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Observations on the Lichen Genus *Lempholemma* Körb. in Australia

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Abstract

The genus *Lempholemma* in Australia comprises the single species, *Lempholemma polyanthes* (Bernh.) Malme [synonym: *L. myriococcum* (Ach.) Th. Fr.]. This species is recorded from Tasmania and Victoria, and its morphology, anatomy, distribution and ecology are discussed. A lectotype for *L. polyanthes* is designated. *L. hypolasium* (Stirt.) F.M. Bailey is a synonym of *Physma byrsaeum* (Pers.) Mont. *Synalissa cancellata* F. Wilson, a further synonym of *Lempholemma polyanthes*, is neotypified. The genus *Synalissa* does not appear to occur in Australia.

Introduction

Lempholemma Körb. is a poorly known, heterogeneous genus of blackish, gelatinous species belonging to the family Lichinaceae, characterised by simple ascospores and a homoiomerous thallus with a photobiont belonging to the genus *Nostoc*. About 30 species have been described (Hawksworth *et al.* 1995), mainly from the Northern Hemisphere where they occur mostly on calcareous rocks. Aspects of the genus have been discussed by Henssen (1968) and Schiman-Czeika (1988). *Lempholemma* has never been properly recognised in the Australian flora, although Filson (1996) records three species: *L. hypolasium* (Stirt.) F.M. Bailey, *L. myriococcum* (Ach.) Th. Fr. and *L. polyanthes* (Bernh.) Malme.

Lempholemma hypolasium was first described as a *Collema* (Bailey 1899), based on a collection from the Gowrie Mountains near Brisbane, Queensland, by F.M. Bailey in 1877. Studies of the isotype in BM have shown this taxon to be a synonym of *Physma byrsaeum* (Pers.) Mont. The first Australian record of *L. myriococcum* was by Wilson (1891) who referred one of his collections from Mt Macedon, Victoria to "*Synalissa micrococca* Born. & Nyl.". Subsequently, Wilson (1892) described his specimen as *Synalissa cancellata* F. Wilson, and later also recorded the species from the South Esk River, Launceston, Tasmania (Wilson 1893). On the basis of a specimen obtained from Wilson, Shirley (1894) correctly identified this taxon as conspecific with *Lempholemma myriococcum*, a fact which has been generally overlooked by Australian lichenologists, despite this information being reiterated by Zahlbruckner (1925). Thus the name *Synalissa cancellata* has continued to be cited in checklists for Australia, for example Filson (1996) and its forerunners, and for Tasmania (Kantvilas 1994). In fact, the genus *Synalissa* is not known to occur in Australia at all, although a superficially similar lichen from an undescribed genus has been collected from south-western Tasmania (Henssen, Jørgensen & Kantvilas, in prep.). Material in Australian herbaria referred to *Synalissa*, including that of *S. symphorea* (Ach.) Nyl. which is recorded by Filson (1996) for the Australian mainland, has been reidentified to other genera, mainly *Peccania*, by Professor Dr A. Henssen.

In this paper, we provide an account of *L. polyanthes*, the only species of the genus known currently from Australia. This species is widespread in the temperate Northern Hemisphere where it occurs amongst bryophytes, chiefly over calcareous rocks (Santesson 1993, Purvis *et al.* 1992). Its morphology, anatomy, distribution and ecology in Australia (including Tasmania) are discussed here.

Lempholemma polyanthes (Bernh.) Malme, *Lich. suec. exs.* 883 (1924). *Lichen polyanthes* Bernh. in Schrader, *Syst. Samml. krypt. Gew.*: 82 (1797). *Type:* Germania, ex herb. Schrader (lectotype, here designated, L!).

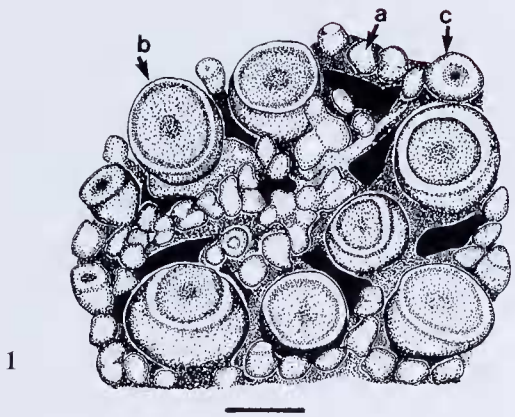
Lempholemma myriococcum (Ach.) Th. Fr., *Nova Acta R. Soc. Scient. upsal.*, ser. 3, 3: 381 (1861); *Lichen myriococcus* Ach., *Lichenogr. Suec. Prodr.*: 127 (1799). *Type:* Suecia (H-ACH!).

