measuring 56–75 × 12–17 μm, with a tuberculate to broadly convex ocular chamber and 8 biserially arranged, medially 1-septate ascospores of 12–18 × 5–8 μm.

Type: Australia, South Australia, Kangaroo Island, Ironstone Hills, 35°44'S, 137°57'E, alt. 70 m, on bark of a dead understorey tree in *Allocasuarina*-dominated woodland, G.Kantvilas 382/15, 3.x.2015 (holotype — HO 580935).

Thallus crustose, endophloeodal to very thinly epiphloeodal, effuse, silvery white to pale grey, 0.5–3(–5) mm wide and up to 20 μm thick when subepiphloeodal, ecorticate, UV–. *Photobiont* *Trentepohlia*, cells sparse or patchily abundant, 8–15 × 7–12 μm; interstitial hyphae 2–3 μm thick. *Prothallus* not apparent. *Ascomata* perithecioid, numerous, semi-immersed in the substratum to almost superficial, mostly solitary, occasionally paired or in clusters of 3 or 4, strongly convex to subconical or subglobose, smooth, dull black, circular to slightly elliptic in outline, (0.18–)0.26(–0.35) mm wide [*n* = 100];

apex often becoming plane or slightly excavate with age. *Ostiole* apical, inconspicuous or in a shallow, concave depression that is concolorous with or a little paler than the ascomatal wall. *Ascomatal wall* 25–40(–50) μm thick near the apex and laterally, up to 70 μm thick at the base, greenish black to jet-black in section, cellular and hyphal, not incorporating bark cells, extending down to excipulum-base level, contiguous with the excipulum or converging a little at the base, not overgrown by the thallus; surface smooth to minutely and irregularly uneven. *Excipulum* 10–15 μm thick, of elongate, periclinal hyphae, dark brown apically and laterally, pale to medium orange-brown at the base. *Hymenium* non-amyloid, I+ orange-brown, not interspersed with granules or oil globules. *Subhymenium* c. 10 μm thick. *Pseudoparaphyses* 1–1.5(–2) μm wide, long-celled, with abundant, mainly distal anastomoses; apices not swollen, occasionally hooked. *Asci* 8-spored, narrowly or broadly cylindrical or cylindroclavate, 56–75 × 12–17 μm; apex rounded; ocular chamber of immature asci tuberculate, remaining tuberculate or becoming broadly convex at maturity. *Ascospores* hyaline, narrowly ellipsoid to oblong-ellipsoid, 1-septate, occasionally slightly constricted at the median septum, irregularly biseriata in the ascus, (12–)15(–18) × (5–)6.5(–8) μm [*n* = 100]; apices rounded to subacute; contents clear or guttulate; perispore usually lacking, occasionally up to 2 μm thick. *Pycnidia* not seen.

Etymology: The epithet *austroaustraliense* refers to the discovery of the new species in South Australia.

Remarks

The diagnostic attributes, outlined above, confirm the integrity of *Anisomeridium austroaustraliense*. While it is rather similar to the almost cosmopolitan *A. bifforme* (Borrer) R.C.Harris, the latter has larger ascomata [0.3–0.5(–0.6) mm] with a thicker involucrellum (50–100 μm), a paler excipulum and longer asci (60–130 × 9–15 μm) containing spores in a uniseriate arrangement (Harris 1975, 1995; Coppins *et al.* 2009). The similarly widely distributed *A. polypori* (Ellis & Everh.) M.E.Barr is comparable to *A. austroaustraliense* in its thin, effuse thalli and small ascomata with a thin involucrellum. However, even in the absence of pycnidia, which are distinctively conical with an ostiolar neck in the former, its ascospores differ significantly from those of the Australian lichen, being longer and narrower (12–23 × 3–6 μm), with a markedly submedian septum (Harris 1975, 1995; Coppins *et al.* 2009).

The new species is known only from the type locality on Kangaroo Island, South Australia, where it grew in low coastal woodland dominated by *Allocasuarina verticillata*. The diversity and abundance of lichens in this type of vegetation tends to be low. The ground surface is typically blanketed by a thick carpet of dead *Allocasuarina* branchlets and seed cones that smothers all lichens apart from occasional, hardy patches of *Cladonia squamules*. The thick, very coarsely furrowed bark of the *Allocasuarina* is also usually poorly colonised, although dead trees can be thickly covered with *Flavoparmelia rufidota* (Hook.f. & Taylor) Hale and *Punctelia pseudocoralloidea* (Gyeln.) Elix & Kantvilas. Thus, the greatest diversity of lichens tends to be on occasional scattered understorey trees and shrubs, or on large rock outcrops elevated above the ground surface. The new species was collected from a dead understorey tree, probably *Bursaria spinosa*, where it was represented only by very sparse, scattered thalli. Associated lichens include *Pertusaria pertractata* Stirt., *Austroparmelia conlabrosa* (Hale) A.Crespo, Divakar & Elix, stunted *Teloschistes chrysophthalmus* (L.) Th.Fr. and *Ramalina* species.

References

- Coppins, BJ; James, PW; Orange, A (2009): *Anisomeridium* (Müll.Arg.) M.Choisy (1928). In Smith, CS; Aptroot, A; Coppins, BJ; Fletcher, A; Gilbert, OL; James, PW; Wolseley, PA (eds), *The Lichens of Great Britain and Ireland*, 148–150. British Lichen Society, London.
- Harris, RC (1975): *A Taxonomic Revision of the Genus Arthopyrenia Massal. s. lat. (Ascomycetes) in North America*. Ph.D. dissertation, University of Michigan, Ann Arbor.
- Harris, RC (1995): *More Florida Lichens including the 10¢ Tour of the Pyrenolichens*. Privately published, New York.
- McCarthy, PM (2016): *Checklist of the Lichens of Australia and its Island Territories*. Australian Biological Resources Study, Canberra. Version 22 January 2016. <http://www.anbg.gov.au/abrs/lichenlist/introduction.html>

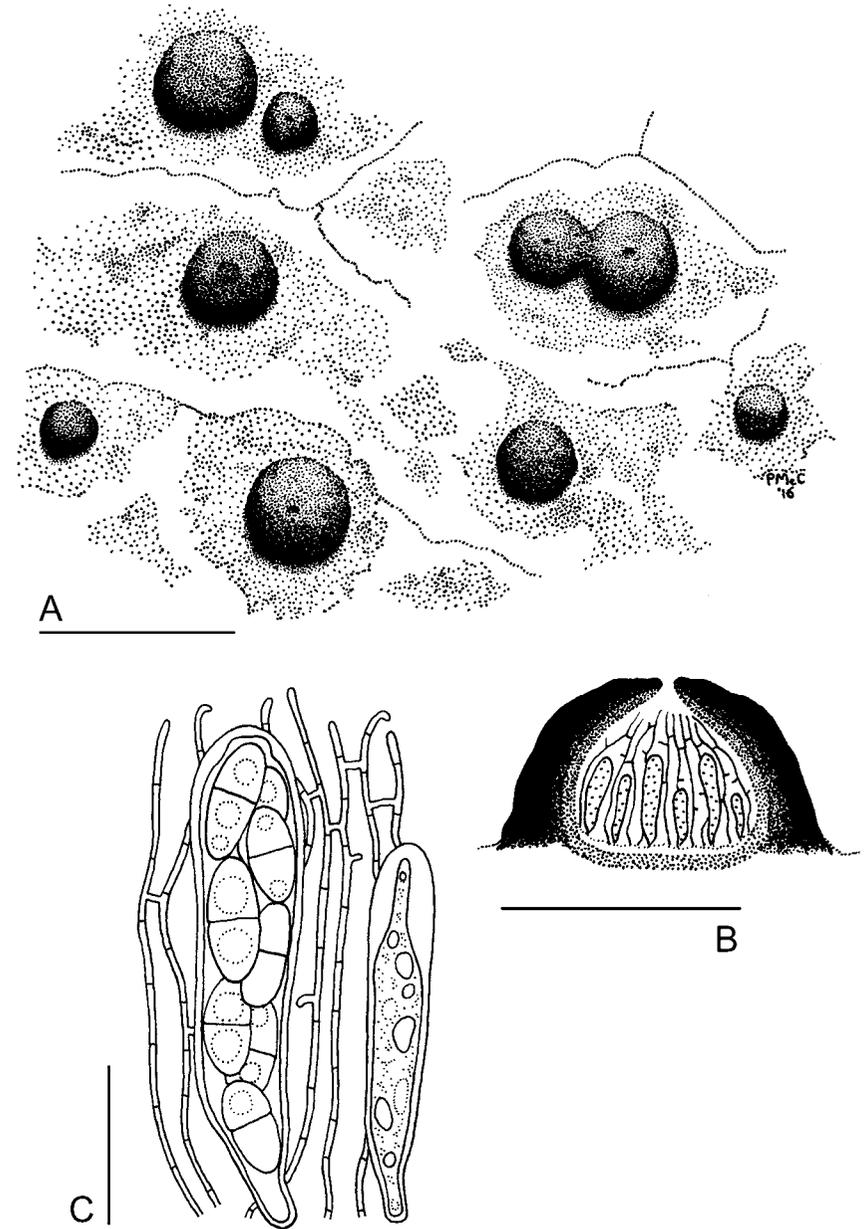


Figure 1. *Anisomeridium austroaustraliense* (holotype). **A**, Habit of thallus and perithecia; **B**, Sectioned perithecium (semi-schematic); **C**, Immature and mature asci (with ascospores) and pseudoparaphyses. Scales: **A** = 0.5 mm; **B** = 0.2 mm; **C** = 20 μm.

A new species of *Megalaria* (lichenized Ascomycota, Ramalinaceae) from north-eastern Queensland, Australia

Patrick M. McCarthy
64 Broadsmith St, Scullin, A.C.T. 2614, Australia
e-mail: pmcc2614@hotmail.com

John A. Elix
Research School of Chemistry, Building 137
Australian National University, Canberra, A.C.T. 2601, Australia
e-mail: john.elix@anu.edu.au

Abstract: *Megalaria coralloidea* sp. nov. is described from a fallen log at a rainforest margin in north-eastern Queensland, Australia. It has a well-developed, olive-green, isidiate thallus containing atranorin and zeorin, large, sessile apothecia with a uniformly hyaline, cupulate proper excipulum, a red-brown hypothecium, a nondescript epihymenium, comparatively small, 1-septate ascospores, and pycnidia that are immersed in the apices of isidia.

Megalaria Hafellner (Ramalinaceae), an almost cosmopolitan genus of c. 40 mostly corticolous species, is recognised by its usually pale, crustose thallus with a unicellular green photobiont, large, mainly black apothecia lacking a thalline margin but with a thick, cupulate proper excipulum, an amyloid hymenium with *Biatora*- or *Bacidia*-type asci or a variant of the *Lecanora*-type (*sensu* Hafellner 1984), simple, sparingly branched or somewhat anastomosing paraphyses, the apices with or without dark, pigmented caps, and 1-septate ascospores (Hafellner 1984; Ekman & Tønsgberg 1996; Kalb 2007; Kantvilas 2008, 2016; Sanderson 2009; Fryday & Lendemer 2010; Fryday 2016; McCarthy & Elix 2016). Kalb (2007) described the genus *Catillochroma* for several, mostly tropical species of *Megalaria* with a bilayered proper excipulum and zeorin in the thallus. However, this entity was convincingly rebutted by Fryday & Lendemer (2010), who demonstrated these characters to be variable and sometimes contradictory, with a number of intermediate character states being known in *Megalaria*. Those authors also synonymized *Lopezaria* Kalb & Hafellner with *Megalaria*, the type of *Lopezaria* being closely related to that of *Catillochroma*.

In this contribution, we describe *M. coralloidea*, a new species from a rainforest margin in north-eastern Queensland, Australia.

Methods

Observations and measurements of photobiont cells, thalline and apothecial anatomy, asci, ascospores, pycnidial anatomy and conidia were made on hand-cut sections mounted in water and treated with 10% potassium hydroxide (K), 50% nitric acid (N) and 10% hydrochloric acid (H). Sections of apothecia were also observed in Lugol's Iodine (I), with and without pre-treatment in K. Chemical constituents were identified by thin-layer chromatography (Elix 2014) and comparison with authentic samples.

Megalaria coralloidea P.M.McCarthy & Elix, sp. nov.
Mycobank No.: MB817684

Figs 1, 2

Characterized by the thick, olive-green, globose-isidiate to coralloid-isidiate thallus containing atranorin (major) and zeorin (major); apothecia adnate to sessile, 1–2.9 mm wide, with a thin, pale margin and a blackish convex disc; proper excipulum cupulate, bilayered, lacking pigments; hypothecium red-brown, K+ greenish black, H+ intensely reddish, N+ deeper red-brown or maroon, I-; epihymenium nondescript; hymenium pale brown, amyloid; ascospores 1-septate, 12–19 × 5–7.5 µm; pycnidia completely immersed in the apices of isidia; conidia 2.5–6 × 0.8–1.2 µm.

Type: Australia, Queensland, Atherton Tableland, Danbulla State Forest, 24 km NE of Tolga, Danbulla Forest Drive, Kauri Creek, 17°08'02"S, 145°35'55"E, alt. 660 m, on a fallen log by a creek at a rainforest margin, J.A. Elix 44230, 4.viii.2006 (holotype – CANB, isotype – BRI).

Thallus crustose, determinate, to at least 10 cm wide, pale to medium olive-green, densely isidiate, robust, 0.3–2(–3) mm thick (including isidia). *Isidia* dominating the thallus, initially verrucose projections that become subglobose to globose, constricted at the base and 100–250 µm diam.; subsequently forming erect to oblique, bead-like strings of 2–4 subglobose elements, or terete, simple or coralloid stalks that branch dichotomously or laterally, the branch tips swollen, often slightly paler and faintly byssoid, many with immersed pycnidia (see below); detached isidia leaving concave, rimmed scars. *Cortex* 20–35 µm thick, uniformly hyaline, amorphous or of short prosoplectenchymatous hyphae near the surface, this subtended by a palisade of 3–6 µm wide, thicker-walled cells. *Algal layer* continuous, 25–50 µm thick. *Photobiont* green, chlorococcoid; cells 4–8(–10) µm wide; interstitial hyphae anticlinal, short-celled, thin-walled, 2.5–4.5 µm wide. *Medulla* loose, almost byssoid; hyphae variously orientated, long-celled, ±thin-walled, 3–6 µm wide. *Prothallus* white, byssoid under the thallus, up to 4 mm wide and fimbriate at the thallus margin, of individual hyphae and radiating, white cords of conglutinate hyphae 0.1–0.2 mm wide; hyphal cords later enclosed within a cortex and an algal layer and forming an irregular matrix of branching and overlapping “lobes” 0.2–0.4 mm wide from which isidia and apothecia develop. *Apothecia* rounded or irregular in outline, solitary or forming rosettes that proliferate from a single apothecium, (1–)1.9(–2.9) mm wide [*n* = 22], adnate or sessile and attached to the thallus by no more than c. one-third to half of its lower surface; margin at first hyaline, smooth and entire, later hyaline to pale brown, 50–80 µm thick, finally thinner but persistent, or becoming excluded by the most convex discs; disc initially concave, later plane, finally moderately to strongly convex or undulate, dull greenish black to black, smooth, epruinose. *Proper excipulum* cupulate in section, bilayered, lacking pigments, K-, H-, N-, I-; outer layer (30–)50–70(–100) µm thick, appearing waxy and hyaline on the cut surface of a sectioned apothecium, the hyphae radiating outwards laterally and downwards basally, anastomosing, tightly coherent, basally 6–10 µm wide, thick-walled (the lumina 1–2 µm wide), laterally 3–6 µm wide, thick-walled (the lumina c. 1 µm wide); inner layer 120–180 µm thick, appearing white on the cut surface of a sectioned apothecium; hyphae loosely arranged, unaligned (*textura intricata*) to periclinal, thin-walled, 3–6 µm wide, the walls heavily encrusted with crystals that dissolve in K; in the transition to the outer layer, the hyphae of the lower inner layer become considerably thicker, thicker-walled and tend towards anticlinal. *Hypothecium* medium to dark reddish brown, bilayered, not interspersed with oil droplets or granules, or with sparse granules distally, 70–120 µm thick, K+ greenish black with a faint bluish tone, H+ more intensely reddish, N+ deeper red-brown or maroon, I-; upper layer darker and thinner, the cells ±paraplectenchymatous or prosoplectenchymatous and anticlinal, thicker-walled, 2–5(–6) µm wide; lower layer paler red-brown and thicker, of ±periclinal hyphae. *Hymenium* 55–75 µm thick, not interspersed with granules or oil globules, hyaline to pale brown, the pigment dissolving in N; K-, H-, I+ blue (pre-treated with K) or I+ blue-black, turning dark red-brown (not pre-treated). *Epilhymenium* very poorly defined, pale brown and scarcely distinguishable from the rest of the hymenium, K-, H-, I+ blue, the pale brown pigment dissolving in N. *Paraphyses* simple to sparingly branched, with occasional anastomoses, not very tightly conglutinate in water, loosening further in K, 1–1.5(–2) µm thick; apices neither swollen nor pigmented. *Asci* narrowly clavate to clavate-cylindrical, mostly 8-spored, occasionally with up to 4 spores aborted, the spores biserial, irregularly arranged, or massed in the distal half of the ascus, 55–70 × 10–16 µm [*n* = 15], ±*Biatora*-type; tholus weakly to strongly amyloid, penetrated almost to the ascus wall by a conical *masse axiale*, this often bordered by a narrow,

