

**A new species of *Mycobilimbia* s. lat. (Ascomycota, Lecideaceae) from the Northern Territory, Australia**

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**Abstract:** An enigmatic, terricolous lichen collected in the seasonally wet tropics of the Northern Territory, Australia, is described as *Mycobilimbia territorialis* P.M. McCarthy & Elix, sp. nov. (Lecideaceae).

A highly distinctive and richly fertile crustose lichen collected from soil at an abandoned uranium mine site in the wet tropics of the Northern Territory, Australia, although somewhat anomalous in its anatomy, chemistry and tropical occurrence, exhibits particularly strong affinities to the mainly northern-temperate to boreal *Mycobilimbia* Rehm (Lecideaceae). The new species is described and illustrated, and its circumscription and relationships are discussed.

*Mycobilimbia territorialis* P.M. McCarthy & Elix, sp. nov. MycoBank No.: MB 815596

Figs 1, 2

Characterized by the pale grey-green, granular thallus containing argopsin and chlorococcoid algae, adnate to stipitate, biatorine apothecia, *Mycobilimbia*-type apothecial ontogeny, the usually massive, chondroid hypothecium, asci with a well-defined and strongly amyloid tholus, narrowly ellipsoid to oblong-fusiform or fusiform, 3-septate ascospores and bacilliform conidia.

Type: Australia, Northern Territory, Rum Jungle, 65 km S of Darwin, 12°59'26"S, 130°59'57"E, alt. 75 m, on soil bank in abandoned mine site, with scattered *Acacia* and *Calytrix*, J.A. Elix 38527, 6.viii.2005 (holotype – CANB).

*Thallus* superficial on soil, plant detritus and sandstone pebbles, likely to form extensive colonies, diffuse to continuous or sparingly rimose, with a few irregular areolae to 0.15 mm wide, dull pale greyish green, 40–100  $\mu\text{m}$  thick, minutely granular (granules 30–80  $\mu\text{m}$  wide), lacking soralia, ecorticate or with an indistinct, alga-free hyphal layer 8–15  $\mu\text{m}$  thick. *Algal layer* continuous or not, 40–80  $\mu\text{m}$  deep; cells chlorococcoid, bright green, globose or broadly ellipsoid, rather thick-walled, (7–)8–12(–15)  $\mu\text{m}$  wide; interstitial hyphae short- or long-celled, thin-walled, hyaline, 1.5–2.5(–3)  $\mu\text{m}$  wide. *Prothallus* absent. *Apothecia* numerous, biatorine, pale to medium reddish brown to darker olive-brown, at first commonly translucent-glossy, eventually dull, although somewhat paler and a little translucent when wetted, adnate, sessile to substipitate or turbinate, solitary, paired or in tight clusters of up to 8, often 2–4 discrete apothecia tightly fused to form a single, shallowly lobate, stipitate structure, the shape of individual apothecia frequently distorted by mutual pressure; solitary apothecia (0.30–)0.44(–0.64) mm wide [ $n = 67$ ]; clustered apothecia (0.40–)0.68(–0.90) mm in maximum extent [ $n = 43$ ], some clusters clearly formed by fusion of apothecia, others likely to have been derived from rupture and subsequent proliferation; disc smooth, epruinose, at first plane to slightly convex, becoming moderately to strongly convex or subglobose. *Proper margin* (20–)30–50  $\mu\text{m}$  thick in surface view when immature, entire, concolorous with or much darker than the disc, smooth, glossy, soon becoming excluded, but sometimes visible as a thin dark brown ring when mature apothecia are wetted; in section the proper exciple is medium to dark greenish brown adjacent to the hymen-

ium, 25–50  $\mu\text{m}$  thick, I–, consisting of 3–4  $\mu\text{m}$  wide, parallel to radiating hyphae, the lumina thin (0.7–1.8  $\mu\text{m}$  wide), but the hyphal structure remaining distinct (in marked contrast to the hypothecial tissue, see below); outermost cells of the excipular hyphae not enlarged; lower levels of the exciple (e.g. where it encloses the hypothecial stalk) anatomically identical but considerably paler than uppermost tissues. *Epithymenium* poorly defined, hyaline to pale diffuse brown or yellowish brown, c. 10–15  $\mu\text{m}$  thick, K–, N–, I–. *Subhymenium* poorly defined, especially its transition to the upper levels of the hypothecium. *Hypothecium* with an upper layer that is pale to medium olive-brown, 40–60(–80)  $\mu\text{m}$  thick, not interspersed with granules or oil droplets, K–, N–, I–; lower levels 80–300  $\mu\text{m}$  thick and forming the apothecial stalk, anatomically a compact, chondroid tissue of thick-walled, hyaline hyphae (yellowish *en masse*) 3–5  $\mu\text{m}$  thick, K–, N–, I+ yellowish brown, in section the hyphal lumina appearing punctate or simple- to branched-serpentine, 0.8–1.5  $\mu\text{m}$  wide. *Hymenium* 60–80(–100)  $\mu\text{m}$  thick, predominantly hyaline, not interspersed with granules or globules, K–, C–, N–; *paraphyses* tightly conglutinate, simple to sparingly branched and anastomosing, long-celled, apparently thin-walled, 1–1.5(–1.8)  $\mu\text{m}$  thick; apical cells hyaline, thin-walled, not swollen. *Asci* narrowly clavate or cylindroclavate, 58–74  $\times$  10–14  $\mu\text{m}$  [ $n = 20$ ], 8-spored; walls amyloid; ascus apex very difficult to observe in thin section, in Lugol's iodine (pretreated with K) with a thick amyloid tholus with or without narrow vertical bands of more deeply staining material on either side of a short conical ocular chamber to 2  $\mu\text{m}$  tall and 0.7–1  $\mu\text{m}$  wide. *Ascospores* colourless, irregularly biserial in the ascus, 3-septate, narrowly ellipsoid to oblong-fusiform or fusiform, usually straight, occasionally slightly curved, not constricted at the septa, (15–)18(–22)  $\times$  (4.5–)6(–7.5)  $\mu\text{m}$  [ $n = 60$ ]; apices rounded to subacute; spore wall to 0.5  $\mu\text{m}$  thick, lacking a perispore. *Pycnidia* uncommon, superficial, globose, black, glossy, c. 0.1 mm wide, resembling apothecial initials; conidiogenous cells mostly terminal (cf. conidiophore-type IV of Vobis 1980); conidia bacilliform, 3–5  $\times$  0.7–1  $\mu\text{m}$ . *Chemistry*: Thallus K–, C–, PD–, UV–; argopsin (major) by TLC.

