A new *Sclerococcum* (Dactylosporaceae, Ascomycota) on *Gloeocapsa* from Antarctica

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Abstract
The new species *Sclerococcum gloeocapsae*, growing on the cyanobacterium *Gloeocapsa* sp. in Marie Byrd Land, Antarctica, is described and illustrated.

Introduction
In the austral summer of 1987–1988, a combined geological and biological expedition was made to Edward VII Peninsula (77°00′–78°30′S, 152°–156°W), Marie Byrd Land. A general survey was made of algae, mosses, lichens and microfauna (Broady 1989) and of bird life (Broady et al. 1989). In total, 376 samples of lichens were collected at 23 nunataks in the Rockefeller and Alexandra Mountains. The collections are deposited at CHR. A few of the collections contain a black crust, identified as a *Gloeocapsa* species, of which five were found with apothecia. The apothecia proved to belong to an undescribed *Sclerococcum* species, which is documented below.

Methods
Apothecial characteristics were examined by light microscopy on hand-cut sections mounted in 10% KOH or Lugol’s reagent. Thallus sections were investigated in 10% KOH. Measurements of ascospores and paraphyses were made in 10% KOH. Hamathecial filaments are referred to as “paraphyses” regardless of their origin.

New species
*Sclerococcum gloeocapsae* Øvstedal, Broady & Fryday, sp. nov. Figs 1–4

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Somatic stage as ramified, brown hyphae in colonies of cyanobacteria. *Apothecia* up to 0.8 mm wide, flat with a thin margin, brown-black, sessile to half-immersed. *Hymenium* pale brownish, 70–80 µm high, 1+ blue. *Asci* 30–32 × 7–8 µm, non-amyloid, clavate, no apical amyloid structures observed. *Paraphyses* c. 1.5 µm wide, ramified to slightly anastomosed, the end cell not enlarged. *Ascospores* 8 per ascus, brown, 3-septate, 19–21 × 5–6 µm, not constricted at the septa. *Hypothecium* brown, 50–60 µm high, pseudoparenchymatous. *Proper eixcle* as an extension of the hypothecium. Below the hypothecium a 40–45 µm high zone of brown tissue, with cell walls darker brown, pseudoparenchymatous, with large cells, the individual cells 8–9 µm wide.

Ecology: growing in *Gloeocapsa* sp., which occurs as crustose, blackish mats, 3–4 cm wide, the colonies up to 30 µm diam. over moribund bryophytes and mineral soil. Mucilage slightly pink-purple, lamellate, the individual cells globose, 2–2.5 µm diam. Also, some filaments of *Stigonema* are found in the thallus, but they appear not to be associated with the hyphae.

Remarks
The genus *Sclerococcum* Fr. (incl. *Dactylospora* Körb., see Diederich et al. 2018) includes approximately 60 species, mostly lichenicolous, but some at least partly saprophytic (Hafellner 1979; Triebel 1989). It is characterized above all by having brown, septate to submuriform ascospores, with black, apothecial ascomata and the asci with an external euamyloid gelatinous cap (Hafellner 1979; Elks et al. 2019). The present species more or less conforms to the description of the genus, except that an external euamyloid gelatinous cap of the asci is not developed, and the paraphysis tips are not enlarged and dark-capped. Olariaga et al. (2019) described the new genus *Pseudsclerococcum*, growing on wood, with many similarities to *Sclerococcum*, but differing in having cylindrical asci lacking a euamyloid gelatinous cap. A multigene phylogeny affirmed that both genera belong in Dactylosporaceae with *Pseudosclerococcum* basal to *Sclerococcum*. Unfortunately, the material of *S. gloeocapsae* is too old for molecular studies to be successful.

We originally intended to name our new species *Sclerococcum antarcticum*, but discovered that Alstrup et al. (2018) had described a new species *Dactylospora antarctica* Alstrup & Olech from the South Shetland Islands, which would have to be transferred to *Sclerococcum* as *S. antarcticum* (Diederich et al. 2018). Unfortunately, the authors failed to register any of the six new genera and 31 new species described in that paper, so none is validly published, and therefore the names are still available. However, anticipating that the authors will eventually rectify their omission and validate the names, as well as describe *D. antarcticum* in its correct genus, we decided not to use that epithet.

*Dactylospora antarctica* nom. inval. differs from our new species in having 1-septate ascospores and being lichenicolous on a *Leccidea* sp. Alstrup et al. (2018) also mention a collection from the South Shetland Islands, which was lichenicolous on a *Pertusaria* sp., that they called *D. rostrupii* Alstrup (= *Sclerococcum rostrupii* (Alstrup) Ertz & Diederich). It was described from the Faroe Islands, where it occurred on *Pertusaria dactylina* (Ach.) Nyl. [= *Lepra dactylina* (Ach.) Hafellner], and has 3-septate ascospores of a length similar to those of *S. gloeocapsae* but significantly wider (19–25 × 8.5–11 µm; Alstrup et al. 1994). Most other *Sclerococcum* species with 3-septate ascospores have much shorter ascospores (<15 µm long), although those of *S. suburceolatum* (Fryday & Coppins) Ertz & Diederich (Fryday & Coppins 2012) are similar [(14–)17–21(–24) × (4.8–)6.0–7.0(–9.5) µm]; however, that species is also lichenicolous.