more deeply amyloid zone; ocular chamber convex to conical; ascoplasm non-amyloid. *Ascospores* narrowly ellipsoid or oblong-ellipsoid, hyaline, 1-septate (a few 2-septate), not constricted at the median, slightly thickened septum, straight, occasionally slightly curved or bent at the middle, (12–)16(–19) × (5–)6.5(–7.5) μm [*n* = 100]; apices rounded or subacute; wall to 1 μm thick, lacking an epispore; contents clear. *Pycnidia* common, completely immersed in subglobose or globose isidia or in the swollen branch apices of coralloid isidia, 80–110 μm wide and 100–130 μm tall, mostly obpyriform or broadly ellipsoid, with a minute, nondescript or pale brown ostiole 15–25 μm wide, the apex faintly byssoid, with hyaline, thick-walled hyphae c. 10 μm long and 2.5 μm wide projecting from the cortex; pycnidial wall hyaline, long-celled, 5–8 μm thick; conidiogenous layer not convoluted; conidiogenous cells unbranched, 15–25 μm long and 1–1.5 μm wide (Type II *sensu* Vobis 1980); conidia produced in series from the tips of the conidiogenous cells, narrowly ellipsoid to bacilliform, 2.5–6 × 0.8–1.2 μm.
Chemistry: Thallus K–, C–, KC–, PD–, UV–; atranorin (major) and zeorin (major) by TLC.

Etymology: The epithet *coralloidea* refers to the coralloid isidia of the new species.

Remarks

Unambiguously isidiate thalli are uncommon in *Megalaria*, and the six known species with such propagules all differ from *M. coralloidea* in aspects of thalline anatomy and/or chemistry, as well as apothecial structure, pigmentation and/or ascospore dimensions. Thus, *M. spodophana* (Nyl.) D.J.Galloway from New Zealand (Galloway 1985, 2007), *M. bengalensis* Jagadeesh, Aptroot, G.P.Sinha & Kr.P.Singh from India (Jagadeesh Ram *et al.* 2007) and *M. bryophila* (Müll.Arg.) Elix from south-eastern Australia (Elix 2012) have ascospores similar in size to those of *M. coralloidea*, but in all cases the isidia are more delicate or obscure, the thallus lacks the combination of atranorin and zeorin, and the proper excipulum, hypothecium and/or the epihymenium are bluish black or otherwise darkly pigmented. The possibly pantropical *M. isidiza* (Makhija & Nagarkar) Fryday & Lendemer has considerably larger ascospores (Sipman 1983, Fryday & Lendemer 2010), while the recently described *M. orokonuiana* Fryday & A.Knight, from south-eastern Australia and southern New Zealand, has a thallus that lacks lichen substances, as well as larger ascospores (20–41 × 9–17 μm) and a very different pattern of apothecial pigmentation (Fryday & Knight 2012, McCarthy & Elix 2016). Finally, the saxicolous *M. montana* P.M.McCarthy & Elix, from the Central Tablelands, New South Wales, lacks lichen substances, the proper excipulum is violet-grey to blue-black laterally and hyaline at the base, the hypothecium is very pale, the epihymenium is blackish and the ascospores are 19–40 × 8–13 μm (McCarthy & Elix 2016).

Robust, branched isidia are very distinctive in *M. coralloidea*, and this character is compounded in significance by the pycnidia immersed in the isidial apices. Pycnidia are known from only five species of *Megalaria* (Sipman 1983, Ekman & Tonsberg 1996, Sanderson 2009, Fryday & Lendemer 2010), in all cases immersed in the thallus or in thalline verrucae. More broadly, pycnidiate isidia are extremely rare in lichens and have been reported only from small numbers of Parmeliaceae and Pertusariaceae (e.g. Kantvilas & Elix 2008; Benatti 2012, 2013; Bungartz *et al.* 2015).

Megalaria coralloidea is known only from the type locality, a fallen log at a rainforest margin on the Atherton Tableland in north-eastern Queensland, Australia.

ADDITIONAL SPECIMEN EXAMINED

Queensland: type locality, J.A. Elix 44229, 4.viii.2006 (BRI, CANB).

References

- Benatti, MN (2012): A review of the genus *Bulbothrix* Hale: the species with medullary norstictic or protocetraric acids. *Mycoskeys* **2**, 1–28.
- Benatti, MN (2013): A review of the genus *Bulbothrix* Hale: the species with medullary fatty acids or without medullary substances. *Mycosphere* **4**, 303–331.
- Bungartz, F; Elix, JA; Yáñez-Ayabaca, A; Archer, AW (2015): Endemism in the genus *Pertusaria* (Pertusariales, lichenized Ascomycota) from the Galapagos Islands. *Telopea* **18**, 325–369.
- Ekman, S; Tønsberg, T (1996): A new species of *Megalaria* from the North American west coast, and notes on the generic circumscription. *Bryologist* **99**, 34–40.
- Elix, JA (2012): Additional lichen records from Australia 74. *Australasian Lichenology* **70**, 3–13.
- Elix, JA (2014): *A Catalogue of Standardized Thin-Layer Chromatographic Data and Biosynthetic Relationships for Lichen Substances*, 3rd edn. Published by the author, Canberra.
- Fryday, AM (2016): *Lichens of the Southern Subpolar Region*. <http://www.herbarium.msu.edu/SSP/index.html> (viewed 11 July 2016).
- Fryday, AM; Knight, A (2012): A new species of *Megalaria* (Ramalinaceae, lichenized Ascomycota) from South Island, New Zealand. *Australasian Lichenology* **70**, 26–29.
- Fryday, AM; Lendemer, JC (2010): Reassessment of the genus *Catillochroma* (lichenized Ascomycota, Ramalinaceae). *Lichenologist* **42**, 587–600.
- Galloway, DJ (1985): *Flora of New Zealand Lichens*. P.D.Hasselberg, Government Printer, Wellington.
- Galloway, DJ (2007): *Flora of New Zealand Lichens*. Revised second edition. Manaaki Whenua Press, Lincoln.
- Hafellner, J (1984): Studien in Richtung einer natürlicheren Gliederung der Sammelfamilien Lecanoraceae und Lecideaceae. *Beihefte zur Nova Hedwigia* **79**, 241–371.
- Jagadeesh Ram, TAM; Aptroot, A; Sinha, GP; Singh, KP (2007): A new isidiate *Megalaria* species and new records of lichenized, lichenicolous and non-lichenized ascomycetes from India. *Nova Hedwigia* **85**, 139–144.
- Kalb, K (2007): New or otherwise interesting lichens. III. *Bibliotheca Lichenologica* **95**, 297–316.
- Kantvilas, G (2008): Observations on some Tasmanian species of the lichen genus *Megalaria* (Lecanorales: Megalariaceae). *Muelleria* **26**, 64–71.
- Kantvilas, G (2016): Further observations on the lichen genus *Megalaria* Hafellner in Tasmania: some species with blue-green apothecial pigments. *Herzogia* **29**, In press.
- Kantvilas, G; Elix, JA (2008): Additions to the lichen genus *Pertusaria* in Tasmania. *Sauteria* **15**, 249–263.
- McCarthy, PM (2016): *Checklist of the Lichens of Australia and its Island Territories*. Australian Biological Resources Study: Canberra; Version 22 January 2016. <http://www.anbg.gov.au/abrs/lichenlist/introduction.html>
- McCarthy, PM; Elix, JA (2016): Five new lichen species (Ascomycota) from south-eastern Australia. *Telopea* **19**, In press.
- Sanderson, NA (2009): *Megalaria* Hafellner (1984). In Smith, CW; Aptroot, A; Coppins, BJ; Fletcher, A; Gilbert, OL; James, PW; Wolseley, PA (eds), *The Lichens of Great Britain and Ireland*: 565–567. British Lichen Society, London.
- Sipman, HJM (1983): A monograph of the lichen family Megalosporaceae. *Bibliotheca Lichenologica* **18**, 1–241.
- Vobis, G (1980): Bau und Entwicklung der Flechten-Pycnidien und ihrer Conidien. *Bibliotheca Lichenologica* **14**, 1–141.



Figure 1. *Megalaria coralloidea* (holotype). A, Thallus margin, showing the white prothallus and the early development of the thallus and isidia. B, An older part of the same thallus with apothecia and the fully developed isidiate crust. Scales: 5 mm.

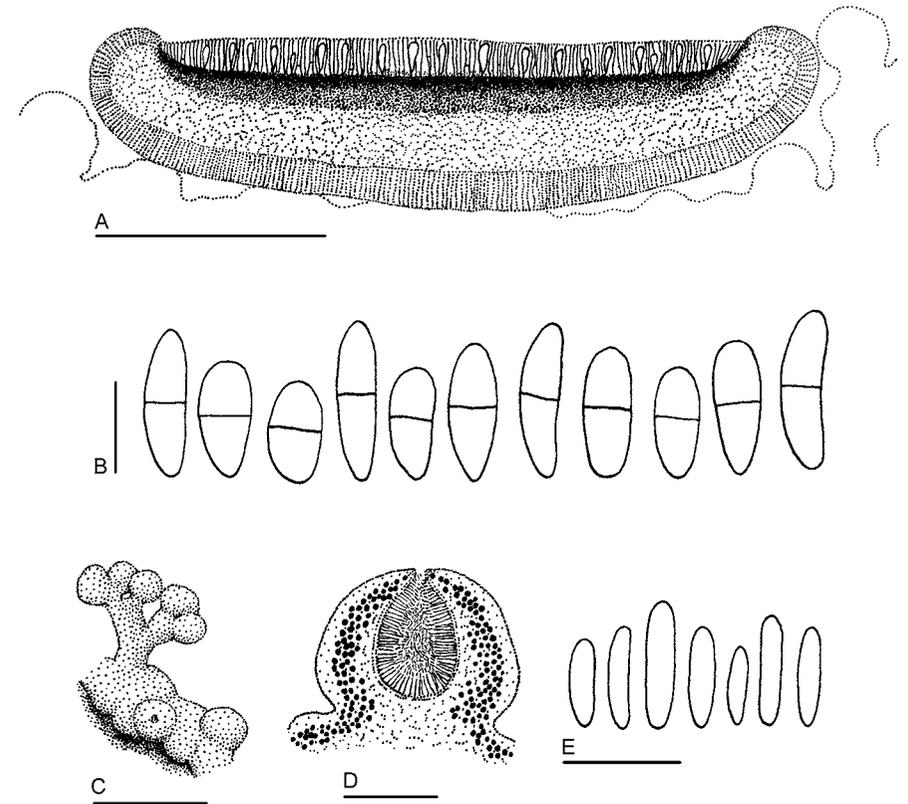


Figure 2. *Megalaria coralloidea* (holotype). A, Sectioned apothecium and adjacent thallus (semi-schematic and slightly off-centre). B, Ascospores. C, Pycnidiate isidia. D, Sectioned apex of an isidium with an immersed pycnidium (semi-schematic). E, Conidia. Scales: A, C = 0.5 mm; B = 10 μ m; D = 0.1 mm; E = 5 μ m.

New species and new records of buellioid lichens
(Ascomycota, Physciaceae) in Tasmania

John A. Elix

Research School of Chemistry, Building 137
Australian National University, Canberra, A.C.T. 2601, Australia
e-mail: John.Elix@anu.edu.au

Gintaras Kantvilas

Tasmanian Herbarium, PO Box 5058
UTAS LPO, Sandy Bay, Tasmania 7005, Australia
e-mail: Gintaras.Kantvilas@tmag.tas.gov.au

Abstract

Buellia austera Elix & Kantvilas, *B. fallax* Elix & Kantvilas and *Endohyalina gillamsensis* Elix & Kantvilas are described as new to science. In addition, *Buellia cranwelliae* Zahlbr. is reported as new to Tasmania and Australia, and the new combination *Amandinea nebulosa* (Elix & Kantvilas) Elix & Kantvilas is made. A remarkable lichenicolous *Arthonia* infecting the apothecia of *B. austera* is also discussed.

This paper continues our investigation of *Buellia*-like lichens in Australia, and follows the first accounts of *Buellia* and related genera (Elix 2009a, 2011) and our additions and revisions to *Amandinea* (Elix & Kantvilas 2013a, 2016), *Buellia sens. lat.* (Elix & Kantvilas 2013b), *Buellia sens. str.* (Elix & Kantvilas 2014a), *Baculifera* (Elix & Kantvilas 2014b), *Cratiria* (Elix 2014), *Monerolechia* (Elix 2015) and other crustose Physciaceae (Elix & Kantvilas 2015). In this paper, we deal with further new saxicolous species of *Buellia* in the broad sense. Methods are as described in previous papers cited above.

The new species

1. *Buellia austera* Elix & Kantvilas, sp. nov.
Mycobank No. MB 817122

Fig. 1

Similar to *Buellia kimberleyana* Elix, but differs in having a poorly developed thallus, broader ascospores, 7–9.5 µm wide, and longer, bacilliform conidia, 8–10 µm long.

Type: Australia, Tasmania, Lovely Banks Road, 42°28'S, 147°15'E, 280 m alt., on sandstone outcrops in degraded *Eucalyptus tenuiramis* open bushland, *G. Kantvilas 478/02*, 18.ix.2002 (holotype – HO).

Thallus crustose, inconspicuous, pale dingy grey-brown to olive-brown, forming discontinuous patches to c. 100 mm wide and 0.1–0.2 mm thick, but often much thinner, effuse to ±absent and with only the apothecia apparent; prothallus absent; cortex c. 10 µm thick; medulla I–; photobiont cells 8–15 µm diam. *Apothecia* 0.1–0.5 mm wide, scattered, lecideine, broadly adnate to sessile; disc black, epruinose, plane to weakly convex; proper excipulum distinct and persistent, in section 25–40 µm thick, the outer zone dark brown to brown-black, K–, N+ orange-brown, the inner zone paler brown. *Epithemium* 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 approximating the *Bacidia*-type, 8-spored. *Ascospores* at first of the *Physconia*-type, then of the *Buellia*-type, 1-septate, grey-green to brown, ellipsoid, 10–16 × 7–9.5 µm, not constricted at the septum; outer spore-wall smooth to faintly ornamented when old. *Pycnidia* immersed; conidia bacilliform, straight, 8–10 × 1 µm.

