Three new species of buelliolid lichens (Caliciaceae, Ascomycota) from New Zealand and the first report of Rinodinella dubyanoides (Physciaceae, Ascomycota) from Australia and New Zealand

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Abstract
Amandinea delangei Elix & H. Mayrhofer, Buellia blahaiana Elix & H. Mayrhofer and B. harrisiensis Elix & H. Mayrhofer are described as new to science. In addition, Rinodinella dubyanoides (Hepp) H. Mayrhofer & Poelt is reported for the first time from New Zealand and Australia. Methods are as described in the papers cited above.

New species
1. Amandinea delangei Elix & H. Mayrhofer, sp. nov. Figs 1, 2
MycoBank No.: MB 836829

Similar to Amandinea litoralis (Zahlbr.) H. Mayrhofer & Elix, but differs in having a granular-sorediate upper surface and pruinose apothecial discs.

Type: New Zealand, North Island, Te Aupouri, Oneroa-a-Tohe (Ninety Mile Beach), Te Wake-tehua (The Bluff), 34°41’06”S, 172°53’22”E, 20 m alt., on weathered basalt cliff face in the spray zone, P. J. de Lange 13389, T. J. P. de Lange & K. A. Raharaha, 1.1.2017 (holotype – CANB; isotype – UNITEC).

2. Buellia blahaiana Elix & H. Mayrhofer, sp. nov. Fig. 3
MycoBank No.: MB 836830

Similar to Buellia straminea Tuck., but differs in lacking extended marginal lobes and in having somewhat shorter ascospores, 9–13 µm long.

Type: New Zealand, New Island, Coromandel Peninsula, Fletchers Bay, N of Coromandel Town, E of Port Jackson, 36°28’35”S, 175°23’25”E, 0–3 m alt., on coastal greywacke rocks, J. Blaha 0205, 17.iv.2001 (holotype – GZU).

Thallus crustose, to 12 mm wide and 0.1 mm thick, areolate to rimose-areolate; areoles crowded or dispersed, 0.1–0.4 mm wide; upper surface yellow-white to pale yellow-brown, dull; prothallus absent; medulla white, lacking calcium oxalate (H₂SO₄), 1–; photobiont cells 5–14 µm in diam. Apothecia 0.3–1 mm wide, lecideine, broadly adnate then sessile and constricted at the base, isolated, rounded; disc black, epruinose or weakly pale grey-pruinose, plane then markedly convex. Proper excipulum tumid at first, excluded in older apothecia, in section the outer zone brown-black, 35–55 µm thick, K–, N–, inner zone pale brown to colourless. Ephydemium 10–15 µm thick, brown to dark brown, K–, N–. Hypotheicum 5–15 µm thick, K–, Hymenium 70–80 µm thick, colourless, not inspersed; subhymenium 25–35 µm thick, pale brown, inspersed with oil droplets. Paraphyses 1.2–1.5 (–2) µm wide, sparsely branched, with apices 4–5 µm wide and brown caps. Asci of the Bacidia-type, with 8 or fewer (3, 5) spores. Ascospores Physconia-type when immature, Buellia-type when mature, brown, ellipsoid, 12–[13.9]–16 × 6–[7.4]–9 µm, older spores constricted at the septum; outer spore-wall weakly ornamented. Pycnidia immersed; ostiole black; conidia filiform, curved, 16–25 × 0.7–1 µm. Chemistry: Thallus K–, P–, C–, UV–; no lichen substances detected.

Etyymology: The species is named after the Austrian biologist Dr Juliane Blaha, the collector of the type specimen.

Remarks
This species is characterized by the crustose, areolate to subquasimullose, grey-white to pale grey thallus with a granular-sorediate upper surface, the broadly adnate then sessile apothecia, the non-amyloid medulla, an inspersed subhymenium, the 1-septate, Physconia-type ascospores, 12–16 × 6–9 µm, curved, filiform conidia, 16–25 µm long, and the absence of lichen substances. Morphologically, it can resemble specimens of A. litoralis, but that species lacks a sorediate upper surface and an inspersed subhymenium (Blaha et al. 2016). Amandinea rangitataensis Elix & H. Mayrhofer, from the South Island of New Zealand, also has a sorediate upper surface, but it differs in having larger ascospores, 14–[17.1]–20 × 7–[9.2]–11 µm, with a strongly rugulate outer spore-wall, a non-inspersed subhymenium and in containing atranorin (Elix & Mayrhofer 2017).

