

**A new species of the lichenicolous genus *Phaeospora*
Hepp ex Stein (Verrucariales) from Australia**

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Abstract

A pyrenocarpous microfungus, collected from consolidated soil in *Eucalyptus*-dominated woodland in the Australian Capital Territory, proved to be a species of the lichenicolous genus *Phaeospora* Hepp ex Stein (Verrucariales), probably parasitic on the endemic *Sarcogyne terrulenta* P.M.McCarthy & Elix (Acarosporaceae). *Phaeospora australiensis* P.M.McCarthy & Elix has minute, semi-immersed to almost superficial perithecia lacking an involucrellum and paraphyses, but with a uniformly brown-black excipulum, simple paraphyses, an amyloid hymenium, (4–)8-spored fissitunicate asci, and 3-septate ascospores that are medium grey or medium brown or brownish grey, lack a perispore, and measure 12–22 × 4.5–8 µm.

Introduction

The lichenicolous fungal genus *Phaeospora* Hepp ex Stein is most diverse in temperate and higher latitudes of both hemispheres. It is characterized by simple, perithecioid ascomata with fissitunicate, (4–)8-spored asci, paraphyses but no paraphyses, and brown 3(–)7-septate ascospores. Fourteen species are known to be parasitic on various Parmeliaceae, as well as on species of *Aspicilia*, *Catolechia*, *Diplotomma*, *Evernia*, *Lecania*, *Lecanora*, *Micarea*, *Myriolecis*, *Pannaria*, *Peltigera*, *Placopsis*, *Protoblastenia*, *Pseudocyphellaria*, *Rhizocarpon*, *Squamarina* and *Verrucaria* (Hawksworth 1980, 1983, 2003; Clauzade *et al.* 1989; Alstrup & Hawksworth 1990; Øvstedal & Hawksworth 1986; Horáková & Alstrup 1994; Alstrup & Olech 1996; Alstrup & Hansen 2001; Galloway 2007; van den Boom & Etayo 2014; Zhurbenko 2014; Diederich *et al.* 2018; and others). Two additional taxa were described as new from *Acarospora* and *Rinodina* in the South Shetland Islands by Alstrup *et al.* (2018); however, the names lacked registration numbers and they are, therefore, invalid. Previously unknown in Australia (McCarthy 2015), the genus is represented in New Zealand by *P. perrugosaria* (Lindsay) R.Sant., which occurs on the apothecia of *Placopsis perrugosa* (Nyl.) Nyl. (Galloway 2007).

In this contribution, *Phaeospora australiensis* P.M.McCarthy & Elix sp. nov. is described from a community of terricolous lichens in the Australian Capital Territory. While the identity of the host lichen is not known with complete certainty, it is probably the endemic, crustose species *Sarcogyne terrulenta* P.M.McCarthy & Elix (Acarosporaceae).

Methods

Observations and measurements of ascomatal anatomy, asci and ascospores were made on hand-cut sections mounted in water and dilute KOH (K). Asci were also observed in Lugol's Iodine (I), with and without pretreatment in K.

***Phaeospora australiensis* P.M.McCarthy & Elix, sp. nov.**

Fig. 1

MycoBank No.: **MB835578**

Lichenicolous on an immersed, terricolous host, probably depauperate thalli of *Sarcogyne terrulenta* P.M.McCarthy & Elix, with black, semi-immersed to almost superficial, simple perithecia, 0.11–0.25 mm diam., each with a brown-black excipulum, unbranched paraphyses (c. 10–18 × 2–3 µm) but without paraphyses. Hymenial gel KI+ medium blue. Asci (4–)8-spored, 51–62 × 10–15 µm. Ascospores 3-septate, medium grey or medium brown or brownish

grey, narrowly ellipsoid to oblong-fusiform or oblong, thin-walled and lacking a perispore at maturity, 12–22 × 4.5–8 µm.

Type: Australia. Australian Capital Territory, c. 5 km W of Canberra, Cook, between Bindubi Street and the horse paddocks, 35°16'08"S, 149°04'29"E, 630 m alt., probably lichenicolous on *Sarcogyne terrulenta* on a consolidated soil bank in dry *Eucalyptus* woodland, *J.A. Elix 46984*, 25.iii.2020 (holotype – CANB).