Chemistry. Thallus K+ red, P+ yellow or yellow-orange, best observed in squash preparations due to the thinness of the thallus; containing norstictic acid (major) and connorstictic acid (minor or trace).

Etymology: The epithet refers to the type locality, from the Latin *austerus* (harsh), a very dry, exposed habitat.

Remarks

Buellia austera is an inconspicuous species, often with little apparent thallus, and detectable mainly due to the numerous, small, sessile apothecia scattered over the surface of the rock. It is chemically identical to *Buellia kimberleyana* Elix, a widespread species on siliceous rocks in mainland Australia. However, *B. kimberleyana* differs in having a much better-developed, rimose-areolate thallus, often with a conspicuous, black, marginal prothallus, narrower ascospores, 4.5–6.5 µm wide, and short, bacilliform conidia, 4–6.5 × 0.7–1 µm (Elix 2009b). In overall thalline morphology, *B. austera* resembles *Amandinea nebulosa* (see below), but the latter differs by having asci approximating the *Lecanora*-type and in lacking norstictic acid.

The new species is known only from south-eastern Tasmania, where it occurs on dry, exposed outcrops of Triassic sandstone in rather degraded, *Eucalyptus tenuiramis*-dominated dry sclerophyll forest. That habitat tends to be rich in lichens, and associated species include several species of *Acarospora*, *Caloplaca* and *Xanthoparmelia*.

The apothecia of one of the specimens studied (*Kantvilas 155/13*) is infected by a remarkable species of *Arthonia*. In this specimen, the apothecia of the *Buellia* are frequently somewhat papillate and deformed, and the asci of the *Arthonia* are interspersed within the hymenium of the *Buellia*, rather like the case of *Arthonia intexta* Alm. infecting *Lecidella* species (Kantvilas & Wedin 2015). The *Arthonia* has clavate, eight-spored asci, 35–40 × 12–15 µm, with a well-developed tholus that is I- and KI- and lacks any amyloid ring-structure. The ascospores are ±soleiform, 1-septate, hyaline, 9–12 × 4–5 µm. Pycnidia with bacilliform conidia 5 × 1 µm were also observed with the hymenium of the *Buellia*, but whether they belong to the *Arthonia* or another organism is unclear. There are relatively few lichenicolous *Arthonia* species reported from *Buellia* (Lawrey & Diederich 2015). With respect to the dimensions of the asci, ascospores and conidia, the species studied comes close to *A. epimela* (Norm.) I.M.Lamb (Almquist 1880) as described from Scandinavia, although that species is reported from the thallus of *Amandinea punctata* (Ihlen & Wedin 2008).

SPECIMEN EXAMINED

Tasmania: • Harry Walker Tier, S of Letterbox Gully, 42°35'S 147°07'E, 320 m alt., on sandstone boulders and outcrops in dry sclerophyll woodland, *G. Kantvilas 155/13*, 30.v.2013 (HO).

2. *Buellia fallax* Elix & Kantvilas, sp. nov.
Mycobank No. MB 817123

Figs 2, 3

Similar to *Buellia procellarum* A.Massal., but differs in having smaller ascospores and a non-inspersed hymenium, and in containing hafellic acid.

Type: Australia, Tasmania, Woods Quoin, summit, 42°17'S, 147°06'E, 925 m alt., on vertical, relatively dry and sheltered dolerite rock faces, *G. Kantvilas 58/13*, 5.v.2013 (holotype – HO).

Thallus crustose, rimose-areolate, chinky to markedly bullate, matt, esorediate, white to whitish grey, epruinose, 1.5–5 cm wide and c. 1.5 mm thick; individual areoles

convex, contiguous, 0.5–2 mm wide, \pm subeffigurate at the margins; prothallus absent; cortex 10–15 μ m thick; photobiont cells 8–14 μ m wide; medulla white, containing calcium oxalate (H_2SO_4 +), I–. *Apothecia* 0.3–1.2 mm wide, lecideine, broadly adnate; disc black, epruinose, weakly concave at first, then \pm plane to weakly convex, often crowded and distorted by mutual pressure; proper excipulum distinct, persistent, black, in section 50–80 μ m thick, dark red-brown throughout. *Epilhymenium* 10–20 μ m thick, dark brown to olive-brown, K–, N–. *Hypothecium* 25–35 μ m thick, dark brown. *Hymenium* 70–80 μ m thick, colourless, not inspersed; paraphyses 1.5–2.5 μ m wide, simple to weakly branched, capitate, with apices 5–6 μ m wide, dark brown. Asci of the *Bacidia*-type, 8-spored. *Ascospores* initially of the *Callispora*-type, then *Buellia*-type, 1-septate, olive-green to brown, ellipsoid, 15–22 \times 7–10 μ m, constricted at the septum, \pm slightly curved, often pointed at apices, with medial and weak subapical wall-thickenings; outer spore-wall smooth. *Pycnidia* immersed; conidia bacilliform, straight, 4–5.5 \times 1–1.2 μ m.

Chemistry: Thallus K+ yellow, P+ pale yellow, C–, UV–; atranorin (major), chloroatranorin (minor), hafellic acid (minor) and neopaludonic acid (trace).

Etymology: From the Latin *fallax* (deceptive), in reference to the cryptic habitat of the species, typically growing amongst other buellioid lichens.

Remarks

The new species is characterized by the crustose, rimose-areolate, chinky to markedly bullate, white to whitish grey thallus, the *Callispora*- then *Buellia*-type ascospores with a smooth outer wall, and the presence of atranorin and hafellic acid. *Buellia fallax* is superficially similar to *B. procellarum* A.Massal., a common saxicolous species in Australia. However, *B. procellarum* differs in having an inspersed hymenium, larger ascospores (22–40 \times 10–18 μ m) with a moderately ornamented outer spore-wall and in containing atranorin and diploicin. *Cratiria subtropica* (Elix) Elix has spores similar in size to those of *B. fallax* and contains hafellic acid, but it differs in being corticolous, in having an inspersed hymenium and ascospores with a moderately ornamented outer spore-wall. Furthermore, *C. subtropica* can contain additional norstictic acid.

The first collections of this elusive but distinctive species were made by the intrepid collector Tony Moscal from Maatsuyker Island, a difficult-to-access craggy island off Tasmania's rugged south coast. Associated species, gleaned from the diaries of the Bratt Herbarium (where the specimens were kept), include several *Caloplaca* species, among them *C. cribrata* (Hue) Zahlbr., *Flavoparmelia haysonii* (C.W.Dodge) Hale, *Lecanora flotowiana* Spreng. and *Tylothallia verrucosa* (Müll.Arg.) Kantvilas. Since then the species has been collected a few more times from sheltered underhangs on large dolerite tors in dry sclerophyll forest in south-eastern Tasmania. That habitat tends to be rather species-poor for lichens, but other lichens present on the specimens include depauperate thalli of several *Caloplaca* species, *Usnea torulosa* (Müll.Arg.) Zahlbr. and *Buellia halonia* (Ach.) Tuck. It is also known from the South Island of New Zealand.

SPECIMENS EXAMINED

Tasmania: • Goat Gully (Manning's Property), 42°21'S, 147°40'E, 200 m alt., in sheltered underhangs on dolerite, *G. Kantvilas 188/13 pr.p.*, 18.viii.2013 (HO); • Maatsuyker Island, north point, 43°39'S, 146°17'E, 15 m alt., on exposed schist, *A. Moscal [Bratt Herb. no. 76/914]*, x.1976 (HO); • Maatsuyker Island, 43°39'S, 146°17'E, 15 m alt., on schist, *A. Moscal [Bratt Herb. no. 76/915]*, x.1976 (HO).

New Zealand: • South Island, Canterbury, Banks Peninsula, Taylors Mistake, SE of Christchurch, 43°35'S, 172°47'E, on coastal rocks, *H. Mayrhofer 10808*, 4.ix.1992 (GZU).

3. *Endohyalina gillamsensis* Elix & Kantvilas, sp. nov.
Mycobank No. MB 817124

Figs 4, 5

Similar to *Endohyalina kalbii* (Giralt & Matzer) Giralt, van den Boom & Elix, but differs in having a bright yellow-green thallus and larger ascospores, and in containing xantholepinone A.

Type: Australia, Tasmania, Gillams Beach, S of Ryans Point, Recherche Bay, 43°33'S 146°54'E, 2 m alt., on large shrubs of *Leptocophylla oxycedrus* along foreshore, *G. Kantvilas 355/14*, 4.ix.2014 (holotype – HO).

Thallus crustose, bright yellow-green, epiphloeodal, continuous to rather dispersed-areolate, forming patches to c. 1.5 cm wide; individual areoles smooth to verruculose, 0.05–0.1 mm wide; prothallus generally indistinct, mainly marginal, dark grey; medulla I–; photobiont cells 7–16 μ m wide. *Apothecia* 0.2–0.9 mm wide, lecideine, broadly adnate or rarely sessile, scattered or crowded, rounded or irregular through mutual pressure; disc black, epruinose, plane then markedly convex; proper exciple thin and persistent or excluded in more convex apothecia, in section 25–50 μ m thick, with an outer dark brown to black-brown zone, K+ yellow solution, N+ intense red-brown, the inner zone paler brown. *Epilhymenium* 10–17 μ m thick, dark olive-brown to olive-black, K–, N+ purple-brown. *Hypothecium* 50–100 μ m thick, red-brown, K–, N+ orange, densely inspersed with oil droplets. *Hymenium* 50–75 μ m thick, colourless, densely inspersed with oil droplets; paraphyses 1.4–1.7 μ m wide, simple to sparsely branched, with apices capitate, brown, 3–4.5 μ m wide; asci of the *Bacidia*-type, 8-spored. *Ascospores* at first of the *Serotina*-type, then of the *Pachysporaria*-type, *Dirinaria*-type or *Physconia*-type, and eventually *Cratiria*- or *Buellia*-type, 1-septate, pale olive-green to brown, (12–)14–17(–20) \times 8–10(–11) μ m, rarely weakly constricted at the septum, ultimately with apical wall-thickenings; outer spore-wall smooth. *Pycnidia* not seen.

Chemistry: Thallus K+ orange, C+ orange, P+ yellow, UV–; containing xantholepinone A (major).

Etymology: The specific epithet refers to the type locality.

Remarks

The new species is characterized by the yellow-green, smooth to verruculose, crustose thallus, lecideine apothecia with an inspersed hymenium and rather unusual ascospores, and by containing xantholepinone A. *Endohyalina kalbii* is similar in having juvenile *Dirinaria*-type ascospores and in lacking diploicin, a compound frequently found in the genus (it contains secalonin acid A as a major substance), but differs in that the mature ascospores are smaller (11–16 \times 5–8 μ m) and of *Pachysporaria*-type, and the thallus is brown rather than yellow (Giralt *et al.* 2009). Xantholepinone A also occurs in the saxicolous *E. arachniformis* Elix & Kantvilas, but that species contains additional diploicin, has a conspicuous, dark brown to black, marginal prothallus and ascospores of *Dirinaria*-type that grade into *Mischoblastia*- or *Physcia*-type. Initially, the juvenile ascospores of *E. gillamsensis* approximate the *Serotina*-type where they develop two globose-shaped lumina with an interconnecting canal, transitioning to *Pachysporaria*-, *Dirinaria*- or *Physconia*-type spores, and ultimately to *Cratiria*- or *Buellia*-type spores with definite apical wall-thickenings but obscure internal lumina. The younger ascospores of *E. gillamsensis* are very similar to those of *Sculptolumina serotina* (Malme) Marbach, but that species differs in having larger ascospores ([16–]18–22[–27] \times [8–]9–12[–14] μ m) and in containing lobaric acid and an unknown secalonin acid derivative (Marbach 2000).

At present *E. gillamsensis* is only known from the type locality, where it grows on the rather coarse, fibrous bark of unusually large individuals of the Epacridaceous shrub *Leptocophylla* in rather damp, shaded coastal scrub immediately above the high tide mark.

A new combination

Amandinea nebulosa (Elix & Kantvilas) Elix & Kantvilas, comb. nov.
MycoBank No. **MB 817875**

Basionym: *Buellia nebulosa* Elix & Kantvilas, *Australas. Lichenol.* **73**, 28 (2013).
Amandinea nebulosa is a very inconspicuous lichen, often with little apparent thallus and detectable mainly by the numerous, minute, sessile apothecia scattered over the surface of the rock. Older apothecia become markedly convex and seemingly imarginate. The new generic placement of this species follows the discovery of pycnidia and conidia in the isotype specimen (CANB). The pycnidia are minute, black and partially immersed, and the conidia are filiform and curved, $13\text{--}17 \times 0.7\text{--}1 \mu\text{m}$, consistent with the genus *Amandinea*. A detailed description is given in Elix & Kantvilas (2013b).

New record for Australia

Buellia cranwelliae Zahlbr., *Denkschr. Akad. Wiss. Wien math.-naturwiss. Kl.* **104**, 375 (1941)

This species was previously known from New Zealand (Galloway 2007) and Norfolk Island (Elix 2016). It is characterized by a white crustose thallus that is \pm sublobate or placodioid at the margins, a white medulla containing calcium oxalate (H_2SO_4^+), 8-spored asci, a dark brown, N+ greenish-black excipulum, 1-septate, olive-brown to brown, ellipsoid ascospores initially of the *Physconia*-type, then of the *Buellia*-type, $(10\text{--})11\text{--}16(\text{--}18) \times 5\text{--}8(\text{--}10) \mu\text{m}$, that are rarely weakly constricted at the septum and have a smooth outer wall, and the straight, bacilliform conidia, $3\text{--}5 \times 1\text{--}1.2 \mu\text{m}$. The thallus lacks lichen substances. A detailed description is given in Elix (2016).

SPECIMENS EXAMINED

New South Wales: • Glasshouse Rocks, 2 km S of Narooma, $36^\circ 13' 39''\text{S}$, $150^\circ 08' 25''\text{E}$, 1–5 m alt., on coastal shale rocks in the splash zone, *J.A. Elix* 46105, 46112, 46115, 9.ii.2016 (CANB); • Camel Rock, 5 km N of Bermagui, $36^\circ 22' 41''\text{S}$, $150^\circ 04' 37''\text{E}$, 1–5 m alt., on coastal rocks in the splash zone, *J.A. Elix* 46118, 46122, 10.ii.2016 (CANB); • Keating Rocks, c. 1.5 km N of Bermagui, $36^\circ 24' 54''\text{S}$, $150^\circ 03' 55''\text{E}$, 1–5 m alt., on coastal slate rocks in the splash zone, *J.A. Elix* 46143, 10.ii.2016 (CANB).

Tasmania: • Between mouths of Italian and Lagoon Rivers, Dago Plains vicinity, $41^\circ 30'\text{S}$, $144^\circ 49'\text{E}$, 5 m alt., on coastal rocks, *G. Kantvilas* 120/15, 129/15, 30.i.2015 (HO).

Acknowledgements

We thank Jean Jarman for the photographs of the new species and Dr H. Mayrhofer (GZU) for providing a key collection. Specimens examined during this study include material collected during a field survey co-funded by the Australian Biological Resources Study (ABRS) and BHP Billiton under the Bush Blitz Programme, and further supported by an ABRS Tactical Taxonomy Grant to the second author.

