

***Psoroma inflatum*, a new alpine lichen from New Zealand**

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Abstract

Psoroma inflatum sp. nov. is described from mountains in Canterbury and Otago in New Zealand's South Island. It is related to *P. hypnorum*, but differs in having a strongly inflated and glossy thallus. The squamules are prostrate, ascending or erect, and form brown, coarsely coralloid patches. They lack a dorsiventral morphology and anatomy, in contrast to other *Psoroma* species, except that the lower sides of ascending lobes are less pigmented and have a white tomentum on the cortex, which is less pigmented, thicker and with elongated lumina. The genus *Psoroma* is currently considered to include 11 species in New Zealand, but it is poorly known and very likely includes even more undescribed taxa.

Introduction

Galloway (2007) treated the genus *Psoroma* as comprising 16 species in New Zealand. Since then, two species have been transferred to *Xanthopsoroma* (Elvebakk *et al.* 2010) and one to *Pannaria* (Passo *et al.* 2008), whereas *Psoroma caliginosum* Stirt. and *P. melanizum* Zahlbr. are under study by the author and colleagues as possible members of *Pannaria*. The identity of the true *Psoroma pholidotoides* (Nyl.) Trevis. is still not resolved, and it too might belong in *Pannaria*. However, the name has traditionally been adopted for what is now *Xanthopsoroma contextum* (Stirt.) Elvebakk.

Of the ten species treated by Galloway (2007) and still placed in *Psoroma*, three are corticolous forest species (*P. asperellum* Nyl., *P. coralloideum* Nyl. and *P. geminatum* P.M.Jørg.), four are characteristic alpine species (*P. buchananii* (C. Knight) Nyl., *P. fruticosum* P.James & Henssen, *P. paleaceum* (Fr.) Timdal & Tønberg and *P. rubromarginatum* P.James & Js.Murray), and two are very rare (*P. angustisectum* Zahlbr. and *P. cyanosorediatum* P.M.Jørg.) in addition to *Psoroma hypnorum* (Vahl) S.F.Gray. The latter was described from Norway by Vahl (1787) and is the generitype of *Psoroma*. It is widely distributed, and was considered as “cosmopolitan in cool temperate and arctic-alpine areas” (Smith *et al.* 2009), although “bipolar” as used by Galloway (2007) would describe it more accurately.

In New Zealand *Psoroma hypnorum* has been collected at one montane site in the North Island and ten localities in the South Island, including Old Man Range (Galloway 2007). When I came across a small specimen on the Old Man Range during a visit in 2002, I took it for granted to be *P. hypnorum*. However, later studies, particularly in the three New Zealand herbaria AK, CHR and WELT, have indicated that lichens filed under this name are a very heterogeneous assemblage. So far, I have not seen a single convincing specimen of true *Psoroma hypnorum* in New Zealand. The same is true of Australia, where the species is no longer accepted, and where most of the material represents *P. buchananii* and *P. nigropunctatum* Elvebakk & Elix, a new species (Elvebakk & Elix 2021).

Some specimens deposited in New Zealand herbaria represent a distinct, undescribed species with inflated and strongly glossy squamules. One of the collections is from the Craigieburn Range east of Christchurch, which I visited in 2019 to search for it and two other apparently undescribed Pannariaceae. However, heavy snowfalls restricted the visit to areas just above the tree-line. Still, the species is distinct enough to be described as new based on existing collections, which is the aim of the present contribution.

Material and methods

This paper is based on material from the herbaria AK, CHR, TROM, and W; the species has not been found in other herbaria. Ascospore structures were studied in water mounts and restricted to spores liberated from their asci. Detailed drawings of 35 ascospores from three

samples of *P. inflatum* were made, and copies of the sketches were included with the specimens. The sketches were compared with c. 150 unpublished corresponding sketches made earlier of 16 samples of *Psoroma hypnorum* from Europe and South America/Antarctica. Thin-layer chromatography of acetone extracts followed standardized procedures and used solvents A and C (Orange *et al.* 2010). Nomenclature of ascospore structures follows Nordin (1997).

The species

Psoroma inflatum Elvebakk sp. nov.
Mycobank No.: **MB 839613**

Figs 1–3

Type: New Zealand. *Canterbury*: Craigieburn Range, slopes between North Canterbury Ski Club Huts and Nervous Knob, 43°07'S, 171°40'E, on soil in crevices amongst rock outcrops through fellfield, 4.xi.1989, *A.E. Wright 9257* (AK 187329 — holotype).

Similar to *Psoroma hypnorum*, but squamules inflated and strongly glossy, ascending, without dorsiventral morphological and anatomical structures, except for white tomentum on the less exposed side, apothecia cupulate with large, swollen inrolled lobes of the thalline excipuli with scattered irregular outgrowths, and ascospores mostly longer and narrower.

