

A remarkable new species of *Rimularia* Nyl. (lichenized fungi: Trapeliaceae) from tropical Australia

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Summary

Kantvilas, G., McCarthy, P.M. & Stuckey, B. (2008). A remarkable new species of *Rimularia* Nyl. (lichenized fungi: Trapeliaceae) from tropical Australia. *Austrobaileya* 7(4): 659–663. The new species *Rimularia cerebriformis* Kantvilas is described, based on a collection and field observations from dry eucalypt woodland in the Northern Territory, Australia. It represents an unusual occurrence of a genus that occurs mostly in moist environments in cool to cold, temperate latitudes of both hemispheres. Relationships with other species of the genus are discussed briefly.

Key Words: lichens, *Rimularia cerebriformis*, Trapeliaceae, Northern Territory, Australia

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Introduction

Rimularia Nyl. is a genus of crustose lichens, widespread in cool to cold temperate areas of both hemispheres. General accounts of the genus are provided by Hertel & Rambold (1990) and Lumbsch (1997) and, although many additional species have been described since that time, the delimitation of the genus has remained generally unchanged. It is characterised by the presence of a *Chlorella*-type photobiont, lecideine apothecia with a well-developed, carbonised, cupulate excipulum, branched and anastomosing paraphyses, simple, non-halonate ascospores and, in particular, eight-spored asci of the *Rimularia*-type in the sense of Hertel & Rambold (1990) and Hafellner (1984); that is, with a well-developed tholus with amyloid flanks and an amyloid cap, and generally weakly amyloid internal structures. Species of *Rimularia* occur on rocks, bark, soil, bryophytes and other lichens.

Ten species of *Rimularia* have been recorded for Australia (McCarthy 2007), seven of which are found in Tasmania (Coppins & Kantvilas 2001; Kantvilas & Elix 2007), highlighting the predilection of the genus for cool, moist environments. Indeed, of the approximately 25 known species in the world,

only two, *R. globulispora* from New Guinea (Aptroot & Sipman 1991) and *R. gyromuscosa* from Taiwan (Aptroot & Sparrius 2003) occur in low latitudes. However, both of these are restricted to high elevations; the former is also known from Tasmania (Coppins & Kantvilas 2001). Hence the discovery of a species in tropical Australia, growing on exposed rocks in a lowland, very harsh environment, can be regarded as very unusual. This species is new to science and is described below.

Materials and methods

The study is based on collections and observations made by the authors, and on comparative material in herbaria, chiefly in the Tasmanian Herbarium (HO). Anatomical and morphological observations were undertaken using light microscopy, with thin hand-cut sections mounted in water, 10% KOH, Lactophenol Cotton Blue, and Lugol's Iodine after pretreatment with KOH (the last indicated as K/I). Ascospore measurements are presented in the format: smallest measurement–mean–largest measurement, and are based on 60 observations. Ascus measurements are presented in the same way but, owing to the paucity of material, are based on 20 observations only. Chemical composition was determined by thin-layer chromatography using standard methods (Orange *et al.* 2001).

Taxonomy

Rimularia cerebriformis Kantvilas **species nova** apotheciis intense gyrosis et igitur *Rimulariae gyrizanti* *R. gyromuscosaeque* optime congruens sed thallo inconspicuo, acidum gyrophoricum continenti, ascosporis 10–19 μm longis, 5–10 μm latis differens. **Typus:** Northern Territory. Edith Falls, 14°12'S, 132°13'E, on exposed sandstone outcrops in river gorge, 22 September 2007, *G.Kantvilas* 291/07 (holo: HO; iso: DNA).

Thallus inapparent, very thin and discontinuous. *Photobiont* cells very sparse and limited to the base of the apothecia, *Chlorella*-like, with individual cells globose to rhomboid, mostly 6–8 μm wide, occurring singly or in pairs, surrounded by a gelatinous sheath; colonies of unidentified cyanobacteria also present. *Apothecia* numerous and scattered, 0.5–0.8 mm wide, jet-black, strongly convex to subglobose, broadly adnate at the base, with disc intensely gyrose-contorted and margin indistinct and mostly camouflaged by the gyrae of the disc; in section comprising a mass of amorphous, opaque dark brown, sterile excipular tissue to *c.* 500 μm high, imbedded in the upper part with 'strands' or 'locules' of chiefly colourless hymenial tissue, 60–80 μm high and 50–80 μm wide. *Excipulum* in section K+ olive brownish at the edges, comprising irregularly roundish cells to 10 μm wide. *Hymenium* colourless to pale brownish in the uppermost part, K/I+ pale blue; *asci* eight-spored, broadly clavate, 40–47.8–55(–62) \times (13–)15–17.8–22 μm , of the typical *Rimularia*-type (*sensu* Hafellner 1984); *paraphyses* rather dense, frequently branched and anastomosing, robust, 1–3 μm thick, frequently rather moniliform and of variable thickness; apices neither capitate nor pigmented. *Ascospores* ovate, broadly ellipsoid to oblong, hyaline to occasionally slightly pale brownish, 10–13.6–19 \times (5–)6–7.3–9(–10) μm . *Pycnidia* not observed. **Fig. 1 & 2.**