References

- Almquist, S (1880): Monographia Arthoniarum Scandinaviae. *Kongliga Svenska vetenskaps-akademiens handlingar* **17**, 1–69.
Elix, JA (2009a): *Buellia*. *Flora of Australia (Lichens)* **57**, 495–507.
Elix, JA (2009b): New saxicolous species and 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 (2014): New species and new records of the lichen genus *Cratiria* (Physciaceae, Ascomycota) in Australia. *Telopea* **16**, 141–148.
Elix, JA (2015): A new species of the lichen genus *Monerolechia* (Ascomycota, Physciaceae) from Australia. *Telopea* **18**, 91–95.
Elix, JA (2016): New species and new records of buellioid lichens from islands of the South Pacific Ocean. *Telopea* **19**, 1–10.
Elix, JA; Kantvilas, G (2013a): New taxa and new records of *Amandinea* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **72**, 3–19.
Elix, JA; Kantvilas, G (2013b): New taxa and new records *Buellia sensu lato* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **73**, 22–44.
Elix, JA; Kantvilas, G (2014a): New taxa and new records of *Buellia sens. str.* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **74**, 17–25.
Elix, JA; Kantvilas, G (2014b): New species and new records of the lichen genus *Baculifera* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **75**, 28–37.
Elix, JA; Kantvilas, G (2015): New taxa and new records of crustose lichens in the family Physciaceae (Ascomycota) in Australia. *Australasian Lichenology* **76**, 16–23.
Elix, JA; Kantvilas, G (2016): Mimics of *Amandinea conioips* (Physciaceae, Ascomycota) in Tasmania and New Zealand. *Australasian Lichenology* **78**, 22–31.
Galloway, DJ (2007): *Flora of New Zealand Lichens*. Revised second edition. Manaaki Whenua Press, Lincoln.
Ihlen, PG; Wedin, M (2008): An annotated key to the lichenicolous Ascomycota (including mitosporic morphs) of Sweden. *Nova Hedwigia* **86**, 275–365.
Kantvilas, G; Wedin, M (2015): Lichenicolous species of the Ascomycete genus *Arthonia* Ach. from Kangaroo Island. *Journal of the Adelaide Botanic Gardens* **29**, 1–6.
Lawrey, JD; Diederich, P (2015): Lichenicolous fungi – worldwide checklist, including isolated cultures and sequences available.
<http://www.lichenicolous.net> [10/10/2015].
Marbach, B (2000): Corticole und lignicole Arten der Flechtengattung *Buellia sensu lato* in den Subtropen und Tropen. *Bibliotheca Lichenologica* **74**, 1–384.



Figure 1. *Buellia austera* (holotype in HO). Scale bar = 1 mm.



Figure 2. *Buellia fallax* (holotype in HO). Scale bar = 1 mm.

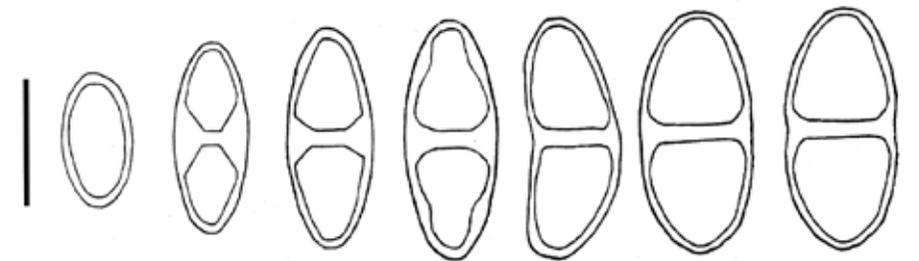


Figure 3. Ascospore ontogeny of *B. fallax*. Scale bar = 10 μ m.

Five new saxicolous species of *Amandinea* (Ascomycota, Physciaceae) from New Zealand and southern Australia

Juliane Blaha¹ and Helmut Mayrhofer

Institut für Pflanzenwissenschaften, NAWI Graz
Karl-Franzens-Universität Graz, Holteigasse 6, 8010 Graz, Austria
e-mail: helmut.mayrhofer@uni-graz.at

John A. Elix

Research School of Chemistry, Building 137
Australian National University, Canberra, A.C.T. 2601, Australia
e-mail: John.Elix@anu.edu.au

Abstract

Amandinea australasica Blaha, H.Mayrhofer & Elix, *A. brunneola* Elix & H.Mayrhofer, *A. julianeae* H.Mayrhofer & Elix, *A. variabilis* Elix, Blaha & H.Mayrhofer and *A. vitellina* Blaha, H.Mayrhofer & Elix are described as new to science. *Amandinea julianeae* has been found in New Zealand and Norfolk Island, but the other four new species also occur in southern Australia. The new combinations *Amandinea decedens* (Nyl.) Blaha, H.Mayrhofer & Elix, *A. litoralis* (Zahlbr.) Elix & H.Mayrhofer and *A. otagensis* (Zahlbr.) Blaha, H.Mayrhofer & Elix are made. *Amandinea litoralis*, together with the previously poorly understood *A. fuscostratula* (Zahlbr.) Elix and *A. nitrophila* (Zahlbr.) Elix, are re-circumscribed, and a key to the saxicolous species of *Amandinea* in New Zealand is provided.

In his revised second edition of the *Flora of New Zealand*, Galloway reported seven species of *Amandinea* (Galloway, 2007), four of which occur on rock. Since that time, *Amandinea fuscostratula* (Zahlbr.) Elix and *A. nitrophila* (Zahlbr.) Elix, previously listed under *Buellia*, have been added (Elix *et al.* 2015) and a new species, *A. austroconiops* Elix & Kantvilas, described (Elix & Kantvilas 2016). In this paper, we describe five new saxicolous species of *Amandinea*, all of which occur in New Zealand. Four of those species also occur in Tasmania, three in mainland Australia and two in Norfolk Island.

Methods

Observations and measurements of photobiont cells, thallus and apothecium anatomy, asci, ascospores and conidia were made on hand-cut sections mounted in water and 10% KOH (K). Asci were also observed in Lugol's Iodine (I), with and without pre-treatment in K. Medullary sections were treated with 10% sulfuric acid (H₂SO₄), and apothecial sections with 50% nitric acid (N). Chemical constituents were identified by thin-layer chromatography (Elix 2014) and comparison with authentic samples.

The species

1. *Amandinea australasica* Blaha, H.Mayrhofer & Elix, sp. nov. MycoBank No. **MB 816942**

Figs 1, 2

Similar to *Amandinea punctata* (Hoffm.) Coppins & Scheid., but differs in having a better-developed thallus, longer conidia and smaller ascospores that exhibit weak medial wall-thickenings in early ontogeny (*Physconia*-type), and become constricted at the septum when mature.

¹Present address: Amt der Steiermärkischen Landesregierung, Abteilung 10 Land- und Forstwirtschaft, Referat Pflanzengesundheit und Spezialkulturen, Ragnitzstraße 193, A-8047 Graz, Austria. e-mail: juliane.blaha@stmk.gv.at

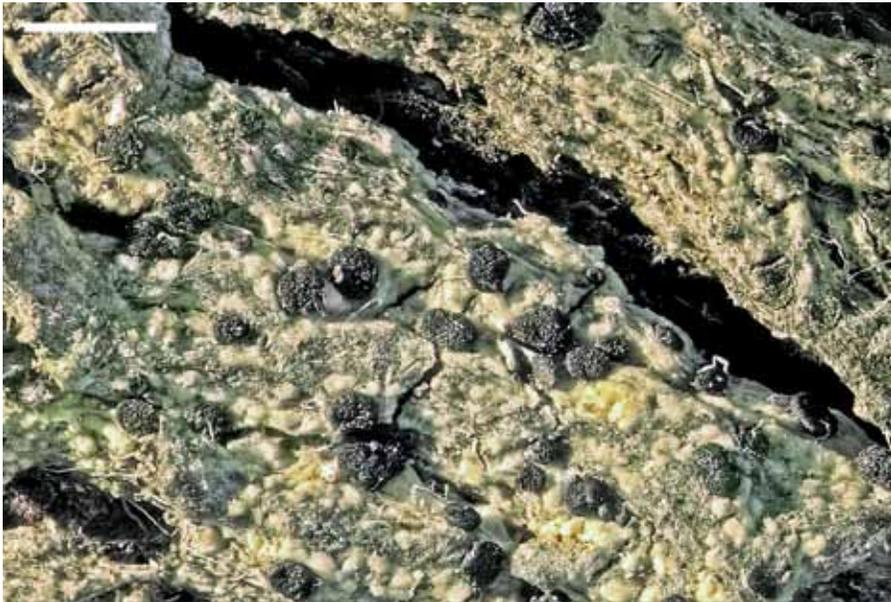


Figure 4. *Endohyalina gillamsensis* (holotype in HO). Scale bar = 1 mm.

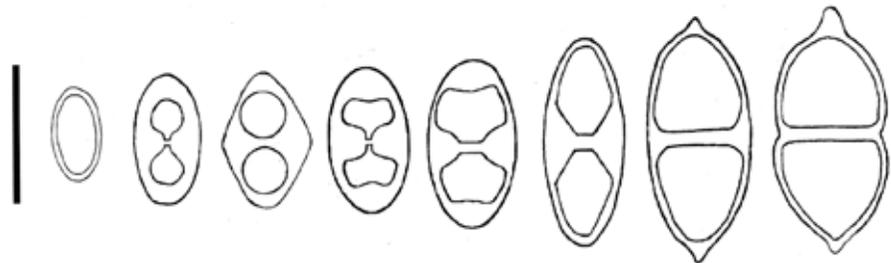


Figure 5. Ascospore ontogeny of *E. gillamsensis*. Scale bar = 10 µm.

Type: New Zealand, North Island, Wellington, Te Rewarewa Point, Hongoeka Bay, NW of Plimmerton 41°04'S, 174°51'E, on coastal schist rocks, *H. Mayrhofer* 12292, *D. Glenny, W. Nelson, B. Polly & C. West*, 23.viii.1992 (holotype – GZU).

Thallus crustose, continuous, rimose to verrucose-areolate, to 40 mm wide and 0.2 mm thick; individual areoles irregular, angular, 0.1–0.4 mm wide; upper surface pale grey to grey-brown or pale brown, matt; prothallus marginal, white, brown or often not apparent; medulla white, lacking calcium oxalate (H₂SO₄-), I-; photobiont cells 8–18 µm diam. *Apothecia* 0.1–0.5(–0.8) mm wide, lecideine, immersed then mainly broadly adnate, more rarely sessile and constricted at the base, isolated or crowded, rounded or distorted by mutual pressure; disc black, epruinose, weakly concave then plane, eventually markedly convex; proper exciple thin, thick at first, excluded in older convex apothecia, in section the outer zone dark olive-brown to brown-black, K-, N-, 40–55 µm thick, the inner zone pale brown. *Epihymenium* 8–10 µm thick, brown to dark brown, K-, N-. *Hypothecium* dark brown to brown-black, 60–125 µm thick, K-. *Hymenium* 45–65 µm thick, colourless; subhymenium 25–55 µm thick, pale brown, not interspersed with oil droplets; paraphyses 1–1.5 µm wide, sparsely branched, with dark brown caps, the apices 4–6 µm wide; asci of the *Bacidia*-type, 8-spored. *Ascospores* *Physconia*-type when immature, *Buellia*-type when mature, brown, ellipsoid, 9–[11.4]–14 × 5–[6.1]–7 µm, constricted at the septum; outer spore-wall weakly ornamented. *Pycnidia* immersed, ostiole black; conidia filiform, curved, 20–30 × 0.7–1 µm. *Chemistry:* Thallus K-, P-, C-, UV-; no lichen substances detected.

Etymology: The species is named after its distribution.

Remarks

The new species is characterized by the crustose, areolate to verrucose-areolate, pale grey to grey-brown or pale brown thallus, the broadly adnate to sessile apothecia, the non-amyloid medulla, the small 1-septate, *Physconia*- then *Buellia*-type ascospores, curved, filiform conidia and the absence of lichen substances. *Amandinea australasica* resembles *A. punctata* in some respects, but that species has a thinner, less conspicuous thallus, larger *Buellia*-type ascospores, 10–[13.5]–20 × 5–[7.5]–9 µm, which do not become constricted at the septum, and it has shorter conidia, 14–20 µm long (Bungartz *et al.* 2007, Scheidegger 2009, Elix 2011). Morphologically, *A. australasica* can resemble *A. litoralis* (described below), but that species has larger ascospores, 12–[13.7]–17 × 6–[7]–9 µm, and usually a thicker thallus in which the areoles become aggregated and imbricate to form a bullate, warted, secondary squamulose crust.

Amandinea australasica is known from siliceous rocks in coastal regions of New Zealand, southern Australia (New South Wales, Victoria, Tasmania) and Norfolk Island. Associated species include *Amandinea decedens*, *A. pelidna* (Ach.) Fryday & L.Arcadia, *Buellia cranwelliae* Zahlbr., *Caloplaca cribrosa* (Hue) Zahlbr., *C. gallowayi* S.Y.Kondr., Kärnefelt & Filson, *Halecania subsquamosa* (Müll.Arg.) van den Boom & H.Mayrhofer, *Lecanora subcoarctata* (C.Knight) Hertel, *Pertusaria xanthoplaca* Müll.Arg., *Rinodina blastidiata* Matzer & H.Mayrhofer and *Jackelixia ligulata* (Körb.) S.Y.Kondr., Fedorenko, S.Stenroos, Kärnefelt & A.Thell.

SPECIMENS EXAMINED

Australia. *New South Wales:* • Near Melville Point, 13 km SSE of Batemans Bay, 35°50'S, 150°12'E, 2 m alt., on coastal rocks, *J.A. Elix* 26617A, 15.iii.1992 (CANB). *Victoria:* • Black Rock, beach on N side of Red Bluff, opposite Eliza Street, 37°57'51"S, 145°00'40"E, 2 m alt., on old asphalt rubble, *V. Stajsic* 6485, 18.viii.2012 (CANB, MEL). *Tasmania:* • Spiky Bridge, 42°11'S, 148°04'E, on dolerite rock outcrops in pasture near coast, *G. Kantvilas* 172/84b, 2.ii.1984 (HO); • Little Beach Coastal Reserve, SE of St. Marys, 41°37'30"S, 148°19'E, on coastal granite rocks, *H. Mayrhofer* 11218 *pr.p.* & *E. Hierzer*, 5.viii.1992 (GZU).

New Zealand. • South Island: • Nelson, Kaiteriteri, Stephens Bay, W of Nelson, 41°02'51"S, 173°01'04"E, 1–3 m alt., on coastal granite rocks, *J. Blaha* 0156, 4.iv.2001 (GZU); • Nelson, Dun Walkway, NZMS 260 O27:352897, 220 m alt., on rocks, *W. Malcolm* 2636A, 24.viii.1994 (CANB); • Canterbury, Banks Peninsula, Tumbledown Bay, S of Little River, 43°51'12"S, 172°46'01"E, 0–5 m alt., on coastal basalt rocks, *J. Blaha* 0093, 11.iii.2001 (GZU); • Canterbury, Banks Peninsula, Decanter Bay, NE of Duvauchelle, 43°39'35"S, 172°59'31"E, 0–3 m alt., on coastal basalt rocks, *J. Blaha* 0100, 13.iii.2001 (GZU); • Canterbury, Banks Peninsula, Otanerito Bay, 43°50'14"S, 172°03'28"E, 0–3 m alt., on coastal basalt rocks, *J. Blaha* 0105, 14.iii.2001 (GZU); • Otago, Black Head, S of Dunedin, 45°35'58"S, 170°25'37"E, 15 m alt., on coastal rocks, *J. Blaha* 0120, 0235, 22.iii.2001 (GZU); • Otago, Nuggets, Nugget Bay, S of Dunedin, 46°26'11"S, 169°47'46"E, 0–3 m alt., on coastal rocks, *J. Blaha* 0135, 22.iii.2001 (GZU); • Otago, Brighton, S of Dunedin, 45°56'48"S, 172°19'59"E, 0–3 m alt., on coastal sandstone rocks, *J. Blaha* 0229, 22.iii.2001 (GZU).

2. *Amandinea brunneola* Elix & H.Mayrhofer, sp. nov.
Mycobank No. **MB 816943**

Figs 3, 4

Similar to *Amandinea australasica*, but differs in having a thicker, darker brown thallus and broader *Buellia*-type ascospores that do not become constricted at the septum at maturity.

Type: Australia, Tasmania, Bicheno, 41°53'S, 147°18'E, 2 m alt., on granite rocks along the foreshore, *J.A. Elix* 5539, 13.i.1979 (holotype – CANB).