Thallus squamulose, tripartite, terricolous, often on bryophytes and lichens, forming patches 3–10 cm wide on an indistinct hypothallus. *Chlorobiont squamules* 0.5–3 mm wide, irregularly branched, forming coralloid patches of weakly ascending to erect lobes 0.3–0.6 mm thick, without a dorsiventral morphology and anatomy; *upper surface* glossy, brown, glabrous, except for a distinct white tomentum on the lower, less exposed side. *Cortex* 60–100 µm thick, upper part brown and sclerenchymatic, lower part pale and paraplectenchymatic, lumina mostly elongate, arranged perpendicularly to the upper surface, 4–8 × 2–4 µm, walls 3–4 µm thick, less pigmented and thinner on the less exposed side, where lumina are more elongated, up to 12 µm long and often arranged in a labyrinth-like pattern. *Chlorobiont layer* 80–150 µm thick, below the cortex, of *Trebouxia* cells, globose to irregularly subglobose, 8–20 µm diam.; chloroplasts angular. *Medulla* centrally positioned, 50–150 µm thick, but poorly defined due to transitions towards the surrounding chlorobiont layer. *Cyanobiont Nostoc*, in globose to weakly coralloid, greyish cephalodia, 0.1–0.3 mm wide, situated between chlorobiont squamules, common. *Nostoc* cells greyish green, irregularly subglobose to ellipsoid, often angular, with uneven surfaces, 4–6 × 2–3 µm, organized within small glomeruli and without visible chain structures. *Apothecia* common, substipitate, 3–7 mm wide, discs reddish brown, strongly cupulate; *thalline excipulum* 0.3–1 mm broad, crenate and swollen, of few and large, inrolled lobes 0.3–1 mm wide, occasionally with inflated additional irregular outgrowths, glabrous on the lower side, except for a very thin, partial white tomentum at the bases. *Epithecium* brown, c. 15 µm thick; *hymenium* pale, 100–120 µm, IKI+ blue; *hypothecium* brownish, 60–80 µm, algal layer continuous below the hypothecium. *Paraphyses* simple, septate, c. 2.5 µm wide, and strongly adglutinated in the epithecium. *Asci* clavate, c. 80 × 15 µm, with 8 spores, internally with IKI+ blue structures, seen as tube-like in low IKI concentrations. *Ascospores* regularly ellipsoid to weakly citriform or ovoid, 17–23 × 8–11 µm, perispores 20–30 × 10–13 µm, regularly verrucose, apically mostly with verrucose or nodulose extensions, sometimes triangular and pointed, c. 3 µm long, rarely acuminate and c. 8 µm long. *Pycnidia* not observed.

Chemistry: brown melanins, lacking TLC-detectable compounds.

Etymology: The species is named for its strongly inflated squamules.

ADDITIONAL SPECIMENS EXAMINED

New Zealand. *Canterbury*: ● Arthur's Pass, basin of Rough Creek, alt. 5500 ft, leg. unknown, '287' (CHR); ● spur from Island Saddle Road summit to Crimea Range, 42°10'S, 172°48'E, alt. 1500 m, common on moss in rock crevices on small outcrops in subalpine scrub, *A.E.*

Wright 12790, 2.i.2002 (AK 257334A); *Otago*: ● North Otago, Kakanui Range, Mt Pisgah, 45.079346°S, 170.391572°E, on tussock bases, summit (1643 m), *J.Scott Thomson*, 1934 (CHR 505269); ● *loc. id.*, alt. c. 1150 m, on dead tussocks of *Festuca novaezelandiae*, *J. Scott Thomson ZA 405*, i.1935 (W 1936-1930); ● summit of Rock and Pillar Range, alt. 1300 m, on earth, *J. Child*, 13.ii.1941 (CHR 505268); ● *loc. id.*, growing amongst low turf on soil at top of road cutting through open tussockland, *A.E. Wright 9207* (AK 187280); ● Old Man Ridge, top plateau, Cock Creek Catchment area, 45°21.9'S, 169°12.6'E, alt. 1620 m, on the ground, on plant remains and cryptogams, associated with *Psoroma paleaceum*, *A. Elvebakk 02:620A*, 9.xii.2002 (TROM).

Remarks

The inflated and glossy thallus of the new species is very characteristic. Figs 1 and 2 show the thick, brown, coarsely coralloid crust, in which the squamules are two to three times thicker than those of *Psoroma hypnorum*. The latter, as well as most other *Psoroma* species, have a distinct dorsiventral lobe pattern, whereas in *P. inflatum* the squamules are weakly ascending to erect. However, the less exposed side also has a cortex, which is covered by a white tomentum, similar to the tomentum on the lower side of the excipuli in *P. hypnorum*. The lower parts of excipuli in *P. inflatum* have a distinctly thinner tomentose layer. The coralloid appearance of the thallus probably explains why Zahlbruckner (1941) determined the specimen *Scott Thomson ZA 405* as *P. coralloideum* Nyl., which in fact is a different species.

Most spores of *P. inflatum* are longer and narrower than those of *P. hypnorum*, and some perispores of *P. inflatum* have pointed extensions. Although the two species look markedly different, they are considered to be related because of their pigmentation and spore characteristics.

The new species is endemic to New Zealand and is so far known from only a handful of localities at altitudes of 1100 to 1600 m in the mountains of Canterbury and Otago. Anthony E. Wright, who collected three of the eight known collections, commented that the species is common in one of the localities in Canterbury. Further searches are expected to show it to be widely distributed in the mountains of the South Island.

At present, my conclusion is that no sample from New Zealand seen to date represents true *P. hypnorum*. That might suggest *P. hypnorum* belongs to an evolutionary lineage that developed in Antarctica and spread along American mountain chains to the Northern Hemisphere, in contrast to a lineage including *P. inflatum* which spread into New Zealand. The *P. buchananii* lineage might have a different evolutionary history. More fresh samples are required for an ongoing phylogenetic study on the evolution of Austral *Psoroma*.

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Fig. 1. *Psoroma inflatum*, holotype. Scale-bar = 5 mm.



Fig. 2. *Psoroma inflatum*, Wright 12790 (AK). Scale-bar = 5 mm.



Fig. 3. Ascospores of *Psoroma inflatum*. Scale-bar = 10 μ m.