*Etymology*: The epithet *territoralis* refers to the type locality in the Northern Territory, Australia.

**Remarks**

The new species is characterized by the following combination of attributes: (1) a thin, pale grey-green, granular, terricolous thallus containing the  $\beta$ -orcinol depsidone argopsin; (2) rather thick-walled chlorococcoid algae; (3) moderately large, adnate to stipitate, biatorine apothecia that are solitary or clustered; (4) a convex to subglobose, reddish brown to olive-brown apothecial disc and a thin, uniformly hyphal proper exciple that becomes excluded as the apothecium matures; (5) a nondescript epithymenium, an amyloid hymenium, a comparatively dark subhymenium and a usually massive, chondroid hypothecium; (6) tightly conglutinate, simple to sparingly branched and anastomosing paraphyses with inconspicuous apical cells; (7) asci of an as yet unresolved type, but with a well-defined and strongly amyloid tholus; (8) narrowly ellipsoid to oblong-fusiform or fusiform, 3-septate ascospores; and (9) bacilliform conidia.

*Mycobilimbia territorialis* is reminiscent of some species of *Micarea* (Pilocarpaceae), but it contains chlorococcoid algae rather than smaller, micareoid algae (Coppins 1983, 2009). While the recently described *Brianaria* (Psoraceae) was segregated from *Micarea* largely because of its anomalous chlorococcoid photobiont, that genus also has dimorphic paraphyses and 0–1-septate ascospores (Ekman & Svensson 2014). The new species also exhibits strong similarities in apothecial morphology and anatomy with the almost exclusively northern-temperate to boreal genus *Biatora* (Ramalinaceae), especially the well-supported *Biatora rufidula*-group of corticolous species characterised by 3-septate ascospores and a proper exciple in which individual hyphae remain clearly visible (Printzen 1995, 2014; Printzen & Tonsberg 2000, 2004; Printzen &

Otte 2005; Printzen & Coppins 2009). Importantly, however, apothecial ontogeny in *Biatora* involves paraphyses and excipular hyphae forming together from the same gelatinized hyphae, and the first asci appearing among those same hyphae (Printzen 1995, 2014). By contrast, in *Mycobilimbia* and *M. territorialis*, those primordial hyphae become the developing exciple, while the asci and paraphyses form in the centre of the immature apothecium (Fig. 2; Printzen 1995: 40, Fig. 7).

*Mycobilimbia*, with fewer than 10 accepted species, shares many thalline and ascomatal traits with *Biatora*, but it is distinguished primarily by apothecial ontogeny (Hafellner 1989, Printzen 1995, Printzen *et al.* 2009). The mainly Arctic-alpine *M. tetramera* (De Not.) Vitik., Ahti, Kuusinen, Lommi & T. Ulvinen ex Hafellner & Türk is especially similar to *M. territorialis*, but it has a K+ purplish proper exciple and upper hymenium, and the thallus, like those of all known *Mycobilimbia* species, lacks secondary chemistry (Ekman 2004, Printzen *et al.* 2009). The newly described Australian species is assigned to *Mycobilimbia* due to its thalline and apothecial anatomy and ontogeny, and in spite of its anomalous secondary chemistry and unresolved ascus type. This placement will require a reassessment when ascus structure is finally elucidated and additional specimens become available for molecular analyses.