Thallus crustose, continuous, rimose-areolate to verrucose-areolate, to 70 mm wide and 0.4 mm thick; individual areoles irregular, angular, 0.2–1 mm wide; upper surface brown to dark brown, matt, smooth; prothallus marginal, black or not apparent; medulla white, lacking calcium oxalate (H₂SO₄-), I-; photobiont cells 7–18 µm diam. *Apothecia* 0.1–0.5(–0.6) mm wide, lecideine, immersed then mainly broadly adnate, more rarely sessile and constricted at the base, isolated or crowded, rounded or distorted by mutual pressure; disc black, epruinose, weakly concave then plane, eventually weakly convex; proper exciple persistent, tumid at first, then thinner in older apothecia, in section the outer zone dark brown, K-, N-, 40–60 µm thick, the inner zone paler brown. *Epihymenium* 10–12 µm thick, brown to dark brown, K-, N-. *Hypothecium* brown to dark brown, 100–130 µm thick, K-. *Hymenium* 45–60 µm thick, colourless, not interspersed with oil droplets; paraphyses 1–1.5 µm wide, sparsely branched, with apices 3.5–5 µm wide and brown caps; asci of the *Bacidia*-type, 8-spored. *Ascospores* *Physconia*-type when submature, then *Buellia*-type, brown, ellipsoid, 10–[11.3]–13 × 5–[6.8]–8 µm, not constricted at the septum; outer spore-wall finely ornamented. *Pycnidia* immersed, ostiole black; conidia filiform, curved, 15–25 × 0.7–1 µm. *Chemistry:* Thallus K-, P-, C-, UV-; no lichen substances detected.

Etymology: The species is named after the colour of the upper surface.

Remarks

The new species is characterized by the crustose, areolate to verrucose-areolate, brown thallus, the mainly broadly adnate apothecia with epruinose discs, the white non-amyloid medulla, the small, 1-septate, *Buellia*-type ascospores that are not constricted at the septum, curved, filiform conidia and the absence of lichen substances. *Amandinea brunneola* could be confused with *A. australasica* (described above), but the latter differs in having alternative ascospore development, the spores being *Physconia*-type in early ontogeny and constricted at the septum when mature. Morphologically, the species resembles *A. julianae* (described below), but that species differs in con-

taining an orange medullary pigment and in often having grey-white-pruinose discs. The ascospores of *A. brunneola* resemble those of *A. punctata*, but that has larger *Buellia*-type ascospores, 10–[13.5]–20 × 5–[7.5]–9 µm and a thinner, less conspicuous thallus (Bungartz *et al.* 2007, Scheidegger 2009, Elix 2011).

Amandinea brunneola is common on coastal siliceous rocks in Tasmania, but rare in the South Island of New Zealand. In Tasmania, associated species include *Amandinea decedens*, *A. pelidna* (Ach.) Fryday & L.Arcadia, *Catillaria australittoralis* Kantvilas & van den Boom, *C. gallowayi* S.Y.Kondr., Kärnefelt & Filson, *Halecania subsquamosa* (Müll. Arg.) van den Boom & H.Mayrhofer, *Pertusaria xanthoplaca* Müll.Arg., *Rinodina blastidiata* Matzer & H.Mayrhofer and *Jackelixia ligulata* (Körb.) S.Y.Kondr., Fedorenko, S.Stenroos, Kärnefelt & A.Thell.

SPECIMENS EXAMINED

Australia. Tasmania. • Type locality, on granite rocks along the foreshore, *J.A. Elix* 23979, 21.i.1990 (CANB); • Grants Point, 41°17'S, 148°20'E, 10 m alt., on granite rocks in coastal scrub, *G. Kantvilas* 208/01, 21.ii.2001 (HO); • Little Beach Coastal Reserve, SE of St. Marys, 41°37'30"S, 148°19'E, on coastal granite rocks, *H. Mayrhofer* 11218 *pr.p.* & *E. Hierzer*, 5.viii.1992 (GZU), *H. Mayrhofer* 11223 & *E. Hierzer*, 5.viii.1992 (GZU); • Bicheno, N of Rice Beach, near the Blowhole, 41°53'S, 148°18'E, on coastal granite rocks, *H. Mayrhofer* 11230, 11231 & *E. Hierzer*, 5.viii.1992 (GZU); • Freycinet Peninsula, between Coles Bay and Hazards Beach, SW of Lonny Creek, 42°09'S, 148°15'30"E, on coastal granite rocks, *H. Mayrhofer* 11239 & *E. Hierzer*, 5.viii.1992 (GZU); • Falmouth S of Scamander, Henderson Point, 41°30'S, 148°16'E, on coastal granite rocks, *H. Mayrhofer* 11202, 11212 *pr.p.*, 11213 *pr.p.*, 11214 *pr.p.* & *E. Hierzer*, 6.viii.1992 (GZU); • Cape Sorell, 42°12'S, 145°10'E, on rock, *J.E.S. Townrow* 71/1075, v.1977 (HO); • South West Island, Kents Group, Bass Strait, 39°31'S, 147°07'E, on low rock outcrops, *J.S. Whinray* 1754, 14.xii.1987 (HO, MEL).

New Zealand. • South Island, Otago, Black Head, S of Dunedin, 45°35'58"S, 170°25'37"E, 15 m alt., on coastal rocks, *J. Blaha* 0118, 22.iii.2001 (GZU).

3. *Amandinea fuscoatratura* (Zahlbr.) Elix, *Australas. Lichenol.* 77, 39 (2015) Figs 5, 6 MycoBank No.: **MB 812401**

Basionym: *Buellia fuscoatratura* Zahlbr., *Denkschr. Akad. Wiss. Wien math.-naturwiss. Kl.* 104, 374 (1941).

Type: New Zealand: Otago, Goat Island, near Dunedin, on coastal rocks, *J.S. Thomson* T 1044 (holotype: W!; isotypes CHR!, OTA).

Thallus crustose, to c. 35 mm wide and 0.5 mm thick, rimose-areolate; the individual areoles irregular, angular, 0.1–0.3 mm wide; upper surface pale to dark grey or grey-brown, matt; prothallus black, marginal, usually present; medulla white, H₂SO₄–, I–; photobiont cells 8–16 µm wide. *Apothecia* 0.2–0.8 mm wide, lecideine, immersed, but soon broadly adnate to sessile, dispersed or becoming crowded; disc black, epruinose, weakly concave to weakly convex; proper exciple distinct, thick, swollen, persistent, in section 45–55 µm thick, with the outer zone dark brown to brown-black, K–, paler brown within. *Epithymenium* 8–10 µm thick, brown to dark brown, K–, N–. *Hypothecium* 100–175 µm thick, brown to brown-black, K–, N–. *Hymenium* 45–75 µm thick, colourless, not inspersed; subhymenium 25–30 µm thick, pale brown, not inspersed; paraphyses 1.5–1.7 µm wide, simple to sparsely branched, with apices, 4–6 µm wide and brown caps; asci of the *Bacidia*-type, 8-spored. *Ascospores* initially of the *Physconia*-type, of the *Buellia*-type when mature, 1-septate, brown, ellipsoid, 11–[13.6]–16 × 5–[7.0]–10 µm, straight or rarely curved, becoming weakly constricted at the septum; outer spore-wall finely ornamented (microrugulate). *Pycnidia* common,

pyriform, immersed, black; conidia filiform, curved, 15–25 × 0.7–1 µm. *Chemistry*: Thallus K–, C–, P–, UV–; no lichen substances detected.

Remarks

This species is characterized by the crustose, rimose-areolate, pale to dark grey or grey-brown thallus, the initially immersed then broadly adnate to sessile apothecia, the non-amyloid medulla, non-inspersed subhymenium, 1-septate, *Physconia*- then *Buellia*-type ascospores, 11–16 × 5–10 µm, the curved, filiform conidia, 15–25 µm long, and the absence of lichen substances. It closely resembles *A. nitrophila* (described below), but that species has mainly immersed apothecia and larger ascospores that are not constricted and often slightly dilated at the septum. In addition, *A. nitrophila* differs in having an inspersed subhymenium and usually not having a prothallus.

SPECIMENS EXAMINED

Australia. Tasmania. • Courland Bay, 41°56'S, 148°19'E, 2 m alt., on coastal granite rocks, *G. Kantvilas* 457/02, 20.viii.2002 (HO).

New Zealand. South Island. • Canterbury, Goose Bay, S of Kaikoura, 42°27'29"S, 173°33'15"E, 0–5 m alt., on coastal greywacke rocks, *J. Blaha* 0202, 27.iv.2001 (GZU); • Nelson, Boulder Bank, NE of Nelson, 41°12'56"S, 173°19'43"E, 0–2 m alt., on coastal rocks, *J. Blaha* 0168, 6.iv.2001 (GZU); • Otago, Nuggets, Nugget Bay, S of Dunedin, 46°26'11"S, 169°47'46"E, 0–3 m alt., on coastal rocks, *J. Blaha* 0132, 0133, 0136, 22.iii.2001 (GZU).

4. *Amandinea julianae* H.Mayrhofer & Elix, sp. nov.

Figs 7, 8

MycoBank No. **MB 816944**

Similar to *Amandinea punctata*, but differs in having a better-developed thallus, smaller ascospores that exhibit weak medial thickenings in early ontogeny, longer conidia and in containing an unknown orange pigment in the medulla.

Type: New Zealand, North Island, Wellington, Te Humenga Point, Cape Palliser, 2 km N of Ngawi, SE of Wellington, 41°34'22"S, 175°13'30"E, 0–5 m alt., on coastal greywacke rocks, *J. Blaha* 0195, 24.iv.2001 (holotype – GZU; isotype – WELT).

Thallus crustose, continuous, rimose-areolate to verrucose-areolate, to 50 mm wide and 0.3 mm thick; individual areoles irregular, angular, 0.2–0.7 mm wide; upper surface pale grey to pale brown or orange-brown, matt, ±coarsely to finely granulose; prothallus marginal, white or not apparent; medulla white, with patches of yellow-orange pigment, K+ bright yellow, lacking calcium oxalate (H₂SO₄–), I–; photobiont cells 7–14 µm diam. *Apothecia* 0.1–0.5(–0.6) mm wide, lecideine, immersed then mainly broadly adnate, more rarely sessile and constricted at the base, isolated or crowded, rounded or distorted by mutual pressure; disc black, sparsely to moderately grey-white-pruinose, weakly concave then plane, eventually markedly convex; the proper exciple thin, weakly tumid at first, then indistinct or excluded in older convex apothecia, in section outer zone dark brown, K–, N–, 35–55 µm thick, the inner zone pale brown. *Epithymenium* 8–12 µm thick, brown to dark brown, K–, N–. *Hypothecium* pale brown to brown, 70–100 µm thick, K–. *Hymenium* 45–70 µm thick, colourless, not inspersed with oil droplets; paraphyses 1–1.5 µm wide, sparsely branched, with apices 3.5–4 µm wide and brown caps; asci of the *Bacidia*-type, 8-spored. *Ascospores* *Physconia*-type when immature, *Buellia*-type when mature, brown, ellipsoid, 10–[11.1]–13 × 5–[6.6]–8 µm, not constricted at the septum; outer spore-wall finely ornamented. *Pycnidia* immersed, ostiole black; conidia filiform, curved, 16–27 × 0.7–1 µm. *Chemistry*: Thallus K–, P–, C–, UV–; medulla patchily K+ bright yellow; no lichen substances detected.

Etymology: This species is named after the Austrian biologist Dr Juliane Blaha for her pioneering work on the saxicolous species of *Amandinea* in New Zealand.

Remarks

The new species is characterized by the crustose, areolate to verrucose-areolate, pale grey to pale brown or orange-brown thallus, the broadly adnate to sessile apothecia with pruinose discs, a medulla containing clumps of yellow-orange pigment, the small, 1-septate, *Physconia*- then *Buellia*-type ascospores that are not constricted at the septum, curved, filiform conidia and the absence of lichen substances. Morphologically, it closely resembles *A. australasica* (described above), but that species has a white medulla that lacks pigments, epruinose discs and ascospores that are constricted at the septum. *Amandinea julianeae* also resembles *A. punctata*, but the latter has larger, *Buellia*-type ascospores, 10–[13.5]–20 × 5–[7.5]–9 µm, that do not exhibit any medial wall thickenings throughout spore ontogeny, and shorter conidia, 14–20 µm long (Bungartz *et al.* 2007, Scheidegger 2009, Elix 2011). The same medullary pigment present in *A. julianeae* also occurs in *A. vitellina* (see below). However, *A. vitellina* differs in having a rudimentary, ecorticate, granulose thallus and *Buellia*-type ascospores that lack wall-thickenings.

Amandinea julianeae is rare in coastal regions of New Zealand and Norfolk Island, where it occurs on siliceous rocks. Associated species include *Amandinea decedens*, *A. pelidna* (Ach.) Fryday & L.Arcadia, *Buellia cranwelliae* Zahlbr., *Caloplaca cribrosa* (Hue) Zahlbr., *C. gallowayi* S.Y.Kondr., Kärnefelt & Filson, *Halecania subsquamosa* (Müll.Arg.) van den Boom & H.Mayrhofer, *Lecanora subcoarctata* (C.Knight) Hertel, *Pertusaria xanthoplaca* Müll.Arg., *Rinodina blastidiata* Matzer & H.Mayrhofer and *Jackelixia ligulata* (Körb.) S.Y.Kondr., Fedorenko, S.Stenroos, Kärnefelt & A.Thell.

SPECIMENS EXAMINED

New Zealand. North Island. • Wellington, Cape Palliser Road, c. 13 km N of Ngawihi, 41°29'S, 175°13'E, on rock outcrops near the sea, *H. Mayrhofer 10879* & *E. Hierzer*, 18.viii.1992 (GZU); South Island. • Canterbury, Banks Peninsula, Rapaki Bay, SW of Lyttelton, 43°36'25"S, 172°40'55"E, 1–3 m alt., on coastal basalt rocks, *J. Blaha 0110*, 16.iii.2001 (GZU).

Norfolk Island. • Cascade Creek, Cascade Reserve, 29°01'20"S, 167°57'50"E, 20 m alt., on volcanic rock in grazed grassland, *J.A. Elix 27441*, 15.vi.1992 (CANB); • Duncombe Bay, 29°00'S, 167°55'30"E, 50 m alt., on top of flat boulder on cliffs with grasses and low shrubs, *H. Streimann 34746*, 9.xii.1984 (CANB).

5. *Amandinea litoralis* (Zahlbr.) H.Mayrhofer & Elix, comb. nov. Figs 9, 10
MycoBank No. **MB 816947**

Basionym: *Buellia litoralis* Zahlbr., *Denkschr. Akad. Wiss. Wien math.-naturwiss. Kl.* **104**, 375 (1941).

Type: New Zealand: Otago, Black Head, on coastal rocks, *J.S. Thomson T 397* (holotype – W!; isotype – CHR).

Thallus crustose, continuous, rimose to verrucose-areolate, to 40 mm wide and 0.5 mm thick; individual areoles irregular, angular, 0.2–0.5(–1.2) mm wide, sometimes becoming aggregated and imbricate to form a secondary bullate, warted or subsquamulose crust; upper surface pale grey to grey-brown, matt; prothallus not apparent; medulla white, lacking calcium oxalate (H₂SO₄–), I–; photobiont cells 7–16 µm diam. *Apothecia* 0.3–1.5 mm wide, lecideine, immersed then mainly broadly adnate, more rarely sessile and constricted at the base, isolated or crowded, rounded, rarely becoming tuberculate; disc black, epruinose, weakly concave then plane, eventually markedly

convex; proper exciple thin, tumid at first, excluded in older convex apothecia, in section the outer zone brown-black, K–, N–, 25–35 µm thick, the inner zone pale brown to colourless, 35–45 µm thick. *Epithymenium* 10–14 µm thick, brown to dark brown, K–, N–. *Hypothecium* deep reddish brown, 120–200 µm thick, K–. *Hymenium* 60–80 µm thick, colourless; subhymenium 50–75 µm thick, colourless to pale brown, not interspersed with oil droplets; paraphyses 1–1.5 µm wide, sparsely branched, with apices 4–5 µm wide and brown caps; asci of the *Bacidia*-type, with 8 or fewer spores. *Ascospores* *Physconia*-type when immature, *Buellia*-type when mature, brown, ellipsoid, 12–[13.7]–17 × 6–[7.0]–9 µm, ±curved, older spores constricted at the septum; outer spore-wall weakly ornamented. *Pycnidia* immersed, ostiole black; conidia filiform, curved, 16–27 × 0.7–1 µm.

