

# Four additional lichens from the Antarctic and South Georgia, including a new *Leciophysma* species

Dag O. Øvstedal<sup>1</sup> & Ronald I. Lewis Smith<sup>2</sup>

<sup>1</sup>Bergen Museum, DNS, University of Bergen, N-5007 Bergen, Norway.

E-mail: Dag.Ovstedal@bm.uib.no

<sup>2</sup>Centre for Antarctic Plant Ecology and Diversity, Torr Lodge, Moffat, DG109LB, Scotland.

**Abstract:** Four lichen species new to the Antarctic and sub-Antarctic South Georgia are reported. One is new to science: a species of *Leciophysma* with rough, non-granular thallus and reduced proper exciple. A total of 484 lichenized fungal taxa have now been reported from Antarctica and South Georgia.

**Kokkuvõte:** Nelja samblikuliigi esmasleiud Antarkikast ja Lõuna-Georgia saarelt, sealjuures üks uus *Leciophysma* liik

Teatatakse nelja lihheniseerunud seeneliigi esmakordsetest leidudest Antarkikas ja subantarktilisel Lõuna-Georgia saarel. Üks nimetatud liikidest on teadusele uus – perekonnast *Leciophysma*, kareda, mitteteralise talluse ja vähearenenud pärissevaga. Kokku on nüüd Antarkikast ja Lõuna-Georgia saarelt teada 484 liiki lihheniseerunud seeni.

## INTRODUCTION

Øvstedal & Lewis Smith (2009) recognized 471 species from Antarctica and South Georgia. Additions to the lichen flora of this region are frequently being published, and the number of species is rapidly approaching 500. In this paper we present four additional species, including a new *Leciophysma*, from the biome.

## MATERIAL AND METHODS

Anatomy and morphology were studied using a Zeiss Stemi 2000C microscope, and a Zeiss Axiolab compound microscope. Chemical constituents were identified by thin layer chromatography (Elix & Ernst-Russell, 1993). The material is deposited in the herbarium of the British Antarctic Survey, Cambridge (AAS).

## THE SPECIES

### *Leciophysma parvum* Øvstedal sp. nov.

*Leciophysma furfurascens* similis, sed thallus non-granulatus, exasperatus, nitidus, sine pseudocortex, et exipulum proprium reductum. Photobiont Chroococcales.

Mycobank no. – MB 563274

Holotypus – Antarctica, South Orkney Islands, Signy island, Col below Observation Bluff, alt

300 ft (100 m), montane *Andreaea* community, 20.1.1962, M. W. Holdgate 248a (AAS).

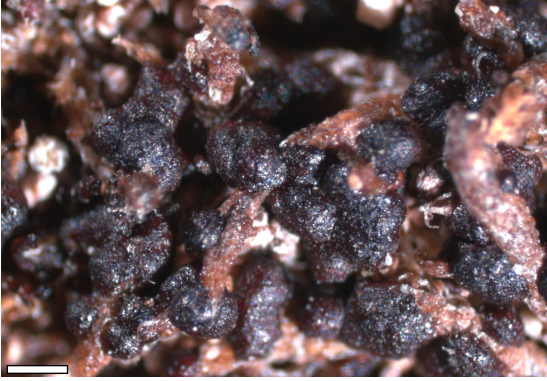
Illustrations – Figs 1 & 2.

Description – Thallus very thin, brown, rough, non-granular, shiny, in transection composed of glomerules of cyanobacteria with hyphal strands between. No cortex or pseudocortex. Cyanobacterial glomerules 70–80 µm wide, individual cells blue-green, ca 10 µm diam, with gelatinous yellowish-brownish sheath (Chroococcales, most probably *Gloeocapsa*). Apothecia up to 0.4 mm diam, semiglobose, dark brown to blackish, when dry with wrinkled surface, without thalline margin. Hymenium ca 100 µm high, amyloid, uppermost part brownish, hypothecium pale yellow-brown. True exciple very narrow, ring-formed, ca 40 µm wide at margin, composed of elongate angular, radiating cells in a gelatinous matrix. Asci obclavate, with thick tholus, with a weak amyloid ring. Ascospores 8 in asci, broadly elliptic to subglobose, 15–17 × 9–11 µm, colourless, with thick wall. Paraphyses prominent, simple to ramified, end cell enlarged.

