



## *Micarea kartana* sp. nov. (lichenised Ascomycetes) from Kangaroo Island, South Australia

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**Abstract:** The new species, *Micarea kartana* Kantvilas & Coppins, is described from Kangaroo Island, South Australia. A member of the *M. prasina* Fr. complex, it is characterised by a goniocyst-like thallus that contains *sedifolia*-grey pigment and gyrophoric acid, grey to blackish apothecia, and 0–1-septate ascospores, 10–14 × 4–5.5 µm. It is compared briefly to selected other species of the group.

**Keywords:** lichens, Pilocarpaceae, taxonomy, new species, South Australia

### Introduction

The genus *Micarea* Fr. is a large and diverse assemblage of crustose lichen taxa which is widespread in boreal, austral, temperate and tropical regions, and occurs on a wide range of substrata, including bark, wood, rock and soil. Phylogenetic studies (Andersen & Ekman 2005) indicate that the genus is highly variable and contains infra-generic groups worthy of generic rank [e.g. *Brianaria* (Ekman & Svensson 2014) and *Szczawinskia* (Funk 1983)], as well as taxa with their closest affinities in other genera, for example *Psilolechia* A.Massal. (Coppins & Purvis 1987). In addition, several infra-generic groups can be recognised within *Micarea* on the basis of their anatomy, morphology and chemistry, and may well be separated into distinct genera in the future (Andersen & Ekman 2005).

In Australia, the genus remains poorly known. Occasional new species have been published (Stirton 1875; Jatta 1911; Coppins & Kantvilas 1990; McCarthy & Elix 2016a, b), and some chiefly Northern Hemisphere taxa have been confirmed as being present in the region (e.g. Rambold 1989; Coppins 2009). However, the 24 species listed by McCarthy (2017) are hardly representative of what is clearly a very species-rich genus in Australia. Unpublished studies by the author in Tasmania (in collaboration with B.J. Coppins) have indicated in the order of a dozen additional, mostly undescribed taxa there, and potentially many more are to be found in the extensive unidentified collections held in Australian herbaria.

The *Micarea prasina* group, of which the new species is a member, includes the generic type and was first recognised as such by Coppins (1983) for species with a goniocyst-like thallus, strongly convex, immarginate apothecia and mostly 0–1-septate, ellipsoid-ovoid ascospores. The group has since been the focus of

chemical (Elix *et al.* 1984) and morphological and phylogenetic studies (e.g. Czarnota & Guzow-Krzemińska 2010) and, as a result, many species have been recognised (e.g. Coppins & Tønsberg 2001; van den Boom & Coppins 2001; Czarnota 2007; Coppins 2009; Czarnota & Guzow-Krzemińska 2010; Brand *et al.* 2014; Guzow-Krzemińska *et al.* 2016; van den Boom *et al.* 2017). The group is well represented in Australia where it is especially abundant on rotting wood and bark in forested habitats, but its taxonomy is poorly resolved and with most collections ascribed either to *M. prasina* Fr. itself, or to the related *M. micrococca* (Körb.) Gams ex Coppins. However, additional taxa are present and several unpublished entities, recognised by Coppins and Kantvilas (unpubl. ms.) were listed by Jarman & Kantvilas (2001) and Kantvilas & Jarman (2012) in their study of wet eucalypt forest, a prime *Micarea* habitat.

Here a further member of the *M. prasina* group is described from Kangaroo Island, South Australia, and compared to other members of the complex.

### Material and methods

Anatomical and morphological observations were undertaken using light microscopy, with thin hand-cut sections mounted in water, 10% KOH, lactophenol cotton blue, Lugol's iodine after pretreatment with dilute KOH, and ammoniacal erythrosin. Ascospore measurements are presented in the format: 5<sup>th</sup> percentile–average–95<sup>th</sup> percentile, with outlying values given in brackets. Routine chemical analyses by thin-layer chromatography follow standard methods (Elix 2014). Comparative data on related species were derived from the literature as cited. Nomenclature of pigments follows Meyer & Printzen (2000).