At present A. delangei is known only from the type collection. Associated species include Buellia halonia (Ach.) Tuck., B. spuria var. amblyogona (Müll. Arg.) van den Boom & H. Mayrhofer, Pertusaria xanthoplaca Müll. Arg., Rinodina oxydata (A. Massal.) A. Massal. and Jackelisia ligulata (Körb.) S. Y. Kondr. & Kärnefelt.
Remarks

This species is characterized by the crustose thallus consisting of crowded to dispersed yellow-white to pale yellow-brown areoles, the adnate to sessile, lecideine apothecia, the non-amyloid medulla, a dark brown, N– excipulum and epihymenium, a non-inspersed hymenium, ellipsoid, 1-septate, Buellia-type ascospores, 9–13 × 5–7 µm and the presence of arthothelin. Chemically, it is identical to B. straminata, and although that species has similar ascospores, it differs in having linear-longate marginal areoles, a bright yellow upper surface and somewhat longer ascospores, 11–12.8 × 5–6.5 × 8 µm (Imshaug 1955; Aptune & Sparrius 2013).

At present B. blahaiana is known only from the type collection. Associated species include Amandinea decedens (Nyl.) Blaha, H.Mayrhofer & Elix, A. pelidna (Ach.) Fryday & K.Arcadia, Buellia crenellatae Zablhr., Caloplaca cribrosa (Hue) Zablhr., C. gallosoyi S.Y.Kondr., Kärnefelt & Filson, Haeckelia subsquamosa (Müll.Arg.) van den Boom & H.Mayrhofer, Lecanora subcoarctata (C.Knight) Hertel, Pertusaria xanthoplaca Müll. Arg., Rinodina blastidiata Matzger & H.Mayrhofer and Xanthoria ligulata (Körb.) P.Jameson. Previously, B. blahaiana was erroneously reported as B. straminata (Elix & Mayrhofer 2018).

3. Buellia harrisiana

Elix & H.Mayrhofer, sp. nov. 
Figs 4–6

MycoBank No.: MB 836831

Similar to Buellia sharpiana Lendemer & R.C.Harris, but differs in having a brown hypothecium, an aeruginose, N+-purple-brown epihymenium and slightly longer ascospores, 12–15 µm long.

Type: New Zealand, South Island, [Canterbury], Malvern County, grassy hillside on north side of Route 73 along the Craigieburn River, [43°8.270’S, 171°45.525’E, 675 m alt.], on rock, R.C. Harris 6433, 24.i.1971 (holotype – MSC).

Thallus crustose, to 15 mm wide and 0.1 mm thick, areolate; areoles crowded or dispersed, 0.2–0.5 mm wide; upper surface pale grey, dull; prothallus black, marginal; medulla white, crustose, to 15 mm wide and 0.1 mm thick, areolate; areoles crowded or dispersed, with brown caps.

Prothallus black, marginal; medulla white, lacking calcium oxalate (H₂SO₄–), I–; photobiont cells 6–14 µm wide. Apothecia 0.2–0.5 mm wide, initially lecanorine and innate, then pseudolecanorine or biatorine, broadly adnate to sessile and constricted at the base; disc brown to black, epruinose, concave to plane or weakly convex. Thalline margin thin, whitish, soon disappeared. Proper exciple prominent, entire, persistent, in section 30–40 µm thick, the outer zone brown, K–, N–, inner zone pale brown. Epiphycium 12–15 µm thick, brown, K–, N–. Hypothecium brown, narrowly ellipsoid, 12–15 × 7–8 µm, constricted at the septum; outer zone brown, K–, N–. Epihymenium brown, narrowly ellipsoid, 12–13.5 µm long. Paraphyses 1.8–2.2 µm wide, sparsely branched towards the apices, the apices 5–7 µm wide with brown caps. Ascii Lecanora-type, 8-spored. Ascospores Rinodinella-type, 1-septate, pale brown, narrowly ellipsoid, 12–21 × 5–7.5 µm, bacilliform conidia, 5–6 × 1 µm.

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

Etymology: The species is named after the American lichenologist Richard C Harris, the collector of the type specimen.

Remarks

This species is characterized by the crustose thallus consisting of crowded to dispersed grey areoles, the immersed to sessile, lecideine apothecia, the amyloid medulla, an aeruginose, N+ purple-brown excipulum and epihymenium, a non-inspersed hymenium, ellipsoid, 1-septate, Buellia-type ascospores, 12–15 × 7–8 µm and the presence of arthothelin. Chemically, it is identical to B. sharpiana, but that species differs in having a colourless hypothecium, a brown, N– epihymenium and somewhat shorter ascospores, 11–12.4 × 13.5 µm long.

At present B. harrisiana is known only from the type collection. Associated species were not recorded. The illustrations of this species (Figs 4–6) were originally published as Buellia sp. (Harris 6344) in Fryday (2019), and are reprinted here with permission.