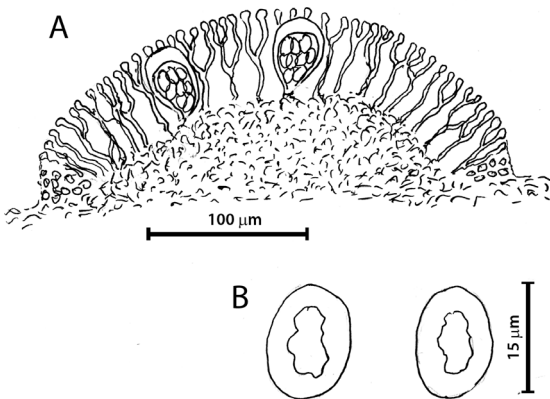
Chemistry – No secondary compounds detected.

Ecology – Growing on stems of *Andreaea* sp.

Specimen seen (holotypus) – The only specimen known is ca 5 × 5 mm.



**Fig. 1.** *Leciophysma parvum*, holotype, general habit (scale = 0.4 mm).



**Fig. 2.** *Leciophysma parvum*, holotype. A: section of apothecium; B: ascospores.

Comments – This minute lichen seems best placed in *Leciophysma* – as it has convex, brownish apothecia without thalline margin, and a ring-formed proper exciple with gelatinous cells. The exciple is, however, much reduced compared to the other species of the genus (see Henssen, 1965). The other possibility would be the genus *Homothecium* A. Massal., which has a similar apothecium structure, and is represented by several species in southernmost South America (Henssen, 1965, 1979). That genus, however, has flat, red-brown apothecia, and larger thalli which are orbicular-membranaceous and lacunose or with radiating and anastomosing lobes, and also always with isidia or soredia (Henssen, 1965, 1979). Recently, a new species

of *Leciophysma*, *L. subantarctica* Henssen, was described from Prince Edward Islands, and Îles Kerguelen (Henssen, 2007). That species has a subfruticose thallus and mostly flat, orange to reddish-brown apothecia, and the photobiont is a chain-forming *Nostoc* (material in MSC from Îles Kerguelen has been studied). The present taxon has a different thallus, and cyanobacteria which are not identical with those of the other species of the genus. Another *Leciophysma* species growing in Arctic areas, *L. furfurascens* (Nyl.) Gyelnik, is characterized by a granulose thallus with a distinct pseudocortex, a better developed exciple, ascospores 11–20 × 7–10 µm with slightly pointed ends, and with *Nostoc* as photobiont (Jørgensen, 2007). Recently, by means of molecular methods, Wedin et al. (2009) found that the genera with simple ascospores, such as *Leciophysma*, previously placed in Collemataceae (Henssen, 1965; Jørgensen, 2007) are better placed in Pannariaceae.

***Lichenomphalia umbellifera* (L.: Fr.) Red-head, Lutzoni, Moncalvo & Vilgalys**

Description – Primary thallus crustose, granulose, dark green (not always present). Cap 5–15 mm diam., infundibuliform, translucently striate, pale ochraceous to pale yellow. Stem 10–20 × 1–2 mm, smooth except base which is very finely pubescent, concolorous with cap, strongly striated when dry. Gills decurrent, distant, whitish to pale yellow. Basidiospores broadly ellipsoid, 8–9 × 7–8 µm.

Ecology – on bryophytes.

Distribution – Europe, North America, Australia, New Zealand, South Georgia

Specimens seen – South Georgia, King Edward Cove area, Grytviken, 1968, R. I. Lewis Smith 2619 (AAS); South Georgia, King Edward Cove area, Grytviken, 1968, R. I. Lewis Smith 3631 (AAS).