Chemistry: gyrophoric acid (major) and lecanoric acid (minor) detected by thin-layer chromatography of the apothecia.

Distribution and habitat: The new species is known only from the type locality in the

upper reaches of a gorge cut by the Edith River. It grows on coarse, quartz sandstone associated with the Kombolgie Sub Group, formed between 1730 and 1822 mya (Kruse *et al.* 1994). The site is very exposed and, although protected from seasonal burning and floodwaters, may be subject to the microclimatic effects of the waterfall nearby during months of heavy rainfall. Vegetation in the surrounding area included a sparse mix of riparian and lithophytic species including *Xanthostemon eucalyptoides* F.Muell., *Ficus atricha* D.J.Dixon, *Syzigium eucalyptoides* (F.Muell.) B.Hyland subsp. *eucalyptoides*, *Cymbopogon procerus* R.Br. and species from the broader, low open woodland communities dominated by *Corymbia* K.D.Hill & L.A.S.Johnson, *Eucalyptus* L'Hérit., *Acacia* Mill. and *Triodia* R.Br. The occurrence of lichens at the locality is extremely sporadic. The surfaces of rock exposed to direct sunlight are almost bare, and even *Rimularia cerebriformis* itself appears to be very localised. More sheltered, shaded surfaces, often within clefts or beneath underhangs, are also very poorly colonised, although an unidentified species of *Buellia* was not uncommon.

Leliyn (Edith Falls) is situated in the wet-dry tropics of northern Australia and experiences year round high temperatures. The average maximum and minimum temperatures for Katherine, *c.* 50 km to the south, are 34°C and 20°C respectively; the type locality could expect even higher temperatures. The area receives a majority of its annual rainfall (1282 mm) during heavy monsoonal rains between December and March.

Notes: This species is detected in the field solely by the presence of its jet-black apothecia (**Fig. 1**), and even under low-power magnification, no thallus is visible. Scattered dull olive-brown to olive-green, irregular granules, nestling amongst the coarse grains of the substratum in the vicinity of the apothecia, belong to unidentified cyanobacteria. The degree of penetration of the lichen hyphae into the rock substratum, as determined by discoloration of the latter, appears to be limited to about the outermost 0.5 mm.

