

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

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Abstract: *Buellia alectorialica* Elix and *B. billewiersii* Elix are reported as new to science. The ascospores of both species have 3 (or occasionally more) septa.

In his revised second edition of the *Flora of New Zealand Lichens*, Galloway recorded a total of 16 species of *Buellia* (Galloway, 2007), although two of those species have since been transferred to *Amandinea* (Elix *et al.* 2015). Among the remaining 14 taxa are three species of *Buellia* in the strict sense, now limited to species with *Callispora*-type ascospores, bacilliform or weakly clavate conidia and a hymenium interspersed with oil droplets (Bungartz *et al.* 2007), with the remainder representing unrelated taxa that remain classified as *Buellia* in the broad sense. Since that time an additional five taxa of *Buellia s. lat.* have been recorded for New Zealand (Elix *et al.* 2015). In this paper, I describe two new species of *Buellia* in the broad sense, both with pluriseptate ascospores.

Methods

Observations and measurements of photobiont cells, thallus and apothecial 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 pretreatment 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 alectorialica* Elix, sp. nov.
Mycobank number: **MB 814272**

Fig. 1

Similar to *Buellia bogongensis* Elix, but differs in having a thicker hymenium and in containing alectorialic rather than norstictic acid.

Type: New Zealand, South Island, Canterbury, Broken River, SE of Arthurs Pass, 43°08'S, 171°41'E, 1500 m alt., on rock high above the snow line, *W.H. Ewers 5734*, 4.xi.1989 (holotype – CANB).

Thallus crustose, to 50 mm wide and 0.1 mm thick, continuous, areolate, the areoles aggregated or delimited by a black prothallus; individual areoles irregular, angular, 0.2–0.7 mm wide; upper surface whitish or yellow-white, smooth; prothallus black, prominent, marginal and between adjacent areoles; medulla white, lacking calcium oxalate (H₂SO₄-), I+ intense blue; photobiont cells 8–14 μm diam. *Apothecia* 0.3–0.6 mm wide, lecidine, immersed in the thallus or among the areoles, isolated or crowded, round or distorted by mutual pressure; disc black, epruinose, weakly concave then plane, initially with a necrotic thalline veil; proper exciple thin, persistent, in section 40–55 μm thick, outer zone brown-black to greenish black, K-, N+ purple-brown, inner zone brown. *Epithymenium* 12–15 μm thick, aeruginose to greenish black, K+ blue-green, N+ purple. *Hypothecium* 75–150 μm thick, deep red-brown to brown-black, K-, N+ red-brown. *Hymenium* 120–140 μm thick, colourless, not interspersed, subhymenium 50–75 μm thick, colourless to pale brown; paraphyses 1.7–2 μm wide, moderately branched, capitate, with apices 3–4 μm wide, caps aeruginose; asci of the *Bacidia*-type, with 8 or fewer spores. *Ascospores* 3-septate or with an additional vertical

septum, brown, elongate-ellipsoid, 13–20(–27) × 6–9(–11) μm; outer spore wall weakly ornamented. *Pycnidia* not seen.

Chemistry: Thallus K+ yellow, P+ yellow, C+ red, UV-; containing atranorin (major), alectorialic acid (minor).

Etymology: The species is named for its characteristic chemistry.

Remarks

This new species is characterized by the crustose, areolate, whitish or yellow-white thallus, the immersed, often crowded apothecia, the 3-septate to submuriform ascospores, the greenish black epithymenium and outer excipulum (N+ purple) and the presence of atranorin and alectorialic acid. Morphologically it closely resembles the Australian *B. bogongensis*, but that species has a narrower hymenium, 75–100 μm thick, and contains atranorin plus norstictic and connorstictic acids (Elix 2011). Alectorialic acid is very uncommon in *Buellia s. lat.*, previously reported from only two corticolous species. The European *B. pulverea* Coppins & P.James produces only alectorialic acid (Coppins *et al.* 2009), while *B. rhizocarpica* Etayo, Giralt & Elix from Central America contains additional atranorin and epanorin, plus rhizocarpic and gyrophoric acids (Etayo *et al.* 2010). Both of those species have relatively small, 1-septate, *Buellia*-type ascospores.

Buellia alectorialica is known from siliceous rock in alpine regions of both the North and South Islands of New Zealand. Associated species include *Buellia aethalea* (Ach.) Th.Fr., *B. ocellata* (Flot.) Körb., *Lecanora farinacea* Fée, *Lecidella stigmatea* (Ach.) Hertel & Leuckert, *L. sublapicida* (C.Knight) Hertel, *Notoparmelia signifera* (Nyl.) A.Crespo, Ferencova & Divakar, *Rhizocarpon geographicum* (L.) DC., *Umbilicaria cylindrica* (L.) Delise ex Duby and *U. umbilicarioides* (B.Stein.) Krog & Swinscow.