Comments – The basidiospores are relatively broader than in N European material. Both specimens studied had no “lichen” structure at base, the stipes are attached directly to mosses, but this is also the case with many N European specimens studied. Earlier reported in Pegler et al. (1980), but not included in Øvstedal & Lewis Smith (2001). The rather similar but larger *Arthenia antarctica* (Singer) Redhead, Lutzoni, Moncalvo & Vilgalys is found on South Orkney

Islands, but appears not to be lichenized (several specimens in BM studied).

### ***Placopsis* sp.**

Description – Thallus foliose, up to 5 mm wide, with indistinct, somewhat cuneate marginal lobes., yellow-white. Areolae in inner part flat, regular. Cephalodia in inner part of the thallus to 1 mm wide, red-brown, irregular. No apothecia seen.

Chemistry – Gyrophoric acid.

Ecology – On rock.

Specimens seen – Continental Antarctica, Eternity Range, Wakefield highlands, 2200 m alt., P. Convey 650 (AAS); Antarctic peninsula, Ellsworth Mountains, Little Nunatak, alt. 650 m, 20.01.2009, P. Convey 1170 (AAS).

Comments – Previously four species of *Placopsis* have been reported from Antarctica and South Georgia: *P. antarctica* D.J. Galloway, R.I.L. Sm. & Quilhot, *P. contortuplicata* I.M. Lamb, *P. bicolor* (Tuck.) de Lesd. and *P. pycnotheca* I. M. Lamb (Galloway et al., 2005; Øvstedal & Lewis Smith, 2001), but our specimens could not be identified with any of these. Here described taxon appears to be closest to *P. contortuplicata*, but that species always shows a cerebriform organization in inner parts. As no apothecia were found, it could not be determined to species. No *Placopsis* species has previously been reported from the inner part of the Antarctic Peninsula.

### ***Psoroma pannarioides* Henssen**

Description – Thallus areolate, areolae dispersed to adnate, flat, dark brown, up to 0.5 mm diam. Apothecia ± flat, up to 2.3 mm diam., thalline margin elevated, uneven-verrucose, paler than disc; disc flat, dull pale brown. Hymenium 90–95 µm high, brownish in uppermost part. Ascospores 8 in asci, 12–18 × 8–12 µm. Thalline margin filled with algae, trexbouxoid, 5–7 µm diam.; cortex 35–40 µm thick, cells thick-walled, lumina 3–4 µm diam. Cephalodia like thallus areolae but smaller, dark brown, with *Nostoc*.

Chemistry – No secondary compounds detected. Ecology – on soil.

Distribution – Argentina, South Georgia, Antarctica: South Shetland Isl., Deception I.

Specimen seen – Deception Island, Ronald Hill crater plain, fine ash and scoria from 1970

eruption, 5 m alt., 27.02.2010, R. I. Lewis Smith 12193 (AAS); South Georgia, R. I. Lewis Smith 8423 (AAS).

Comments – Although no type specimen has been available, we are sure in the present determination, as it fits closely the original description (Henssen, 1983), both as to thallus and apothecia. The only differences seem to be the cortex cells, which are more elongate in the type, and somewhat longer ascospores in the type (20–24 × 7–9.5 µm), but this is considered the normal variation in a species.

## **DISCUSSION**

Øvstedal & Lewis Smith (2009) recognized 471 species from Antarctica and South Georgia. However, several additional species have been reported since then. Seymour et al. (2007) recognized that there is a cryptic species very close to *U. sphacelata* R. Br. in the Antarctic, and Wirtz et al. (2009) considered that this species is, in fact, *U. lambii* Imshaug, a species described from North America. Other species include *Rhizoplaca mcleanii* (C.W. Dodge) Castello and *Buellia vilis* Th. Fr. (Castello, 2010), *Calvitimela uniseptata* G. Thor (Thor, 2011), *Lecidea polypycnidophora* Ruprecht & Türk, *Lecidella greenii* Ruprecht & Türk (Ruprecht & Türk, 2011), *Porpidia submelinodes* Olech & Osyczka (Osyczka & Olech, 2011), *Tephromela atrocaesia* (Nyl. ex Crombie) Fryday and *T. skottsbergii* (Darb.) Fryday (Fryday, 2011). Currently 484 species are now recognized in Antarctica and South Georgia.