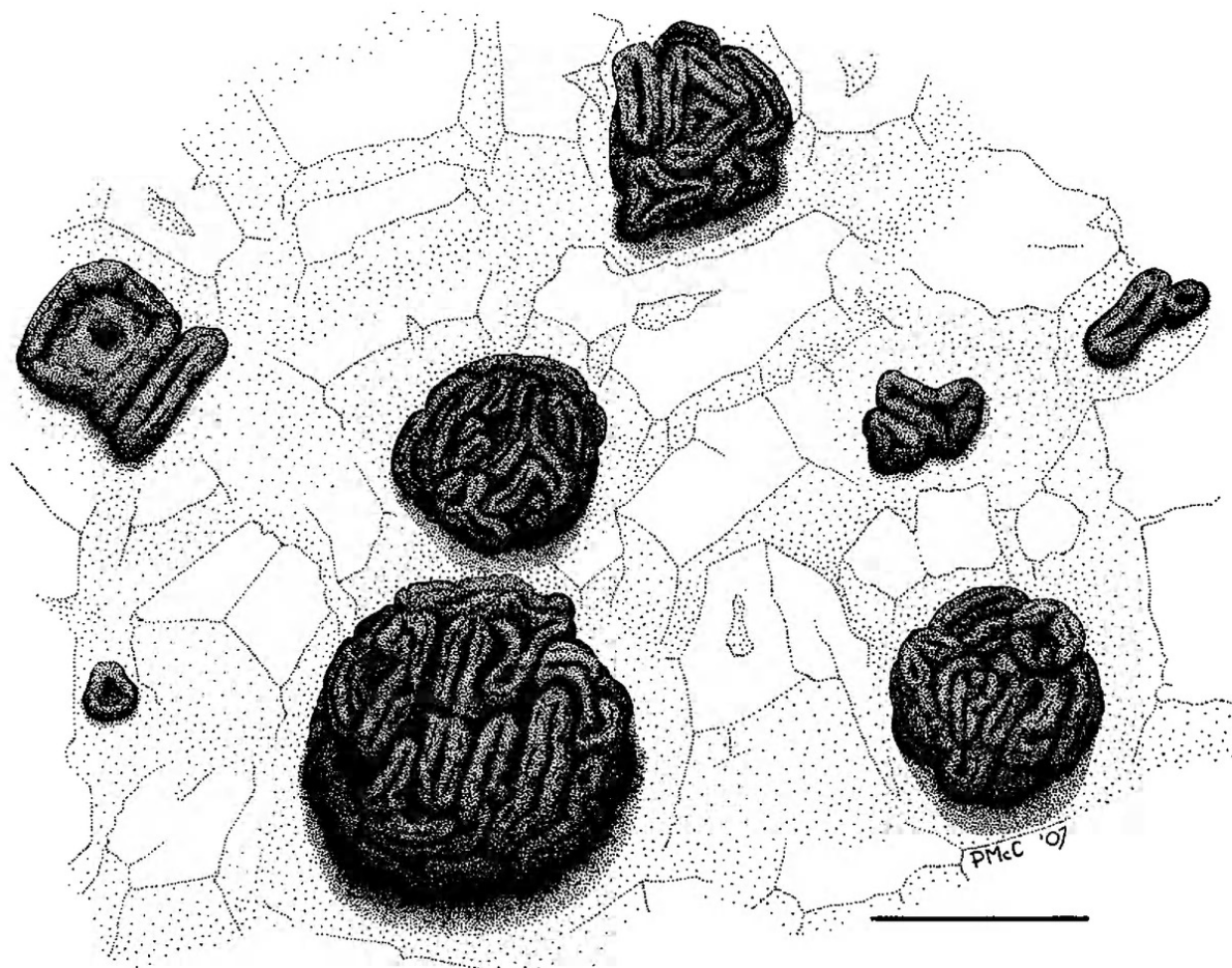


Fig. 1. *Rimularia cerebriformis* habit. Scale = 0.5 mm.

The gyrose apothecia of the new species align it to *Rimularia gyrizans* (Nyl.) Hertel & Rambold, which is widespread in cool temperate areas of Europe and North America, to *R. mullensis* (Stirt.) Coppins, endemic to Great Britain, and to *R. gyromuscosa* Aptroot, endemic to subalpine Taiwan. These species differ from *R. cerebriformis* mainly by having a well-developed thallus. There are also chemical differences: the first contains stictic (major) and norstictic (minor) acids, the second contains norstictic acid whereas the last lacks lichen substances. In addition, the ascospores of all of these species are markedly smaller than those of *R. cerebriformis*: $8\text{--}11 \times 4.7\text{--}8\text{ }\mu\text{m}$ in *R. gyrizans* and $(6\text{--}) 8\text{--}11 \times 4\text{--}7\text{ }\mu\text{m}$ in *R. mullensis* (Hawksworth & Coppins 1992), and $10\text{--}12.5 \times 5\text{--}7\text{ }\mu\text{m}$ in *R. gyromuscosa* (Aptroot & Sparrius 2003).

Amongst the Australian species of *Rimularia*, *Rimularia cerebriformis* is easily

distinguished by its gyrose apothecia. There is one taxon of as yet undetermined identity in alpine Tasmania that has similar apothecia, but this has a well-developed thallus containing norstictic acid. Gyrophoric acid is a relatively common substance in *Rimularia*, and amongst the Australian species, is also known from *R. australis* Hertel & Rambold, *R. exigua* Hertel & Rambold, *R. insularis* (Nyl.) Rambold & Hertel and *R. ramboldiana* Kantvilas & Elix; none of these species could in any way be confused with *R. cerebriformis*. Indeed the most superficially similar lichen known to us is *Stephanocyclos henssenianus* Hertel, a predominantly subantarctic, saxicolous lichen also known from Tasmania. That species lacks a conspicuous thallus and has prominent, subglobose, gyrose apothecia. However, it also has unequivocally *Porpidia*-type asci and belongs in the Porpidiaceae.