SPECIMENS EXAMINED

North Island: • Wellington, Tongariro National Park, Mt Ruapehu, at ski lift, 39°17'S, 175°3'E, on rock above snowline, *W.H. Ewers 2611, 2615, 31.iii.1988* (CANB).

2. *Buellia billewiersii* Elix, sp. nov.
Mycobank number: **MB 814273**

Fig. 2

Similar to *Buellia rubroraeagens* A.Nordin, but differs in having broader ascospores and a thicker hymenium.

Type: New Zealand, South Island, Canterbury, Tasman Glacier Road, Mt Cook, 43°36'S, 170°08'E, on bark, *W.H. Ewers 5223*, 10.xi.1989 (holotype – CANB).

Thallus crustose, up to 25 mm wide, 0.05 mm thick to evanescent, continuous or dispersed, membranaceous; upper surface white to whitish grey or grey, smooth; prothallus not apparent; medulla white, lacking calcium oxalate (H₂SO₄-), I-; photobiont cells 8–17 μm diam. *Apothecia* 0.3–1 mm wide, broadly adnate but soon sessile and constricted at base, often crowded but rarely confluent; disc black, epruinose, plane or rarely weakly convex; proper margin distinct, persistent, slightly higher than the disc, in section 35–55 μm thick, dark brown to brown-black in the outer part, K+ red in part but with no crystals, paler brown within. *Epithymenium* 12–15 μm thick, olive-brown to dark brown, K-, N-. *Hypothecium* 75–90 μm thick, brown to dark brown, K-. *Hymenium* 75–100 μm thick, colourless, not interspersed but with scattered oil drops. *Paraphyses* 1.5–2 μm thick, sparsely branched; apices 3–5 μm wide, with dark brown caps. Asci *Bacidia*-type, with 8 or fewer spores. *Ascospores* olive-brown to dark brown, 1–3-septate when immature, 3-septate at maturity, 17–26 × 8–11 μm, with apical and septal wall thickenings, sometimes curved; outer wall ornamented. *Pycnidia* black, immersed, c. 0.08 mm wide; conidia bacilliform, 4–6 × 0.7–1 μm.

Chemistry: Thallus K+ pale yellow, P+ pale yellow, C-, UV-; containing atranorin (major).

Etymology: The species is named after the late Australian biologist Dr William H. Ewers.

Remarks

Morphologically this new species is similar to *B. rubroreagens* A.Nordin, a tropical species from Brazil and the Caribbean. *Buellia rubroreagens* has ascospores similar to those of *B. billeviersii* and an excipulum and hypothecium that contain a yellow, K+ reddish pigment (Nordin 2000). Specimens of *B. rubroreagens* from the West Indies contain only atranorin, but differ in having a thinner hymenium, 70–80 µm thick, which lacks oil drops, and narrower ascospores, 6.5–8 µm wide, while specimens from Brazil contain additional norstictic acid. *Buellia triseptata* A.Nordin from Europe and north-western North America is also morphologically similar to *B. billeviersii*, but differs in having somewhat smaller ascospores, 14–22 × 5.5–8 µm, and a dark brown, K- excipulum. *Buellia triseptata* usually lacks lichen substances, but sometimes contains atranorin. It also differs in being lichenicolous in the early stages of its development (Nordin 2000).

The new species occurs on the twigs and branches of trees and shrubs in subalpine and alpine areas of the South Island of New Zealand. Associated species include *Haematomma alpinum* R.W.Rogers, *H. babingtonii* A.Massal. and *Xanthomendoza novozelandica* (Hillmann) Sochting, Kärnefelt & S.Kondr.

SPECIMENS EXAMINED

South Island: • Canterbury, Castle Hill, 43°44'S, 173°51'E, 760 m alt., on matagouri in open grassland, J.A. Elix 8484, 9.vi.1980 (CANB); • Type locality, on bark, W.H. Ewers 5224, 5232, 5235, 10.xi.1989 (CANB); • Canterbury, Mount Cook National Park, Tasman Glacier Valley road adjoining moraine, 43°40'S, 170°10'E, on deciduous shrub in stand of alpine scrub between creek and moraine, J. Johnston 3529 *pr.p.*, 9.vi.1980 (CANB).

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Fig. 1. *Buellia alectorialica* (holotype in CANB), scale = 1 mm.



Fig. 2. *Buellia billeviersii* (holotype in CANB), scale = 1 mm.