## The species

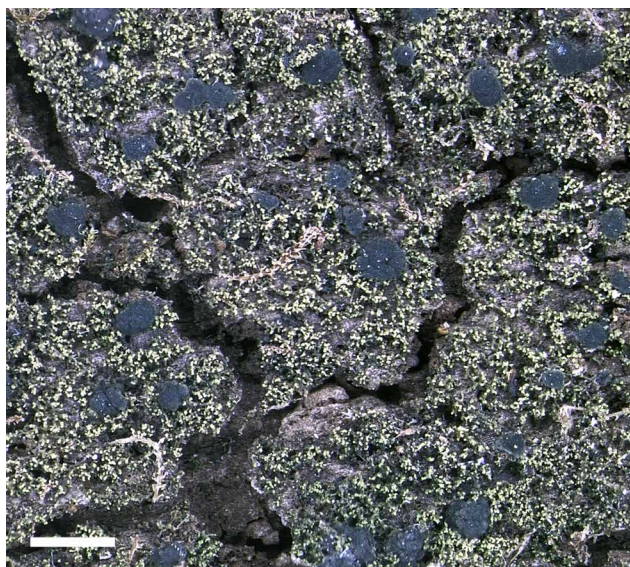
### *Micareea kartana* Kantvilas & Coppins sp. nov.

*Micareae prasinae s.lat. affinis sed thallo acidum gyrophoricum et pigmentum "sedifolia-grisea" continenti, apotheciis sordidis vel denigratis, pigmentum singulare olivaceum continentibus et ascosporis comparate late ellipsoideis, 10–14 µm longis, 4–5.5 µm latis distinguibilis.*

**Typus:** Australia, South Australia: Kangaroo Island, Grassdale Lagoon, 36°00'S 136°53'E, 20 m alt., on a moist log of rotting eucalypt in dry sclerophyll forest, 4 Oct. 2015, G. Kantvilas 338/15 (holo: HO 580610; iso: AD, E).

**Mycobank number:** MB 824888.

*Thallus* minutely granular, generally bright green when wet or dry, here and there with dull greyish patches, composed of coralloid, rather isidioid goniocysts and forming a brittle, thinly dispersed crust 0.2–0.3 mm thick; goniocysts 30–45 µm wide, composed of fascicles of photobiont cells in a mostly colourless gel matrix with patches of greyish, *sedifolia*-grey pigment, K+ violet, C+ violet; photobiont a micareoid green alga with ± globose cells 5–11 µm wide. *Apothecia* scattered, dull grey to blackish, 0.2–0.6 mm wide, c. 0.15–0.25 mm tall, plane to convex, sometimes very strongly so, nestled among the goniocysts, immarginate from the outset but occasionally a little less intensely pigmented at the outer rim. *Excipulum* reflexed and ± excluded, at most visible only in section in the youngest apothecia as a layer c. 20 µm thick of loosely entangled, branched and anastomosing hyphae. *Hypothecium* 40–80 (–170) µm thick, interspersed with oil droplets, patchily olive-green, intensifying greenish to yellowish green in both K and N, C+ yellowish brown and fading. *Hymenium* 40–55 µm thick, mostly colourless but overlain by a patchy layer of olive-green pigment (as in the hypothecium) which forms vertical bands