Vegetative hyphae indistinct, hyaline. *Ascomata* perithecia, moderately numerous, solitary, scattered, semi-immersed and hemispherical to almost superficial and subglobose, (0.11–)0.17(–0.25) mm diam. [*n* = 50], jet-black, the surface smooth and dull to glossy; apex rounded or slightly flattened; ostiole central, inconspicuous or in a shallow depression c. 20 µm wide. *Involucrellum* absent. *Excipulum* uniformly dark brown to brown-black, 30–35 µm thick at the apex, 15–25 µm thick at the sides and base, K–; lateral and basal excipulum 5–8 cell layers thick in thin section, the cells rather thick-walled, narrowly to broadly ellipsoid, or oblong-ellipsoid to fusiform, 5–8 × 2–4(–5) µm. *Subhymenium* hyaline, 10–15 µm thick. *Paraphyses* absent. *Periphyses* unbranched, c. 10–18 × 2–3 µm. *Centrum* obpyriform to ± globose; hymenial gel I+ orange-brown, KI+ medium blue. *Asci* (4–)8-spored, fissitunicate, narrowly to broadly clavate, clavate-cylindrical or somewhat obclavate, 51–62 × 10–15 µm [*n* = 10], when immature the wall markedly thickened at the apex (I–, KI–) and with a narrow ocular chamber, at maturity the tholus reduced, with a thin, KI+ dark blue cap and the ocular chamber absent. *Ascospores* irregularly biseriolate or ± massed in the ascus, 3-septate, narrowly ellipsoid to oblong-fusiform or oblong, usually straight, occasionally slightly curved, rarely sigmoidal, not to slightly or deeply constricted at the septa, initially hyaline, later pale grey, eventually medium grey or medium brown or brownish grey, transverse septa often markedly darker than the external spore wall, commonly the 2 end cells slightly to distinctly paler than the 2 inner locules, (12–)17.5(–22) × (4.5–)6.5(–8) µm [*n* = 137]; apices rounded or subacute; spore wall very thin, usually lacking a perispore (this occasionally visible and very thin in immature ascospores); spore contents clear, not granulose, most locules with a single large vacuole. *Pycnidia* absent.

Etymology: The epithet *australiensis* refers to known distribution of this species.

Remarks

The new species can be distinguished from most known taxa of *Phaeospora* by the combination of its perithecial dimensions, ascospore size and septation, the amyloid reaction of the hymenium, the absence of a perispore and the presumed host species. It is probably closest to the type species of the genus, *P. rimosicola* (Leighton ex Mudd) Hepp., a parasite of saxicolous *Aspicilia*, *Diplotomma* and *Rhizocarpon* from Iceland and from northern Europe to Central Asia, the latter having brown vegetative hyphae, smaller perithecia with a much thinner excipulum and shorter paraphyses, and ascospores with a conspicuous perispore (Hawksworth 1983; Clauzade *et al.* 1989).

Although the identity of the host lichen of *Phaeospora australiensis* is not known with complete certainty, it is probably the endemic *Sarcogyne terrulenta*, the most abundant terricolous species on comparatively firm and well-drained clay soil at the type locality. Associated species include *Acarospora tasmaniensis* K.Knuksen & Kocourk., *Cladia aggregata* (Sw.) Nyl., a sparse *Cladonia* sp. (squamules only), *Diploschistes* sp., *Gyalidea psammoica* (Nyl.) Lettau ex Vězda, *Lecidea terrena* Nyl., *Micarea albornii* Coppins, *M. humilis* P.M.McCarthy & Elix and *Trapelia terrestris* Elix & P.M.McCarthy. The parasite-host interaction is not apparent on the usually robust, fertile colonies of the *Sarcogyne* which are pale greyish brown or pale to medium sandy brown and rimose or quasi-areolate (McCarthy & Elix 2020). Rather, and assuming the relationship is an exclusive one, it occurs primarily on sterile areas of endosubstratal thalli, where the host is most effuse and nondescript and where the immersed algae form sparse or rather dense clumps, but not a distinct layer. Cells are chlorococcoid, globose or broadly ellipsoid, thin-walled and (5–)6–11(–12) µm wide, while

the interstitial, mycobiont hyphae (or possibly the vegetative hyphae of the parasite) are hyaline, thin-walled, long-celled and 1.5–2.5 µm wide. *Acarospora tasmaniensis* is a noteworthy record here. Formerly *Polysporina terricola* Kantvilas and endemic to Tasmania (Kantvilas 1998), this is among the first records of the species from mainland Australia (see below).