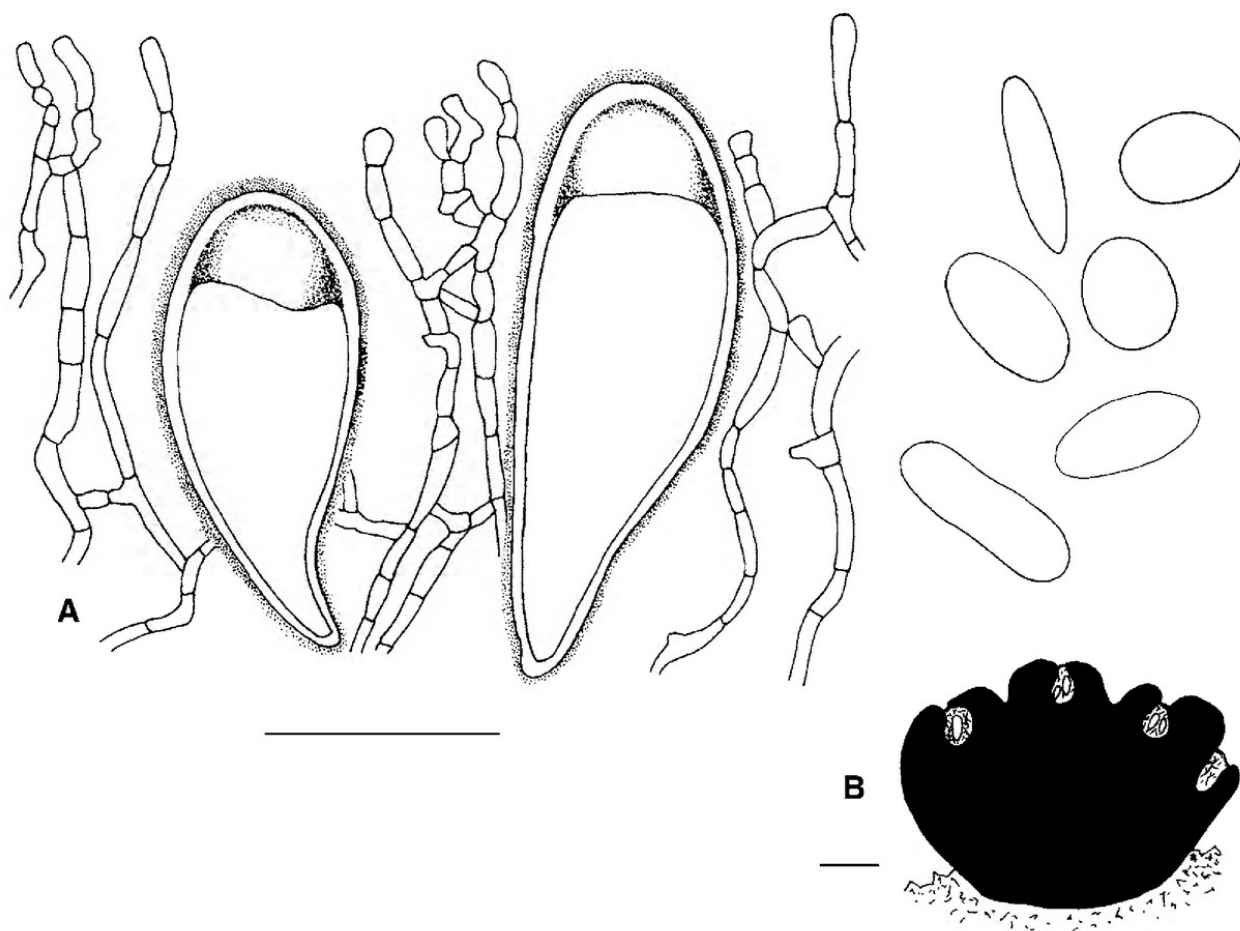


Fig. 2. *Rimularia cerebriformis* anatomy. A. asci, paraphyses and ascospores, with amyloid tissues stippled. Scale = 20 µm. B. vertical section through apothecium (schematic), showing carbonised, massive excipulum and 'locules' of hymenial tissue. Scale = 100 µm.

Acknowledgements

We thank Prof. Jack Elix for confirming the chemical composition of the new species and Dr Jean Jarman for preparing Figure 2 for publication. The companionship of colleagues from the CHAH-2007 field trip in the Northern Territory is cheerfully acknowledged.

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Kantvilas, Gintaras, McCarthy, Patrick Martin, and Stuckey, Benjamin. 2008. "A remarkable new species of Rimularia Nyl. (lichenized fungi: Trapeliaceae) from tropical Australia." *Austrobaileya: A Journal of Plant Systematics* 7(4), 659–663. <https://doi.org/10.5962/p.299760>.

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