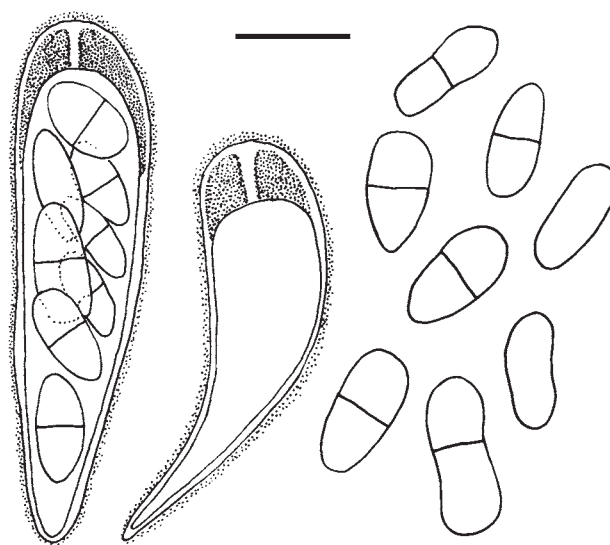


**Fig. 1.** *Micareea kartana* habit (holotype). Scale = 1 mm.

between the asci. *Paraphyses* numerous, branched and anastomosing, 0.8–1 µm wide, with the apices not enlarged. *Asci* 8-spored, 40–52 × 10–15 µm, with a well-developed, intensely amyloid tholus, pierced by an indistinct channel that mostly lacks a darker staining ring structure (approximating the Pilocarpaceae-type). *Ascospores* ellipsoid to ovoid, 0–1-septate, hyaline but with occasional older spores steeped in olive-green pigment, (9–) 10–11.6–14 (–15) × 4–4.9–5.5 (–6) µm (n = 100). *Pycnidia* not found. *Chemistry:* gyrophoric acid; thallus in squash C+ faintly reddish. **Figs 1–2.**

**Etymology.** The specific epithet is derived from the name *Karta* (meaning island of the dead), given to Kangaroo Island by Australia's indigenous inhabitants.

**Remarks.** The diagnostic characters of *Micareea kartana* are summarised in Table 1, where this species is compared to a selection of other taxa from the *M. prasina* group; of these, *M. prasina*, *M. micrococca* and *M. viridileprosa* have all been recorded for Australia (McCarthy 2017). Distinguishing members of this group can be tricky (e.g. see Barton & Lendemer 2014), and characters that have been usefully applied include thallus chemistry, apothecial pigments, anatomy and morphology, ecological and geographical distribution, as well as DNA-sequence data. The new species has several highly diagnostic characteristics. For example, the presence of *sedifolia*-grey pigment in the thallus is commonly encountered in the *M. prasina* group, but in such instances, one might expect that the dark colouration of the apothecia would also be due to this pigment. Instead, *sedifolia*-grey is absent in the apothecia and replaced by an unusual olivaceous pigment that intensifies greenish to yellowish green in both K and N–, and reacts C+ yellowish brown. Furthermore, the ascospores of *M. kartana* are noticeably wider and more broadly ellipsoid than in other members of the group.



**Fig. 2.** *Micareea kartana* asci and ascospores, with amyloid parts stippled (holotype). Scale = 10 µm.

Three additional corticolous species of *Micarea* have been recorded from Kangaroo Island (unpublished data). None are common or widespread and all are easily distinguished from *M. kartana*. These taxa include *M. prasina*, whose distinguishing features are summarised in Table 1, and two taxa, *M. denigrata* (Fr.) Hedl. and *M. globusella* (Nyl.) Coppins, that both contain gyrophoric acid and *sedifolia*-grey pigment, but with the latter, significantly, confined to the apothecia. *Micarea denigrata* differs further by having 0–1-septate ascospores, 10–12 × 3–4 µm, whereas *M. globusella* differs by having ascospores 1,3 (–7)-septate and 15–28 × 2.5–3 µm (Czarnota 2007; Coppins 2009).

**Ecology and distribution.** The new species is known only from the type locality in dry sclerophyll forest, where it grew on a rotting, charred eucalypt log on the ground, sheltered by undershrubs. The habitat is fairly typical for *Micarea* species although, in general, such forests tend to be rather too open and dry for these lichens. Thus, whereas the genus is species-rich in moister, cooler, forested parts of Australia, on Kangaroo Island, only three additional corticolous or lignicolous taxa have been recorded to date (unpubl. data; see above). Lichens associated with the new species included *Leptogium pecten* F.Wilson, *Carbonicola foveata* (Timdal) Bendiksby & Timdal and *Hertelidea pseudobotryosa* R.C.Harris, Ladd & Printzen.