The type collection of *Phaeospora australiensis* consists of approximately 100 perithecia on about 25 square centimetres of soil crust, and the only indication of a recognizable lichen is a single apothecium of *Lecidea terrena*. A second visit to that locality yielded two small clusters of perithecia adjacent to, or possibly on *Sarcogyne* colonies. In the absence of an unambiguous association between the presumed parasite and host lichen, an alternative, but admittedly slim possibility, is that this is a lichenized or at least partially lichenized species of *Phaeospora*.

ADDITIONAL SPECIMEN EXAMINED

Australian Capital Territory. ● c. 5 km W of Canberra, Cook, between Bindubi Street and the horse paddocks, 35°16'08"S, 149°04'29"E, 630 m alt., probably lichenicolous on *Sarcogyne terrulenta* inhabiting a consolidated soil bank in dry *Eucalyptus* woodland, P.M. McCarthy 4936, 8.v.2020 (CANB).

Acarospora tasmaniensis K.Knudsen & Kocourk., *Opusc. Philolich.* **21**, 147 (2015)
Polysporina terricola Kantvilas, *Lichenologist* **30**, 552 (1998)

SPECIMENS EXAMINED

Australian Capital Territory. ● c. 5 km W of Canberra, Cook, between Bindubi Street and the horse paddocks, 35°16'08"S, 149°04'29"E, 630 m alt., on a consolidated soil bank in dry *Eucalyptus* woodland, P.M. McCarthy 4937, 8.v.2020 (CANB).

New South Wales. ● Southern Tablelands, adjacent to Kings Highway, 12 km E of Bungendore, 35°15'01"S, 149°34'29"E, 865 m alt., on consolidated soil in open *Eucalyptus* woodland, J.A. Elix 46920, 20.ii.2020 (CANB).

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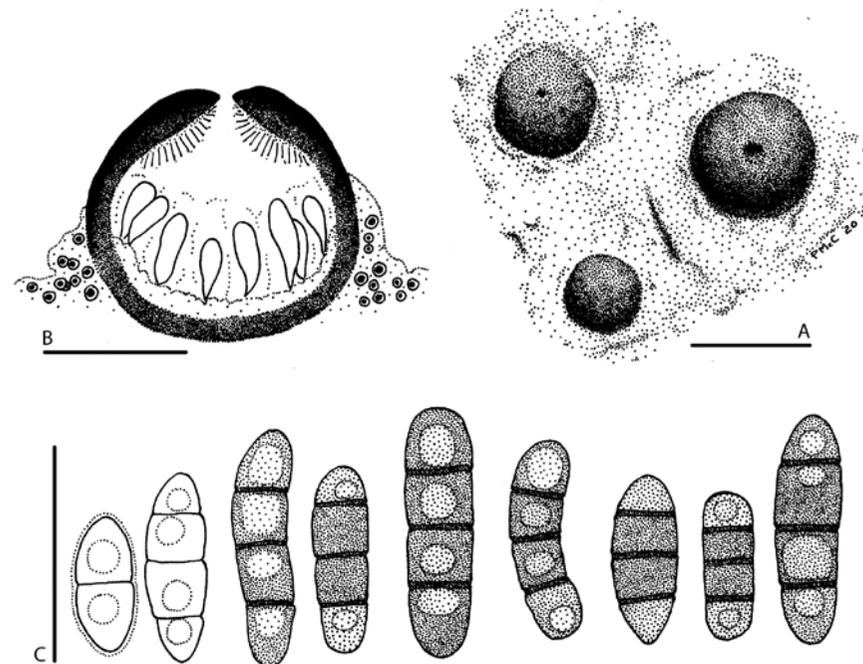


Figure 1. *Phaeospora australiensis* (holotype). A, Perithecia; B, Section of a perithecium and adjacent host thallus (semi-schematic). C, Ascospores (two hyaline ascospores on the left are immature). Scales: A = 0.2 mm; B = 0.1 mm; C = 20 µm.