New record


Thallus crustose, immersed and not apparent, or thin and inconspicuous, more rarely granulose, continuous to 25 mm wide or discontinuous; upper surface white to grey-white, dull; prothallus not apparent; medulla white, lacking calcium oxalate (H₂SO₄–).-I–; photobiont cells 6–14 µm diam. Apothecia 0.2–0.6 mm wide, initially lecanorine and innate, then pseudolecanorine or biatorine, broadly adnate to sessile and constricted at the base; disc brown to black, epruinose, concave to plane or weakly convex. Thalline margin thin, whitish, soon disappeared. Proper exciple prominent, entire, persistent, in section 30–40 µm thick, the outer zone brown, K–, N–, inner zone pale brown. Epiphycium 12–15 µm thick, red-brown, K–, N–. Hypothecium brown, narrowly ellipsoid, 12–15 × 7–8 µm, constricted at the septum; outer zone brown, K–, N–. Epihymenium brown, narrowly ellipsoid, 12–21 × 5–7.5 µm, 8-spored at the septum; outer sporangia smooth. Pycnidia immersed, black; conidia bacilliform, 5–6 × 1 µm.

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

Remarks

This species was previously known from southern Europe and Asia Minor (Mayrhofer & Poelt 1978). It is characterized by the crustose, immersed to white to grey-white, or rarely granular thallus, the immersed to sessile, lecanein then pseudolecanorine or biatorine apothecia, the non-amyloid medulla, a non-inspersed hymenium, the narrowly ellipsoid, 1-septate, Rinodinella-type ascospores, 12–21 × 5–7.5 µm, bacilliform conidia, 5–6 × 1 µm, and the absence of lichen substances. Excellent illustrations are given in Mayrhofer & Poelt (1978).

SPECIMENS EXAMINED

Australia: ● South Australia, South Flinders Ranges, 10 km SSW of Hawker, 31°57’S, 138°23’E, 465 m alt., on limestone-impregnated siliceous rock in grassland with remnant Callitris, H. Mayrhofer 10506, H. Hertel & P. Child, 3.i.1994 (CANB).

Italy: ● Calabria, Prov. Cosenza, Golfo di Policastro, Isola di Dino N Scalea, 100 m alt., on chalk, H. Mayrhofer, 1.vi.1979 (GZU).

New Zealand: ● South Island, Auckland, Little Valley Road, 6 km from Alexandra, 45°17’S, 169°27’E, 460 m alt., on rock, H. Mayrhofer 10506, H. Hertel & P. Child, 2.i.1985 (GZU).

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Figure 1. Amandinea delangei (holotype in CANB). Scale = 1 mm.

Figure 2. Ascospore ontogeny of A. delangei. Scale = 10 µm.

Figure 3. Buellia blahaiana (holotype in GZU). Scale = 1 mm.

Figure 4: Buellia harrisiana (holotype in MSC). Scale bar = 0.5 mm.
An outline of some lichen communities on consolidated, siliceous soils in south-eastern Australia

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Introduction

Our recent investigations of soil-inhabiting lichens in the Australian Capital Territory and adjacent parts of New South Wales led to the discovery of new national, state and territory records and the recognition of novel species of Diploschistes, Micarea, Sarcogyne, Trapelia and Verrucaria (Elix & McCarthy 2018, 2019, 2020a, b, 2021; McCarthy 2020a, b; McCarthy & Elix 2020a, b, 2021). In addition to the taxonomic and floristic novelties, it became apparent that certain, less elevated, terricolous communities, as opposed to their subalpine or alpine counterparts, were dominated by elements of a broad and distinctive suite of mainly crustose and squamulose lichens. These quite diverse terricolous communities inhabited comparatively stable and strongly compacted, nutrient-poor, siliceous soil banks on roadsides and in eucalypt- and Callitris-dominated woodland. Often markedly xeric, being exposed to drying winds and subject to high summer temperatures, they were further characterized by the very sparse or non-existent cover of flowering plants, bryophytes and most Cladoniaceae.

We observed terricolous lichen communities at 19 localities (460–780 m altitude) in the Australian Capital Territory (Figs 1, 2), and at 23 other sites (420–950 m altitude) in nearby areas of the Southern and Central Tablelands, New South Wales (Table 1). Table 2 lists the 52 terricolous lichen taxa seen in these habitats, and it includes a qualitative assessment of their distribution and abundance.

Discussion

The terricolous lichen communities of these roadside soil banks and dry woodland habitats often have a quite distinctive species composition dominated by comparatively robust crusts, as well as squamulose taxa and Xanthoparmelia species (the ± ubiquitous and frequent to common species in Table 2). Thirteen of the species from the 42 collection sites are currently thought to be endemic to south-eastern Australia (including Tasmania), and all of those are exclusively terricolous. Moreover, the soil substratum can be so hard and unyielding that 20 or more of the species are occasionally to primarily saxicolous, often occupying nearby outcrops as well as loose stones and boulders of shale, slate, sandstone, granite, basalt and quartzite. They include Baeomyces heteromorphus, Caloplaca arandensis, Candelariella vitellina, Lecanora pseudistera, Paraporpidia leptocarpa, Xanthoparmelia subprolixa and X. tasmanica.

References

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