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

Remarks

The species is characterized by the crustose, markedly verrucose and areolate to distinctly warted or subsquamulose, pale grey to grey-brown thallus, the broadly adnate to sessile apothecia, the non-amyloid medulla, the broad colourless, inner zone of the excipulum, 1-septate, *Physconia*- then *Buellia*-type ascospores, 12–17 × 6–9 µm, curved, filiform conidia, 16–27 µm long, and the absence of lichen substances. Morphologically, it can resemble depauperate specimens of *A. coniois* (Wahlenb.) M.Choisy ex Scheid. & H.Mayrhofer, but that species has larger ascospores, 12–[16.5]–22 × 7–[8.5]–11 µm, and usually a much better-developed thallus that often becomes short-lobed, or where the areoles become aggregated and imbricate to form a bullate, warted, secondary squamulose crust. In addition, the excipulum of *A. coniois* lacks a broad, colourless inner zone (Elix & Kantvilas 2016).

Amandinea litoralis is known from rock, more particularly siliceous rock, in coastal regions of New Zealand, Tasmania and Norfolk Island. Associated species include *Amandinea decedens*, *A. pelidna* (Ach.) Fryday & L.Arcadia, *Buellia cranwelliae* Zahlbr., *Caloplaca cribrosa* (Hue) Zahlbr., *C. gallowayi* S.Y.Kondr., Kärnefelt & Filson, *Halecania subsquamosa* (Müll.Arg.) van den Boom & H.Mayrhofer, *Lecanora subcoarctata* (C.Knight) Hertel, *Pertusaria xanthoplaca* Müll.Arg., *Rinodina peloleuca* (Nyl.) Müll.Arg., *Tylothallia verrucosa* (Müll.Arg.) Kantvilas and *Jackelixia ligulata* (Körb.) S.Y.Kondr., Fedorenko, S.Stenroos, Kärnefelt & A.Thell.

SPECIMENS EXAMINED

Australia. Tasmania. • Bellerive Bluff, below the battery, 42°53'S, 147°22'E, 2 m alt., on mudstone cliff-face at the shore line, *G. Kantvilas 484/01*, 3.vii.2001 (HO); • Saddle between Mt Amos and Mt Mayson, at old Wineglass Bay Lookout, 42°09'S, 148°17'E, 210 m alt., on granite boulders in dry sclerophyll forest, *G. Kantvilas 193/05*, 19.vii.2005 (HO).

New Zealand. North Island. • Coromandel Peninsula, NW of Colville, between Waiaro and Port Jackson, 36°30'55"S, 175°19'40"E, 0–3 m alt., on coastal rocks, *J. Blaha 0191*, 0192, 16.iv.2001 (GZU); • Wellington, Te Humenga Point, Cape Palliser, 2 km N of Ngawi, 41°34'22"S, 175°13'30"E, 0–5 m alt., on coastal greywacke rocks, *J. Blaha 0196*, 24.iv.2001 (GZU); • Wellington, Island Bay, S of Wellington, 41°21'S, 174°46'E, on coastal rocks, *H. Mayrhofer 10883*, 22.viii.1992 (GZU). South Island. • Marlborough, Tom Canes Bay, NE of Kaikoura, coast road to Blenheim, 41°19'07"S, 174°06'28"E, 0–3 m alt., on coastal schist rocks, *J. Blaha 0177*, 10.iv.2001 (GZU); • Marlborough, Robin Hood Bay, SE of Picton, 41°21'17"S, 174°04'37"E, c. 1–3 m, on coastal schist rocks, *J. Blaha 0179*, 10.iv.2001 (GZU); • Nelson, Okiwi Bay, Marlborough Sounds, NE of Nelson, 41°06'39"S, 173°36'49"E, 1–3 m alt., on coastal rocks, *J. Blaha 0169*, 0172, 7.iv.2001 (GZU); • Nelson, Cable Bay, 17 km NE of Nelson, 41°09'S, 173°24'E, 60 m alt., on weathered rock in pasture, *J.A. Elix 33451*, 1.ii.1993 (CANB); • Nelson, Tantragee Saddle, NZMS 260 O27:358903, 41°18'S, 173°19'E, 180 m alt., on rock, *W. Malcolm 1917*, 8.v.1994 (CANB); • Nelson, Pepin Island, Cable Bay, NE of Nelson, 41°09'S,

173°25'E, on coastal rocks, *H. Mayrhofer* 10761, 29.viii.1992 (GZU); • Nelson, Ataata Point, Cable Bay, NE of Nelson, 41°09'38"S, 173°24'48"E, 0–7 m alt., on coastal granite rocks, *H. Mayrhofer* 10738, 25.viii.1992; • *loc. id.*, *J. Blaha* 0213, 6.iv.2001 (GZU); • Nelson, Patons Rock, Golden Bay, NW of Takaka, 40°47'S, 172°43'E, on coastal rocks, *H. Mayrhofer* 13143, 13153, N. & W. *Malcolm*, 25.viii.1992 (GZU); • Nelson, Kaiteriteri, N of Motueka, 41°02'S, 173°01'E, on coastal granite rocks, *H. Mayrhofer* 12314, N. & W. *Malcolm*, 27.viii.1992 (GZU); • Canterbury, Banks Peninsula, Decanter Bay, NE of Duvauchelle, 43°39'35"S, 172°59'31"E, 0–3 m alt., on coastal basalt rocks, *J. Blaha* 0099, 13.iii.2001 (GZU); • Canterbury, Banks Peninsula, Hickory Bay, 43°46'45"S, 172°05'48"E, 0–5 m alt., on coastal basalt rocks, *J. Blaha* 0109, 15.iii.2001 (GZU); • Otago, Brighton, S of Dunedin, 45°56'48"S, 172°19'59"E, 0–3 m alt., on coastal sandstone rocks, *J. Blaha* 0122, 22.iii.2001 (GZU).
 Norfolk Island. • Philip Island, Upper Long Valley, 29°07'30"S, 167°57'E, 40 m alt., on volcanic rocks in the open, *J.A. Elix* 18480 *pr.p.* & *H. Streimann*, 4.xii.1984 (CANB).

6. *Amandinea nitrophila* (Zahlbr.) Elix, *Australas. Lichenol.* 77, 40 (2015) Figs 11, 12
 MycoBank No. **MB 812402**

Basionym: *Buellia nitrophila* Zahlbr., *Denkschr. Akad. Wiss. Wien math.-naturwiss. Kl.* 104, 372 (1941)

Type: New Zealand: Otago, Black Head, Dunedin, on coastal rocks, *J.S. Thomson* T394 (A84) (holotype W!; isotype CHR!).

Thallus crustose, to c. 45 mm wide and 1 mm thick, rimose-areolate to verrucose-areolate; individual areoles irregular, angular, 0.3–1 mm wide; upper surface grey-white to grey-brown or brown, matt, smooth; prothallus black, marginal, but usually not apparent; medulla white, H₂SO₄–, I–; photobiont cells 10–16 µm wide. *Apothecia* 0.2–0.6 mm wide, lecideine, mainly immersed, rarely becoming adnate, dispersed or rarely crowded; disc black, epruinose, weakly concave to plane; proper exciple distinct, thin, persistent, in section 30–50 µm thick, with the outer zone brown-black, K–, paler brown within. *Epithymenium* 10–12 µm thick, brown to dark brown, K–, N–. *Hypothecium* 100–160 µm thick, brown to brown-black, K–, N–. *Hymenium* 75–100 µm thick, colourless, not interspersed; subhymenium 25–50 µm thick, pale brown, interspersed with oil droplets; paraphyses 1.5–1.7 µm wide, simple to sparsely branched, with apices 4–6 µm wide and brown caps; asci of the *Bacidia*-type, 8-spored. *Ascospores* initially of the *Physconia*-type, of the *Buellia*-type when mature, 1-septate, brown, ellipsoid, 12–[16.3]–20 × 7–[8.7]–12 µm, not constricted and often dilated at the septum; outer spore-wall finely ornamented (microrugulate). *Pycnidia* common, pyriform, immersed, brown to black; conidia filiform, curved, 12–27 × 0.7–1 µm. *Chemistry*: Thallus K–, C–, P–, UV–; no lichen substances detected.

Remarks

The species is characterized by the crustose, rimose- to verrucose-areolate, grey-white to grey-brown or brown thallus, the broadly immersed to adnate apothecia, the non-amyloid medulla, interspersed subhymenium, 1-septate, *Physconia*- then *Buellia*-type ascospores, 12–20 × 7–12 µm, the curved, filiform conidia, 12–27 µm long, and the absence of lichen substances. *Amandinea coniops* has similar-sized ascospores, but they are commonly constricted at the septum (non-constricted or dilated at the septum in *A. nitrophila*). *Amandinea coniops* also differs in having larger apothecia (to 1 mm wide), a non-interspersed subhymenium and usually a much better-developed thallus that often becomes shortly lobed at the margins or where the areoles become aggregated and imbricate to form a bullate, warted, secondary subsquamulose crust (Elix & Kantvilas 2016).

Amandinea nitrophila is known from rock, especially siliceous rock, in coastal regions of New Zealand and southern South America, and on Heard Island in the Southern Indian ocean. In New Zealand, associated species include *Amandinea decedens*, *A. pelidna* (Ach.) Fryday & L.Arcadia, *A. otagensis*, *Buellia cranwelliae* Zahlbr., *Caloplaca scribrosa* (Hue) Zahlbr., *C. gallowayi* S.Y.Kondr., Kärnefelt & Filson, *Halecania subsquamosa* (Müll.Arg.) van den Boom & H.Mayrhofer, *Lecanora subcoarctata* (C.Knight) Hertel, *Pertusaria xanthoplaca* Müll.Arg., *Rinodina blastidiata* Matzer & H.Mayrhofer, *R. peloleuca* (Nyl.) Müll.Arg. and *Jackelisia ligulata* (Körb.) S.Y.Kondr., Fedorenko, S. Stenroos, Kärnefelt & A.Thell.

SPECIMENS EXAMINED

Argentina. • Tierra del Fuego, Dept. Ushuaia, Parque Nacional de Tierra del Fuego, tip of Bahía Lapataia, 0–5 m, on coastal rocks, *J. Poelt*, 13.i.1989 (GZU).

Australia. • Heard & McDonald Islands, Heard Island, Atlas Cove, 53°02'S, 73°25'E, on wind-blasted coastal rocks, leeward side, NE aspect, *A. McGregor* 25 *pr.p.*, 20.ii.1983 (CANB).

Chile. • Chiloé, N coast, road W of Ancud to Quetalmahue, beach between Lechagua and Ancud, sea level, on coastal rocks, *M. Matzer & B. Pelzmann*, 22.xi.1994 (GZU); • Patagonia, XII Region (Magellanes), Straits of Magellan, Fuerte Bulnes, c. 50 km S of Punta Arenas, 53°36'S, 70°56'W, sea level, on coastal rocks, *M. Matzer & B. Pelzmann*, 13.xii.1994 (GZU).

New Zealand. North Island. • Wellington, Manurewa Point W of Toara, S of Martinborough, 41°30'S, 175°32'E, on coastal rocks, *H. Mayrhofer* 132881 & *E. Hierzer*, 19.viii.1992 (GZU). South Island. • Otago, Otago Peninsula, Allans Beach, 45°52'24"S, 170°41'56"E, 0–5 m alt., on coastal basalt rocks, *J. Blaha* 0240, 21.iii.2001 (GZU); • Otago, Crystal Beach, S of Dunedin, E of Milton, 46°11'55"S, 170°05'04"E, 0–3 m alt., on coastal sandstone rocks, *J. Blaha* 0128, 0225, 22.iii.2001 (GZU); • Southland, Curio Bay, Waikawa, E of Invercargill, 46°39'41"S, 169°06'18"E, 1–3 m alt., on coastal sandstone rocks, *J. Blaha* 0142, 23.iii.2001 (GZU); • Southland, Pahia Point, E of Riverton, 46°18'28"S, 167°41'55"E, 1–3 m alt., on coastal basalt rocks, *J. Blaha* 0144, 25.iii.2001 (GZU); • Southland, Cosy Nook, E of Riverton, 46°19'54"S, 167°42'46"E, 1–3 m alt., on coastal rocks, *J. Blaha* 0146, 0215, 25.iii.2001 (GZU); • Southland, Kawakaputa Bay, E of Riverton, 46°22'47"S, 167°48'23"E, 1–3 m alt., on coastal basalt rocks, *J. Blaha* 0146, 25.iii.2001 (GZU).

7. *Amandinea variabilis* Elix, Blaha & H.Mayrhofer, sp. nov. Figs 13, 14
 MycoBank No. **MB 816945**

Similar to *Amandinea pelidna*, but differs in having larger ascospores and a subhymenium interspersed with oil droplets.

Type: New Zealand, North Island, Wellington, Titahi Bay, N of Porirua, 41°07'S, 174°50'E, on coastal rocks, *H. Mayrhofer* 12264 D. *Glenny*, *W. Nelson*, *B. Polly* & *C. West*, 23.viii.1992 (holotype – GZU; isotype – WELT).

Thallus crustose, forming extended patches to c. 60 mm wide, epilithic, white to grey-white or pale brown, to 0.6 mm thick, rimose then rimose-areolate to verrucose-areolate and warty, individual areoles 0.2–1 mm wide; prothallus dark grey, black or often not apparent; medulla white, lacking calcium oxalate (H₂SO₄–), I–; photobiont cells 7–14 µm wide. *Apothecia* 0.1–0.9(–1.2) mm wide, lecideine, immersed then broadly adnate or becoming sessile and constricted at the base, scattered or crowded, rounded or irregular through mutual pressure; disc black, epruinose, weakly concave to plane or weakly convex; proper excipulum distinct, tumid, persistent, often slightly higher than disc, in section 40–60 µm thick, the outer zone dark brown to black-brown, K–, paler brown within. *Epithymenium* 10–15 µm thick, dark olive-brown, K–, N–. *Hypothecium* 150–250 µm thick, dark brown to brown-black, K–, N+ orange-

brown. *Hymenium* 50–75 μm thick, colourless; subhymenium 30–50 μm thick, pale brown, densely interspersed with oil droplets; paraphyses 1.5–1.8 μm wide, simple to sparsely branched, apices 3.5–5 μm wide with dark brown caps; asci of the *Bacidia*-type, 8-spored. *Ascospores* at first of the *Orcularia*-type, later of the *Physconia*-type, 1-septate, pale olive-green to brown, ellipsoid, (11–)13–16.0–18(–20) \times 6–8.7–12 μm , not constricted and often swollen at the septum; outer spore-wall weakly ornamented. *Pycnidia* common, pyriform, superficial, black; conidia filiform, curved, 15–27 \times 0.7–1 μm .

Chemistry: Thallus K–, C–, P–, UV–; no lichen substances detected or the yellow-green pigment, SV-1 present. This substance is a common accessory pigment in lichens (Culberson 1972).

Etymology: The specific epithet refers to the variable ascospore-type during ontogeny.