Recently, several species of *Mycobilimbia* have been described or reported from cool-temperate Australasia and southern South America (Kantvilas *et al.* 2005). Fryday *et al.* (2014) transferred *M. australis* Kantvilas & Messuti and several other taxa to the new genus *Bryobilimbia* (*incertae sedis*) mainly by virtue of their *Porpidia*-type asci and supported by molecular phylogenetic analyses. *Mycobilimbia meridionalis* Kantvilas, a Tasmanian endemic with a small-celled photobiont and 0–2-septate ascospores, was not included in *Bryobilimbia*, nor was *M. subbyssoides* Øvstedal, known only from Heard Island, an Australian subantarctic territory (Øvstedal & Gremmen 2008).

The new lichen grows on oligotrophic soil, sparse plant detritus and sandstone pebbles at the type locality, an abandoned uranium mine site in the wet tropics of the Northern Territory, Australia.

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Figure 1. *Mycobilimbia territorialis* (holotype in CANB). Scale = 2 mm

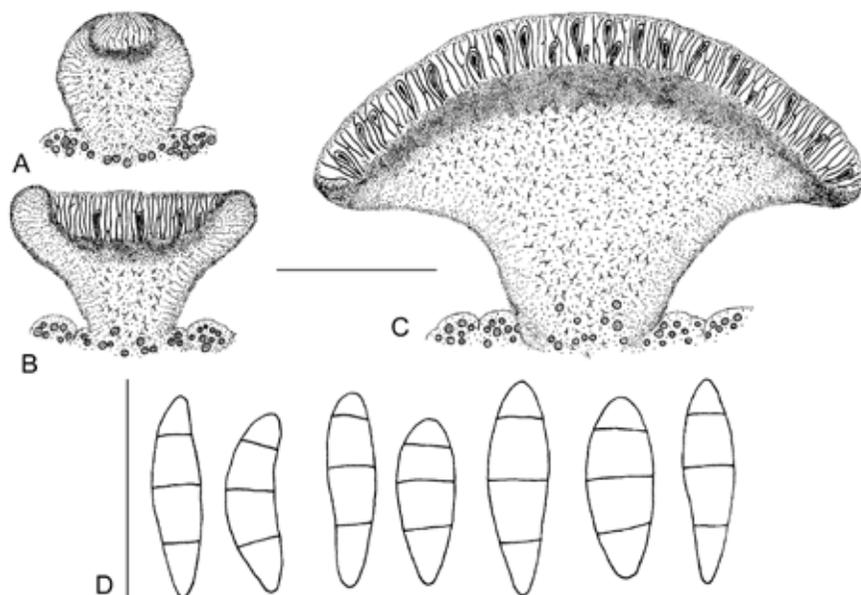


Figure 2. *Mycobilimbia territorialis* (holotype in CANB). A–C, Sectioned apothecia (semi-schematic) at 3 stages of development. D, Ascospores. Scales: A–C = 0.2 mm; D = 20  $\mu$ m.

**Two new corticolous species of *Amandinea*  
(Ascomycota, Physciaceae) from New Zealand**

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**Abstract:** *Amandinea ornata* Ropin, H.Mayrhofer & Elix and *A. ropinii* H.Mayrhofer & Elix are reported as new to science. In addition, *Amandinea lignicola* var. *australis* Elix & Kantvilas and *A. pillagaensis* Elix & Kantvilas are reported for the first time from New Zealand. A key to the corticolous species of *Amandinea* in New Zealand is provided.

In his revised second edition of the *Flora of New Zealand Lichens*, Galloway recorded a total of seven species of *Amandinea* (Galloway, 2007), three of which occur on bark or wood. Since then one of those species has been transferred to the new genus *Orcularia* as *O. insperata* (Nyl) Kalb & Giralt (Kalb & Giralt 2011), and *Buellia porulosa* Nyl. has been transferred to *Amandinea* (Elix *et al.* 2015). In this paper, we describe two new corticolous species of *Amandinea*, and report two new records for New Zealand. *Amandinea ropinii* is also recorded for New South Wales.

**Methods**

Observations and measurements of photobiont cells, thallus and apothecium 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 (H<sub>2</sub>SO<sub>4</sub>), and apothecial sections with 50% nitric acid (N).

**The new species**

**1. *Amandinea ornata*** Ropin, H.Mayrhofer & Elix, sp. nov. Figs 1, 2  
Mycobank number: **MB 815808**

Similar to *Amandinea subduplicata* (Vain.) Marbach, but differs in having initially lecaneorine apothecia, smaller ascospores, and an absence of atranorin.

*Type:* New Zealand, North Island, South Auckland, Stoney Point, Lake Tarawera, SE of Rotorua, 38°11'S, 176°24'E, on *Populus*, H. Mayrhofer 11974 & E. Hierzer, 18.viii.1992 (holotype – GZU; isotype – WELT).

*Thallus* crustose, continuous to rimose-areolate, to 10 mm wide and 0.05 mm thick; upper surface white, smooth, matt, becoming  $\pm$ wrinkled, ridged or slightly granular; prothallus not apparent; medulla white, lacking calcium oxalate (H<sub>2</sub>SO<sub>4</sub>-), I-; photobiont cells 5–12  $\mu$ m diam. *Apothecia* 0.2–0.6 mm wide, initially immersed, erumpent, with an accessory thalline margin that is soon excluded, then biatorine or lecideine, broadly adnate or sessile, separate or in small groups; disc black, epruinose, weakly

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