#### Additional specimen examined

SOUTH AUSTRALIA, Kangaroo Island: type locality, 2015, *G. Kantvilas 337/15* (AD, HO).

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**Table 1.** Salient features of selected members of the *Micarea prasina* complex. All taxa have a goniocyst-like thallus.

	thallus	chemistry	apothecia	ascospores	conidia
<i>M. byssacea</i> (Th.Fr.) Czarnota <i>et al.</i> <sup>1</sup>	green to olive-green, with <i>sedifolia</i> -grey pigment	methoxymicareic acid	pallid to grey to black, often mottled, with <i>sedifolia</i> -grey pigment	(6–) 8–12 (–13) × 2.7–3.5 (–4.2) µm, 0 (–1)-septate	mesoconidia: (3.8–) 4.5–5.5 × 1.2–1.5 µm; microconidia: 5–7.5 (–8) × 0.8–1 µm
<i>M. kartana</i> Kantvilas & Coppins	bright green, with <i>sedifolia</i> -grey pigment	gyrophoric acid	dull grey to blackish, with unknown olive pigment	9–13.5 (–15) × 4–5.5 (–6) µm, 0–1-septate	unknown
<i>M. levicula</i> (Nyl.) Coppins <sup>2</sup>	pale greenish, becoming ± isidioid	gyrophoric acid	pallid	8–12 × 2.5–3.5 µm, 0–1-septate	unknown
<i>M. micrococca</i> (Körb.) Gams <i>ex Coppins</i> <sup>1</sup>	bright green to olive-green	methoxymicareic acid	pallid, without pigments	10–12 (–16) × 3–4.5 µm, 0 (–1)-septate	mesoconidia: (3.8–) 4.5–5.5 × 1.2–1.5 µm; microconidia: 5–7.5 (–8) × 0.8–1 µm
<i>M. prasina</i> Fr. <sup>3</sup>	pale to dark grey-green, sometimes with <i>sedifolia</i> -grey pigment	micareic acid	pale to dark grey or blackish, sometimes with <i>sedifolia</i> -grey pigment	(7–) 8–12 (–14) × (2.3–) 3–4 (–5.5) µm, 0–1 (–3)-septate	mesoconidia: (3.5–) 4–6 × 1–1.2 (–1.5) µm; microconidia: (5–) 5.5–8 × 0.5–1 µm
<i>M. subviridescens</i> (Nyl.) Hedl. <sup>3</sup>	pale grey-green to bluish green, sometimes with <i>sedifolia</i> -grey pigment	prasinic acid	pallid to grey to blackish, with <i>sedifolia</i> -grey pigment	10–18 × 4–6 µm, (0–) 1–3-septate	unknown
<i>M. viridileprosa</i> Coppins & v.d. Boom <sup>2</sup>	bright green, becoming ± soresiate	gyrophoric acid	pallid, without pigments	8–12 (–14) × 2.5–4 µm, 0–1 (–2)-septate	mesoconidia: 4.5–6 × 1.3–2 µm
<i>M. xanthonica</i> Coppins & Tønsberg <sup>4</sup>	pale yellow-green	thiophanic acid	pallid, without pigments	9.3–14 (–14.3) × (3.5–) 3.8–4.2 (–4.7) µm, (0–) 1 (–3)-septate	unknown

**Data sources.** <sup>1</sup> Czarnota & Guzow-Krzemińska (2010); <sup>2</sup> van den Boom & Coppins (2001); <sup>3</sup> Coppins (2009); <sup>4</sup> Coppins & Tønsberg (2001).



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