Remarks

The new species is most likely to be confused with *A. otagensis* and *A. pelidna*, in that all three species have *Orcularia*-type ascospores in the early stages of their development, grow in similar coastal habitats, have similar thalli, numerous pycnidia and lack lichen substances. However, both *A. pelidna* and *A. otagensis* (Zahlbr.) Blaha, H. Mayrhofer & Elix lack oil droplets in the subhymenium. In addition, the ascospores of *A. pelidna* are smaller, 10–[13.5]–16 \times 6–[7.3]–19 μm , and do not become dilated at the septum (Blaha 2002, Galloway 2007). *Amandinea otagensis* differs from *A. variabilis* in having mainly immersed apothecia and somewhat shorter ascospores, 12–14.1–16(–17) μm long (Blaha 2002, Galloway 2007). Although *A. conglomerata* Elix & Kantvilas has an interspersed hymenium, it differs in having numerous, sessile apothecia that become convex and tuberculate with age, forming clusters of satellite discs when old, and by the much smaller *Buellia*-type ascospores, 10–[13.1]–15 \times 5–[5.8]–7 μm that are often constricted at the septum (Elix & Kantvilas 2013). *Amandinea conglomerata* also differs in having a very reduced, inapparent thallus, whereas that of *A. variabilis* is usually well-developed and continuous.

Amandinea variabilis is a coastal species known from New Zealand, Victoria and Tasmania, where it is associated with typical littoral species such as *Amandinea decedens*, *A. pelidna*, *Buellia cranwelliae* Zahlbr., *Caloplaca cribrata* (Hue) Zahlbr., *C. gallowayi* S.Y.Kondr., Kärnefelt & Filson, *Halecania subsquamata* (Müll.Arg.) van den Boom & H. Mayrhofer, *Lecanora subcoarctata* (C.Knight) Hertel, *Pertusaria xanthoplaca* Müll. Arg., *Rinodina blastidiata* Matzer & H. Mayrhofer, *R. peloleuca* (Nyl.) Müll. Arg., *Tylothallia verrucosa* (Müll.Arg.) Kantvilas and *Jackelia ligulata* (Körb.) S.Y.Kondr., Fedorenko, S. Stenroos, Kärnefelt & A. Thell.

SPECIMENS EXAMINED

Australia. **Victoria:** • Merricks Beach, 13 km SW of Hastings, 38°24'06"S, 145°06'E, 2 m alt., on coastal rocks behind beach, *G. Rambold* 5587, 13.iv.1986 (CANB). **Tasmania:** • Lucas Point, Fishermans Haul, 43°02'S, 147°20'E, 1 m alt., in shaded niche on coastal dolerite, *G. Kantvilas* 410/13, 8.xii.2013 (CANB, HO); • Trial Harbour, 41°56'S, 145°10'E, 2 m alt., on coastal serpentine boulders and outcrops, *G. Kantvilas* 416/14, 417/14, 19.ix.2014 (CANB, HO); • Little Beach Coastal Reserve, SE of St. Marys, 41°37'30"S, 148°19'E, on coastal granite rocks, *H. Mayrhofer* 11218 *pr.p.* & *E. Hierzer*, 5.viii.1992 (GZU); N side of creek, c. 0.7 km SW of Marrawah, 40°55'S, 144°42'E, on rock outcrop, *J.S. Whinray*, 1969 (HO, MEL).

New Zealand. **North Island.** • Wellington, Waser Bay, Mirimar Peninsula E of Wellington, 41°19'S, 174°49'E, on coastal rocks, *H. Mayrhofer* 12232, 12233, 12237, 12243, 12244, *D. Glenney*, *W. Nelson*, *B. Polly* & *C. West*, 22.viii.1992 (GZU); • type locality, on coastal rocks, *H. Mayrhofer* 12259, 12266, 12269, *D. Glenney*, *W. Nelson*, *B. Polly* & *C. West*, 23.viii.1992 (GZU); *loc. id.*, *J. Blaha* 0188, 14.iv.2001 (GZU). South

Island. • Nelson, Ataata Point, Cable Bay, NE of Nelson, 41°09'30"S, 173°24'E, c. 7 m alt., on twigs of shrub, *H. Mayrhofer* 10722, *N. & W. Malcolm* & *B. Polly*, 25.viii.1992 (CANB); • Nelson, Golden Bay, Wainui Bay NE of Pohara, 40°47'S, 172°43'E, on coastal granite rocks, *H. Mayrhofer* 10786, 28.viii.1992 (GZU); • Canterbury, Banks Peninsula, Tumbledown Bay, S of Little River, 43°51'12"S, 172°46'01"E, 0–2 m alt., on coastal basalt rocks, *M. Lambauer* 0150, 4.xi.2003 (GZU); • Otago, Black Head, S of Dunedin, 45°35'58"S, 170°25'37"E, 15 m alt., on coastal rocks, *J. Blaha* 0121, 0234, 22.iii.2001 (GZU); • Otago, Otago Peninsula, Allans Beach, 45°52'24"S, 170°41'56"E, 0–5 m alt., on coastal basalt rocks, *J. Blaha* 0115, 21.iii.2001 (GZU); • Otago, Catlins, Cathedral Cove, S of Owaka, 46°35'35"S, 169°21'59"E, 1–3 m alt., on coastal sandstone rocks, *J. Blaha* 0138, 23.iii.2001 (GZU); • Southland, Curio Bay, Waikawa, E of Invercargill, 46°39'41"S, 169°06'18"E, 1–3 m alt., on coastal sandstone rocks, *J. Blaha* 0222, 23.iii.2001 (GZU); • Southland, Ocean Beach, Bluff, S of Invercargill, 46°35'36"S, 168°18'39"E, 1–3 m alt., on coastal basalt rocks, *J. Blaha* 0154, 26.iii.2001 (GZU).

8. *Amandinea vitellina* Blaha, Elix & H. Mayrhofer, sp. nov.

Figs 15, 16

Mycobank No. **MB 816946**

Similar to *Amandinea punctata* (Hoffm.) Coppins & Scheid., but differs in having smaller ascospores and longer conidia, and in containing an unknown orange pigment in the medulla.

Type: Australia, New South Wales, near Melville Point, 13 km SSE of Batemans Bay, 35°50'S, 150°12'E, 2 m alt., on coastal rocks, *J.A. Elix* 26617, 15.iii.1992 (holotype – CANB).

Thallus crustose or absent, discontinuous, verruculose or finely granulose, to 35 mm wide and 0.1 mm thick; individual verrucules-granules irregular, fleck-like, 0.05–0.3 mm wide; upper surface pale grey to white or pale orange, matt, ecorticate; prothallus not apparent; medulla white, with patches of orange pigment (insoluble in acetone), K+ bright yellow, lacking calcium oxalate (H_2SO_4 –), I–; photobiont cells 7–15 μm diam. **Apothecia** 0.1–0.5(–0.6) mm wide, lecideine, mainly broadly adnate, more rarely sessile and constricted at the base, isolated, rounded or rarely crowded and distorted; disc black, epruinose, weakly concave then plane, eventually markedly convex; proper exciple persistent, thick at first, then thinner or excluded in older apothecia, in section the outer zone dark brown, 40–50 μm thick, K–, N–, the inner zone paler brown. **Epithymenium** 8–12 μm thick, brown to dark olive-brown, K–, N–. **Hypothecium** deep red-brown to brown-black, 100–160 μm thick, K–. **Hymenium** 45–60 μm thick, colourless, not interspersed with oil droplets; paraphyses 1–1.5 μm wide, sparsely branched, with apices 3–5 μm wide and dark brown caps; asci of the *Bacidia*-type, 8-spored. **Ascospores** *Physconia*-type when submature, then *Buellia*-type, brown, ellipsoid, 10–[11.7]–13 \times 5–[6.5]–8 μm , not constricted at the septum; outer spore-wall weakly ornamented. **Pycnidia** immersed, ostiole black; conidia filiform, curved, 15–25 \times 0.7–1 μm .

Chemistry: Thallus K–, P–, C–, UV–; medulla patchily K+ bright yellow; no lichen substances detected.

Etymology: The species is named after the pigmentation of the medulla.

Remarks

The new species is characterized by the crustose, discontinuous, verruculose to finely granulose, pale grey to white or pale orange, ecorticate thallus, mainly broadly adnate apothecia with epruinose discs, a medulla containing clumps of orange pigment, the small 1-septate, *Physconia*- then *Buellia*-type ascospores that are not constricted at the septum, curved, filiform conidia and the absence of lichen substances.

Morphologically, it closely resembles *A. julianae* (see above), a species that contains the same medullary pigment but differs in having a thicker, more substantial, corticate thallus, pruinose discs and ascospores that are more markedly *Physconia*-type in early ontogeny. *Amandinea vitellina* also resembles *A. punctata*, but that species has larger, *Buellia*-type ascospores, 10–[13.5]–20 × 5–[7.5]–9 μm, lacks the orange medullary pigment and has shorter conidia, 14–20 μm long (Bungartz *et al.* 2007, Scheidegger 2009, Elix 2011).

Amandinea vitellina is known from siliceous rocks in coastal regions of southern New South Wales and the South Island of New Zealand. Associated species include *Amandinea conglomerata* Elix & Kantvilas, *Buellia aeruginosa* A.Nordin, Owe-Larsson & Elix, *B. cranwelliae* Zahlbr., *B. stellulata* (Taylor) Mudd var. *stellulata*, *Catillaria austrolittoralis* Kantvilas & van den Boom, *Diploicia canescens* subsp. *australasica* Elix & Lumbsch, *Halecania subsquamosa* (Müll.Arg.) van den Boom & H.Mayrhofer, *Lecanora subcoarctata* (C.Knight) Hertel, *Pertusaria xanthoplaca* Müll.Arg., *Rinodina fertilis* (Körb.) Elix var. *fertilis*, *R. fertilis* var. *hypostictica* Elix, *Tylothallia verrucosa* (Müll.Arg.) Kantvilas and *Jackelixia ligulata* (Körb.) S.Y.Kondr., Fedorenko, S.Stenroos, Kärnefelt & A.Thell.

SPECIMENS EXAMINED

Australia. *New South Wales*: • Glasshouse Rocks, 2 km S of Narooma, 36°13'39"S, 150°08'25"E, 1–5 m alt., on coastal shale rocks in the splash zone, *J.A. Elix 46106*, 9.ii.2016 (CANB); • Keating Rocks, c. 1.5 km N of Bermagui, 36°24'54"S, 150°03'55"E, 1–5 m alt., on coastal shale rocks above the splash zone, *J.A. Elix 46138*, 10.ii.2016 (CANB). *New Zealand. South Island*. • Marlborough, Tom Canes Bay, coast road to Blenheim, E of Picton, NE of Kaikoura, 41°19'07"S, 174°06'28"E, 0–3 m alt., on coastal schist rocks, *J. Blaha 0178*, 10.iv.2001 (GZU); • Marlborough, Robin Hood Bay, SE of Picton, 41°21'17"S, 174°04'37"E, 1–3 m alt., on coastal schist rocks, *J. Blaha 0210*, 10.iv.2001 (GZU).

New combinations

The following new combinations are necessary because Juliane Blaha's thesis (Blaha 2002) was not formally published.

Amandinea decedens (Zahlbr.) Blaha, H.Mayrhofer & Elix, comb. nov.
Mycobank No. **MB 816949**

Basionym: *Lecidea decedens* Nyl. in W.A. Leighton, *Bot. J. Linn. Soc.* **10**, 31 (1869).
Synonym: *Buellia decedens* (Nyl.) Müll.Arg., *Bull. Herb. Boissier* **2**, App. **1**, 71 (1894).
Type: New Zealand: Wellington, littoral rocks south side of Wellington Harbour, *W. Colenso 6543* (lectotype: BM; isolectotype H-NYL - here designated).

This species is characterized by a crustose, white to pale grey, rimose-areolate thallus, sometimes containing variolaric acid, often delimited by a marginal, black prothallus, scattered, broadly adnate to sessile, lecidine apothecia up to 0.9 mm wide, often with white- to grey-pruinose discs, a non-inspersed hymenium, 8-spored asci, brown, 1-septate, *Orcularia*- to *Physconia*-type spores with strong medial wall-thickenings, 17–23 × 10–14 μm, and curved, filiform conidia, 20–25 × 0.7–1 μm. Detailed descriptions are given in Blaha (2002) and Galloway (2007).

Amandinea otagensis (Zahlbr.) Blaha, H.Mayrhofer & Elix comb. nov.
Mycobank No. **MB 816948**

Basionym: *Buellia otagensis* Zahlbr., *Denkschr. Akad. Wiss. Wien math.-naturwiss. Kl.* **104**, 373 (1941)
Type: New Zealand: Otago, Otago Heads, on coastal rocks, *J.S. Thomson T 1013*, i.1934 (holotype: W; isotypes CHR!, OTA).

This species is characterized by a white to brownish grey, rimose to rimose-areolate thallus often delimited by a marginal, black prothallus, scattered, immersed apothecia up to 0.5 mm wide, a non-inspersed hymenium, 8-spored asci, brown, 1-septate, *Orcularia*- to *Physconia*-type spores with strong medial wall-thickenings, 14–17 × 6–9 μm, and curved, filiform conidia, 15–30 × 0.7–1 μm. Detailed descriptions are given in Blaha (2002) and Galloway (2007).

Key to saxicolous species of *Amandinea* in New Zealand

- 1 Ascospores with marked medial wall-thickenings, *Orcularia*- to *Physconia*-type **2**
- 1: Ascospores without medial wall-thickenings, or with weak medial wall-thickening during spore ontogeny, *Buellia*-type **5**
- 2 Apothecia to 1 mm diam., often pruinose **3**
- 2: Apothecia to 0.6 mm diam., not pruinose **4**
- 3 Ascospores 17–23 × 10–14 μm; subhymenium not inspersed; ±variolaric acid present **A. decedens**
- 3: Ascospores 11–20 × 6–12 μm; subhymenium inspersed; ±SV-1 present **A. variabilis**
- 4 Apothecia immersed; thallus cream-coloured to pale brown white to brownish grey, rimose to rimose-areolate; ascospores 6–9 μm wide **A. otagensis**
- 4: Apothecia broadly adnate; thallus dirty white to grey-brown, rimose-areolate; ascospores 6–8 μm wide **A. pelidna**
- 5 On coastal and lowland rocks **6**
- 5: On montane rocks **16**
- 6 Ascospores without medial wall-thickenings; thallus grey to grey-brown, thin; apothecia to 0.75 mm wide, broadly adnate; ascospores *Buellia*-type, 12–15 × 7–9 μm; conidia to 20 μm **A. punctata**
- 6: Ascospores with weak medial wall-thickening during spore ontogeny, but quickly reduced **7**
- 7 Ascospores 15–30 × 7–16 μm **8**
- 7: Ascospores 9–17 × 5–10 μm **11**
- 8 Medulla I+ blue; ascospores 15–[19.6]–26 × 8–[11.2]–14 μm. **A. austroconiops**
- 8: Medulla I– **9**
- 9 Ascospores often curved, 18–[23]–30 × 10–[13]–16 μm; spore-wall rugulate **A. subbadioatra**
- 9: Ascospores not curved, 15–20 × 7–10 μm; spore-wall microrugulate **10**
- 10 Mature ascospores constricted; thallus thick, ±sublobate at the margins; subhymenium not inspersed; apothecia to 1 mm wide **A. coniops**
- 10: Mature ascospores not constricted; thallus thin, rimose-areolate; subhymenium inspersed; apothecia to 0.6 mm wide **A. nitrophila**
- 11 Ascospores 11–17 × 5–10 μm **12**
- 11: Ascospores 9–14 × 5–8 μm **13**
- 12 Mature ascospores often constricted; thallus thick, warty; prothallus absent; apothecia to 1.5 mm wide **A. litoralis**

- 12: Mature ascospores not or very rarely constricted; thallus thin, rimose-areolate; prothallus often black and prominent; apothecia to 0.8 mm wide
..... **A. fuscoatratura**
- 13 Ascospores constricted; disc epruinose; thallus lacking orange pigment.....
..... **A. australasica**
- 13: Ascospores not constricted; disc \pm pruinose; thallus with or without orange pigment.....**14**
- 14 Thallus absent or discontinuous, verruculose to granulose, white to pale orange; prothallus absent; thallus containing orange pigment **A. vitellina**
- 14: Thallus rimose-areolate, continuous, grey to brown or dark brown; prothallus often present; thallus \pm containing orange pigment**15**
- 15 Thallus brown or dark brown; prothallus often dark and prominent; disc epruinose; thallus lacking orange pigment**A. brunneola**
- 15: Thallus white to pale grey; prothallus grey-white or not apparent; disc often grey-white-pruinose; thallus containing orange pigment**A. julianeae**
- 16 Medulla I+ blue; ascospores 15–27 \times 8–14 μ m **A. austroconiops**
- 16: Medulla I–**17**
- 17 Ascospores often curved, 18–30 \times 10–16 μ m; spore-wall rugulate; thallus rimose-areolate.....**A. subbadioatra**
- 17: Ascospores not curved, 14–20 \times 7–10 μ m; spore-wall microrugulate; thallus of congested verrucules**A. isabellina**

Acknowledgements

J.B. thanks the late D. Galloway (Otago), C.D. Meurk, H.D. Wilson and A. Fife (all Christchurch), W.M. & N. Malcolm (Nelson) and W. Nelson, B. Polly and P. Scott (all Wellington) for their support during her field trip in 2001, and the Austrian Ministry of Education, Science and Culture for providing a grant. H.M. is indebted to H. Hertel (Munich), B.P.J. Molloy and C.D. Meurk (both Christchurch) for their company during a field trip in 1985 and to his wife Eleonore for her support during another trip in 1992, as well as to D. Glenny, W. Nelson, B. Polly and C. West (all Wellington), N. and W.M. Malcolm (Nelson) and C.D. Meurk (Christchurch) for their assistance in the field. H.M. acknowledges financial support from the Austrian Science Fund (FWF-projects P8500-BIO, P10514-BIO and P25237-B16). We sincerely thank the curators of the following herbaria for the loan of critical specimens, CHR, G, GZU, W, WELT.