The symbiosis between the fungus and the *Gloeocapsa* colonies could be mutualistic, commensalistic or antagonistic (Hawksworth 1988). In this case, both partners seem to be thriving, so there is obviously no antagonism (parasitism). Whether the symbiosis is mutualistic or commensalistic is impossible to determine at this stage. That the fungus profits from chemical products from *Gloeocapsa* is obvious, but whether the cyanobacterium profits from extracellular products is uncertain. Whether the fungus is the primary partner or commensalistic or antagonistic (Hawksworth 1988) is uncertain, but even if the fungal partner does not contribute to the thallus structure.

Cyanobacterial crusts are common in both the Arctic and Antarctic, and they are important soil binders (Williams et al. 2017). The presence of a symbiotic fungus and a possible primitive lichen is an interesting addition to the biodiversity of these habitats.

**ADDITIONAL SPECIMENS EXAMINED**
Antarctica. Marie Byrd Land, Edward VII Peninsula, Rockefeller Mountains, Mount Franklin, nunatak, black crust over mineral soil, P.A. Broady s.n., xii.1987–i.1988 (CHR-647569; CHR-647552; CHR-647556; CHR-647557).
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A new terricolous species of *Fellhaneropsis* (lichenized Ascomycota, Pilocarpaceae) from Papua New Guinea

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Abstract

*Fellhaneropsis humicola* P.M.McCarthy is described from consolidated soil in montane rainforest in Morobe Province, Papua New Guinea. The new species has a pale, terricolous, crustose thallus that is corticate and lacks lichen substances, rather large, dark brown to blackish, adnate to sessile apothecia (the margin often a little paler and the excipulum partly K+ crimson-brown in section and leaching a yellowish, non-crystalline solution). The excipulum is predominantly dark brown and it is prosoplectenchymatous in section; the hypothecium is pale brown to pale golden brown, and the hyaline, narrowly ellipsoid to oblong-fusiform, 3-septate ascospores are 17–25 × 5–8 µm.

Introduction

*Fellhaneropsis* Sérus. & Coppins (Pilocarpaceae), a genus of ten species, is most reliably characterized and distinguished from *Fellhanera* Vězda by having apothecia with a proper excipulum of prosoplectenchymatous rather than paraplectenchymatous hyphae, and filiform rather than pyriform to bacilliform conidia, although not all of the described taxa are fertile or possess pycnidia (Sérusiaux 1996; Thor *et al.* 2000; Lücking *et al.* 2001; Ovstedal & Gremmen 2006, 2009; Kantvilas & Lücking 2009; Aptroot 2012; Ekman 2015; McCarthy *et al.* 2017).

In this contribution, a new terricolous species is reported from montane rainforest in northern Papua New Guinea. Methods are as described in McCarthy *et al.* (2017).

*Fellhaneropsis humicola* P.M.McCarthy, sp. nov.

Figs 1, 2

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Characterized by the thin and very pale, terricolous thallus of smooth, interlocking areoles, green, globose algae, 7–10 µm diam., a thin, prosoplectenchymatous cortex, and the absence of lichen substances. The apothecia are lecideine, adnate to sessile, (0.38–)0.72(–1.22) mm wide and dark greenish brown to blackish, also partly K+ crimson-brown in section and leaching a yellowish non-crystalline solution. The proper excipulum is cupulate, mainly dark brown and prosoplectenchymatous in section; epihymenium indistinct; hypothecium pale brown to pale golden brown; hymenium pale yellowish to pale brown; paraphyses simple, sparingly branched or distally anastomosing. Asci *Byssoloma*-type, (4–)8-spored; ascospores 3-septate at maturity, narrowly ellipsoid to oblong-fusiform, 17–25 × 5–8 µm.

**Type:** Papua New Guinea, Morobe Province, Angabena Ridge, Aseki–Bulolo road, 4 km NE of Aseki, 07°19’S, 146°13’E, alt. 1750 m, on consolidated soil of road bank in montane rainforest, J.A. Elix 11956 & H. Streimann, 4.xii.1982 (holotype – CANB 00677482).

**Thallus** crustose, superficial on consolidated soil, scattered or continuous and forming colonies up to c. 3 cm wide, white to very pale grey, 50–80–100 µm thick, composed of tightly intertwined or interlocking lobe-like areoles (resembling minute jigsaw pieces), these smooth, plane to convex, internally 0.08–0.15(–0.2) mm in maximum extent, to 0.4 mm long and 0.1 mm wide at the thallus margin, non-amyloid (I–), not containing calcium oxalate (H₂SO₄–). **Cortex** prosoplectenchymatous, hyaline, 12–20 µm thick; hyphae 1.5–2(–2.5) µm wide. **Algal layer** c. 50 µm thick; cells green, globose, 7–10 µm diam. **Medulla** poorly delimited; hyphae 1–2 µm wide, thin-walled. **Prothallus** marginal, dark metallic grey and up to 1 mm wide, or not apparent. **Apothecia** very numerous, adnate to sessile or sessile, lecideine, mostly solitary and rounded or shallowly lobate, (0.38–)0.72(–1.22) mm wide [n = 60], partly K+ crimson-brown in section and leaching a yellowish non-crystalline solution; margin rather prominent, usually persistent and 70–100 µm thick in surface view, or becoming almost...