## **ACKNOWLEDGEMENTS**

J. Berge and B. Helle, both Bergen, are thanked for help with the illustrations, and Dr. H. A. Peat, Cambridge, and Dr. A. M. Fryday, East Lansing, for loan of material.

## **REFERENCES**

- Castello, N. 2010. Notes on the lichen genus *Rhizoplaca* from Continental Antarctica and on some other species from Northern Victoria Land. *Lichenologist* 42: 429–432.
- Elix, J. A. & Ernst-Russel, K. D. 1993. *A catalogue of standardized thin layer chromatographic data and biosynthetic relationships for lichen substances* (2<sup>nd</sup> Edition). Australia National University, Canberra.

- Fryday, A. M. 2011. New species and combinations in *Calvitimela* and *Tephromela* from the Southern subpolar region. *Lichenologist* 43: 225–239.
- Galloway, D. A., Lewis Smith, R. I. & Quilhot, W. 2005. A new species of *Placopsis* (Agyriaceae: Ascomycota) from Antarctica. *Lichenologist* 37: 321–327.
- Henssen, A. 1965. A review of the genera of the Collemales with simple spores (excluding *Physma*). *Lichenologist* 3: 29–41.
- Henssen, A. 1979. New species of *Homothecium* and *Ramalodium* from S. America. *Botaniska Notiser* 132: 257–282.
- Henssen, A. 1983. Studies in the lichen genus *Psoroma*. 3. *Psoroma pannarioides* and *Psoroma internectens*. *Mycotaxon* 18: 97–111.
- Henssen, A. 2007. *Leciophysma subantarcticum*, a new cyanophilic lichen from the Southern Hemisphere. *Bibliotheca Lichenologica* 96: 129–135.
- Jørgensen, P. M. 2007. Collemales. *Nordic Lichen Flora* 3: 14–42.
- Oszczka, P. & Olech, M. 2011. A new species of the genus *Porpidia* from Antarctica. *Lichenologist* 43: 367–371.
- Øvstedal, D. O. & Lewis Smith, R. I. 2001. *Lichens of Antarctica and South Georgia. A guide to their identification and ecology*. Cambridge University Press, Cambridge.
- Øvstedal, D. O. & Lewis Smith, R. I. 2009. Further additions to the lichen flora of Antarctica and South Georgia. *Nova Hedwigia* 88(1–2): 157–168.
- Pegler, D. N., Spooner, B. M. & Lewis Smith, R. I. 1980. Higher fungi of Antarctica, the subantarctic zone and Falkland Islands. *Kew Bulletin* 35: 499–562.
- Ruprecht, U., Lumbsch, H. T., Brunauer, G., Green, T. G. A. & Türk, R. 2010. Diversity of *Lecidea* (Lecideaceae, Ascomycota) species revealed by molecular data and morphological characters. *Antarctic Science* 22(6): 727–741.
- Ruprecht, U. & Türk, R. 2011. *Lecidella greenii* U. Ruprecht & Türk sp. nov. *Phytotaxa* 18: 80.
- Seymour, F. A., Crittenden, P. D., Wirtz, N., Øvstedal, D. O., Dyer, P. S. & Lumbsch, H. T. 2007. Phylogenetic and morphological analysis of Antarctic lichen-forming *Usnea* species in the group *Neuropogon*. *Antarctic Science* 19: 71–82.
- Thor, G. 2011. *Calvitimela uniseptata* G. Thor sp. nov. *Phytotaxa* 18: 36.
- Wedin, M., Wiklund, E., Jørgensen, P. M. & Ekman, S. 2009. Slippery when wet: Phylogeny and character evolution in the gelatinous cyanobacterial lichens (Peltigerales, Ascomycetes). *Molecular Phylogenetics and Evolution* 53: 862–871.
- Wirtz, N., Printzen, C., Sancho, L. G. & Lumbsch, H. T. 2006. The phylogeny and classification of *Neuropogon* and *Usnea* (Parmeliaceae, Ascomycota) revisited. *Taxon* 55(2): 367–376.