References

- Blaha, J (2002): *Taxonomische Studien an saxicolen Arten die Flechtengattung Amandinea (lichenisierte Ascomyceten, Physciaceae) von Neuseeland*. Diplomarbeit. Institut für Botanik der Karl-Franzens-Universität Graz, Graz, pp. 1–78.
- Bungartz, F; Nordin, A; Grube, U (2007): *Buellia*. In *Lichen Flora of the Greater Sonoran Desert Region* (Nash, TH; Gries, C; Bungartz, F; eds) Lichens Unlimited, Tempe. pp. 113–179.
- Culberson, CF (1972): Improved conditions and new data for the identification of lichen products by a standardized thin-layer chromatographic method. *Journal of Chromatography* **72**, 113–125.
- Elix, JA (2011): *Australian Physciaceae (Lichenised Ascomycota)*. Australian Biological Resources Study, Canberra. Version 18 October 2011. <http://anbg.gov.au/abrs/lichenlist/PHYSCIACEAE.html>
- Elix, JA (2014): *A Catalogue of Standardized Chromatographic Data and Biosynthetic Relationships for Lichen Substances*, 3rd edn. (Published by the author, Canberra.)

- Elix, JA; Kantvilas, G (2013): New taxa and new records of *Amandinea* (Physciaceae, Ascomycota) in Australia. *Australasian Lichenology* **72**, 3–19.
- Elix, JA; Kantvilas, G (2016): Mimics of *Amandinea coniops* (Physciaceae, Ascomycota) in Tasmania and New Zealand. *Australasian Lichenology* **78**, 22–31.
- Elix, JA; Malcolm, WM; Knight, A (2015): New records and new combinations of buellioid lichens (Physciaceae, Ascomycota) from New Zealand. *Australasian Lichenology* **77**, 36–41.
- Galloway, DJ (2007): *Flora of New Zealand Lichens*. Revised Second Edn. Manaaki Whenua Press, Lincoln.
- Scheidegger, C (2009): *Amandinea* Choisy ex Scheid. & H.Mayrhofer (1993). In *The Lichens of Great Britain and Ireland* (Smith, CW; Aptroot, A; Coppins, BJ; Fletcher, A; Gilbert, OL; James, PW; Wolseley, PA; eds). British Lichen Society, London. pp. 142–144.

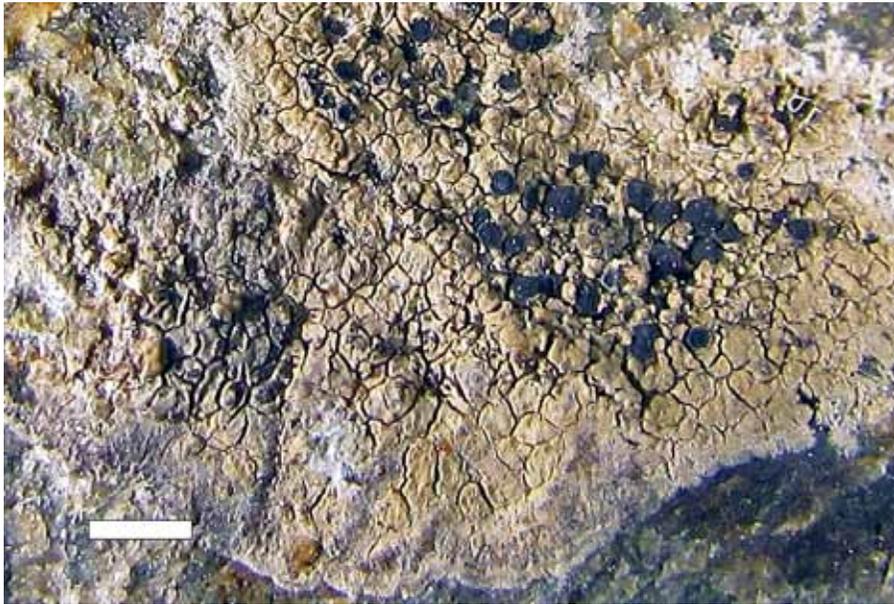


Figure 1. *Amandinea australasica* (holotype in GZU). Scale = 2 mm.



Figure 3. *Amandinea brunneola* (holotype in CANB). Scale = 1 mm.



Figure 2. Ascospore ontogeny of *A. australasica*. Scale = 10 μ m.

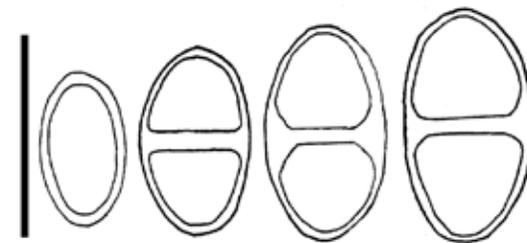


Figure 4. Ascospore ontogeny of *A. brunneola*. Scale = 10 μ m.



Figure 5. *Amandinea fuscostratula* (Blaha 0136 in GZU). Scale = 2 mm.



Figure 7. *Amandinea julianae* (Streimann 34746 in CANB). Scale = 1 mm.

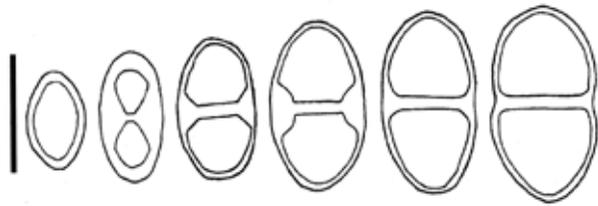


Figure 6. Ascospore ontogeny of *A. fuscostratula*. Scale = 10 μ m.

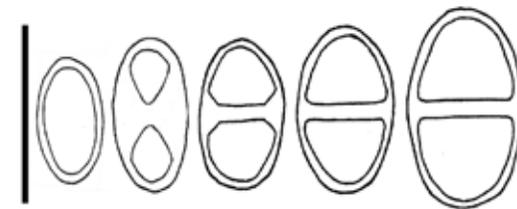


Figure 8. Ascospore ontogeny of *A. julianae*. Scale = 10 μ m.



Figure 9. *Amandinea litoralis* (holotype in W). Scale = 1 mm.

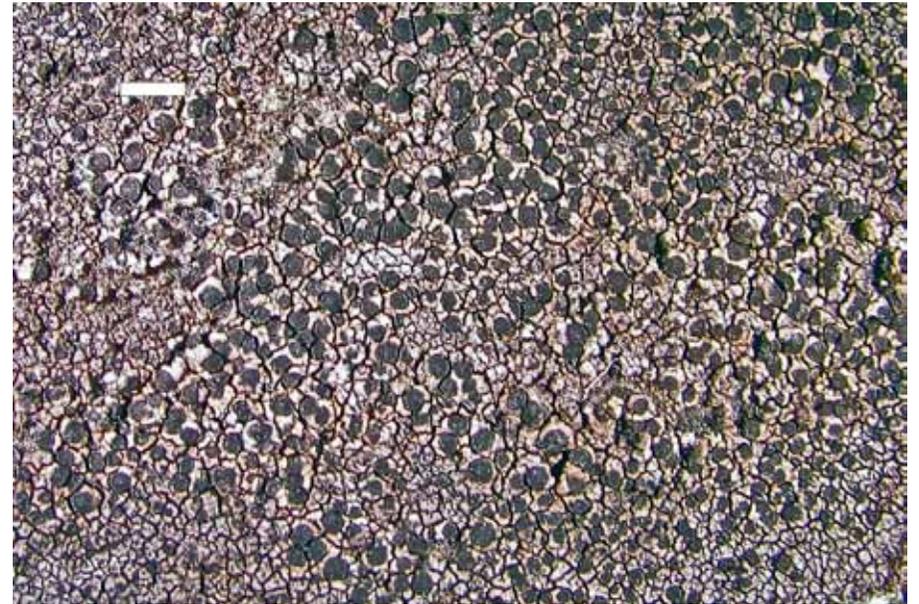


Figure 11. *Amandinea nitrophila* (Poelt 13.i.1989 in GZU). Scale = 2 mm.

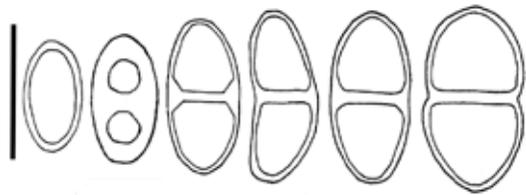


Figure 10. Ascospore ontogeny of *A. litoralis*. Scale = 10 μ m.

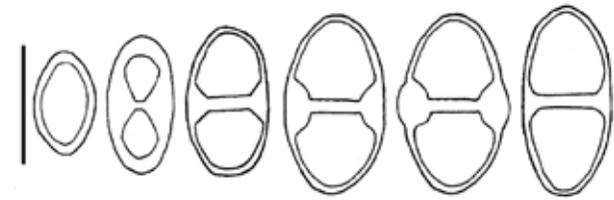


Figure 12. Ascospore ontogeny of *A. nitrophila*. Scale = 10 μ m.



Figure 13. *Amandinea variabilis* (holotype in GZU). Scale = 2 mm.



Figure 15. *Amandinea vitellina* (holotype in CANB). Scale = 1 mm.



Figure 14. Ascospore ontogeny of *A. variabilis*. Scale = 10 μ m.

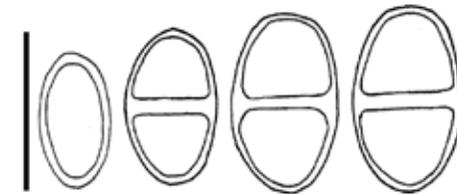


Figure 16. Ascospore ontogeny of *A. vitellina*. Scale = 10 μ m.

- Blaha, J; Mayrhofer, H; Elix, JA (2016): Five new saxicolous species of *Amandinea* (Ascomycota, Physciaceae) from New Zealand and southern Australia. *Australasian Lichenology* **79**, 35–57.
- Divakar, PK *et al.* (2015): Evolution of complex symbiotic relationships in a morphologically derived family of lichen-forming fungi. *New Phytologist* **208**, 1217–1226.
- Elix, JA (2016): New species of *Gassicurtia* and *Stigmatochroma* (Physciaceae, Ascomycota) from Queensland, Australia. *Australasian Lichenology* **79**, 3–9.
- Elix, JA; Kantvilas, G (2016): New species and new records of buellioid lichens (Ascomycota, Physciaceae) in Tasmania. *Australasian Lichenology* **79**, 26–34.
- Elix, JA; Mayrhofer, H (2016): Two new species of *Buellia sens. lat.* (Ascomycota, Physciaceae) from New Zealand with 1-septate ascospores. *Australasian Lichenology* **79**, 10–15.
- Elvebakk, A; Hong, SG; Park, CH; Robertson, EH; Jørgensen, PM (2016): *Gibbosporina*, a new genus for foliose and tripartite, Palaeotropical Pannariaceae species previously assigned to *Psoroma*. *Lichenologist* **48**, 13–52.
- Ferencova, Z; Cubas, P; Divakar, PK; Molina, MC; Crespo, A (2014): *Notoparmelia*, a new genus of Parmeliaceae (Ascomycota) based on overlooked reproductive anatomical features, phylogeny and distribution pattern. *Lichenologist* **46**, 51–67.
- Fryday, AM; Hertel, H (2014): A contribution to the family Lecideaceae s. lat. (Lecanoromycetidae inc. sed., lichenized Ascomycota) in the southern subpolar region, including eight new species and some revised generic circumscriptions. *Lichenologist* **46**, 389–412.
- Kantvilas, G; Kondratyuk, SY (2013): New species of *Caloplaca* (lichenized Ascomycota: Teloschistaceae) from Kangaroo Island. *Journal of the Adelaide Botanic Gardens* **26**, 9–14.
- Kondratyuk, SY; Elix, JA; Kärnefelt, I; Thell, A (2012): An artificial key to Australian *Caloplaca* species (Teloschistaceae, Ascomycota). *Bibliotheca Lichenologica* **108**, 141–161.
- McCarthy, PM; Kantvilas, G (2016): *Thelidium robustum* sp. nov. (lichenized Ascomycota, Verrucariaceae) from Kangaroo Island, South Australia. *Journal of the Adelaide Botanic Gardens* **29**, 37–40.
- McCarthy, PM; Elix, JA (2016): A new species of *Megalania* (lichenized Ascomycota, Ramalinaceae) from north-eastern Queensland, Australia. *Australasian Lichenology* **79**, 20–25.
- McCarthy, PM; Kantvilas, G (2016): A new species of *Anisomeridium* (Monoblastiaceae) from Kangaroo Island, South Australia. *Australasian Lichenology* **79**, 16–19.
- Pennisi, E (2016): A lichen ménage à trois. Genomic and imaging studies of lichen add a third symbiotic partner to the textbook pair. *Science* **353**, 337.
- Purvis, OW; Convey, P; Flowerdew, MJ; Peat, HJ; Najorka, J; Kearsley, A (2013): Iron localization in *Acarospora* colonizing schist on Signy Island. *Antarctic Science* **25**, 24–30.
- Schlensog, M; Green, TGA; Schroeter, B (2013): Life form and water source interact to determine active time and environment in cryptogams: an example from the maritime Antarctic. *Oecologia* **173**, 59–72.
- Sprillie, T *et al.* (2016): Basidiomycete yeasts in the cortex of ascomycete macrolichens. (first release) DOI: 10.1126/science.aaf8287
- Stocker-Wörgötter, E; Elix, JA; Schumm, F; Hametner, C (2012): Bushfire and lichen communities: ecophysiology, culturing and secondary chemistry of two Australasian lichen species, *Thysanothecium scutellatum* and *T. hookeri* (Cladoniaceae, lichenized Ascomycetes). *Bibliotheca Lichenologica* **108**, 241–256.

Australasian Lichenology

Number 79, July 2016 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 5.0 or later). You can download a free copy of Acrobat Reader from Adobe's website (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> 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 from 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> 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.

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\$4.00 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.