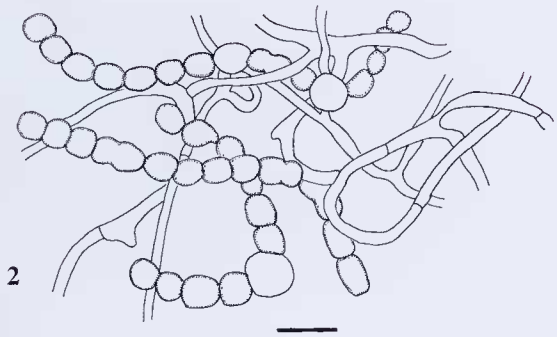
Synalissa cancellata F. Wilson, *Proc. Roy. Soc. Vic.* 5: 151 (1892). *Type:* Australia [Victoria:], Mt Macedon, on subalpine rocks and moss (neotype, here designated, BRI *492018*!).

Thallus homoiomerous, forming a membranous or strand-like film over bryophytes, with numerous irregular fissures, fenestrations and ridges, usually densely covered with discrete or coalescing, warty granules or ± erect, unevenly cylindrical lobules to c. 0.2 mm wide, blackish olivaceous when dry, dark olivaceous and swelling to a granular, pulpy cushion to c. 5 cm wide when wet. *Hormocystangia* absent. *Photobiont Nostoc*, forming chains of cells 4–6 µm diameter, loosely interwoven in a gelatinous matrix with sparsely branched hyphae c. 1.5 µm thick. *Apothecia* ± immersed at first in the swollen apices of granules and lobules, sometimes appearing rather perithecia-like when young, with a sunken, pore-like brownish disc, 0.1–0.2 mm wide, becoming ± globular when well developed; disc soon exposed, ± glossy brown to orange-brown, plane to concave, 0.2–0.3 (–0.4) mm wide; thalline margin thin, persistent or becoming excluded in oldest apothecia. *Hymenium* colourless, 150–270 µm thick, I+ reddish before pretreatment in KOH, I+ blue after pretreatment, surrounded by a cupular excipulum of plectenchymatous to paraplectenchymatous hyphae, c. 30–40 µm thick. *Asci* thin-walled, cylindrical, entirely non-amyloid, 70–100 × 14–20 µm, eight-spored. *Ascospores* hyaline, uniseriate, ellipsoid, thin-walled, (12–) 15–20 × 7–10 µm. *Paraphyses* simple, straight, 1.5 µm thick, with tapered or rounded apices. *Pycnidia* immersed in swollen granules and lobules; ostioles very obscure, lateral and apical. *Conidia* ellipsoid, 1.8–2.5 × 1–1.2 µm. (Figs 1–3)

Notes

Because of its small and inconspicuous nature, *Lempholemma polyanthes* is very easily overlooked in the field and hence its distribution (Fig. 4) should be regarded as very incomplete. It has been recorded from lowland to alpine altitudes, and from a wide range of vegetation types including grassland, heathland, sedgeland, sclerophyll forest and cool temperate rainforest. It grows exclusively over bryophytes, especially mosses, on wet, or at least intermittently moist rocks and soil, such as in stream beds, seepage cracks or on the shaded aspects of bluffs and boulders. Rock types from which *L. polyanthes* has been recorded include dolerite, sandstone, limestone and serpentine. The species associates with a very wide range of bryophytes, depending on its habitat. At alpine and subalpine altitudes, these are typically species of *Grimmia* and *Andraea*. At lower altitudes, especially in sclerophyllous vegetation types, some of the mosses from which it has been recorded include *Barbula pseudopilifera, Breutelia affinis, Hypnum*





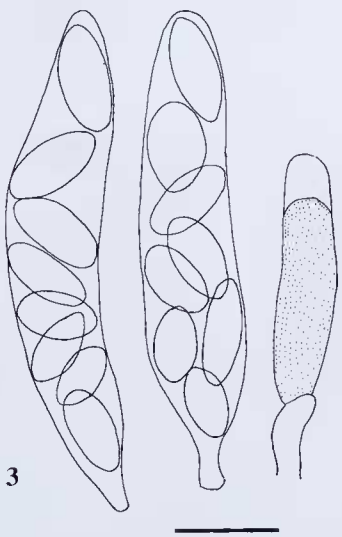


Fig. 1. Habit of *Lempholemma polyanthes* : **a** granules, **b** mature, and **c** immature apothecia. Scale = 250 µm.
Fig. 2. Anatomy of *Lempholemma polyanthes* : chains of *Nostoc*, loosely interwoven with fungal hyphae. Scale = 7.5 µm.
Fig. 3. Asci and ascospores of *Lempholemma polyanthes;* immature ascus RHS. Scale = 15 µm.

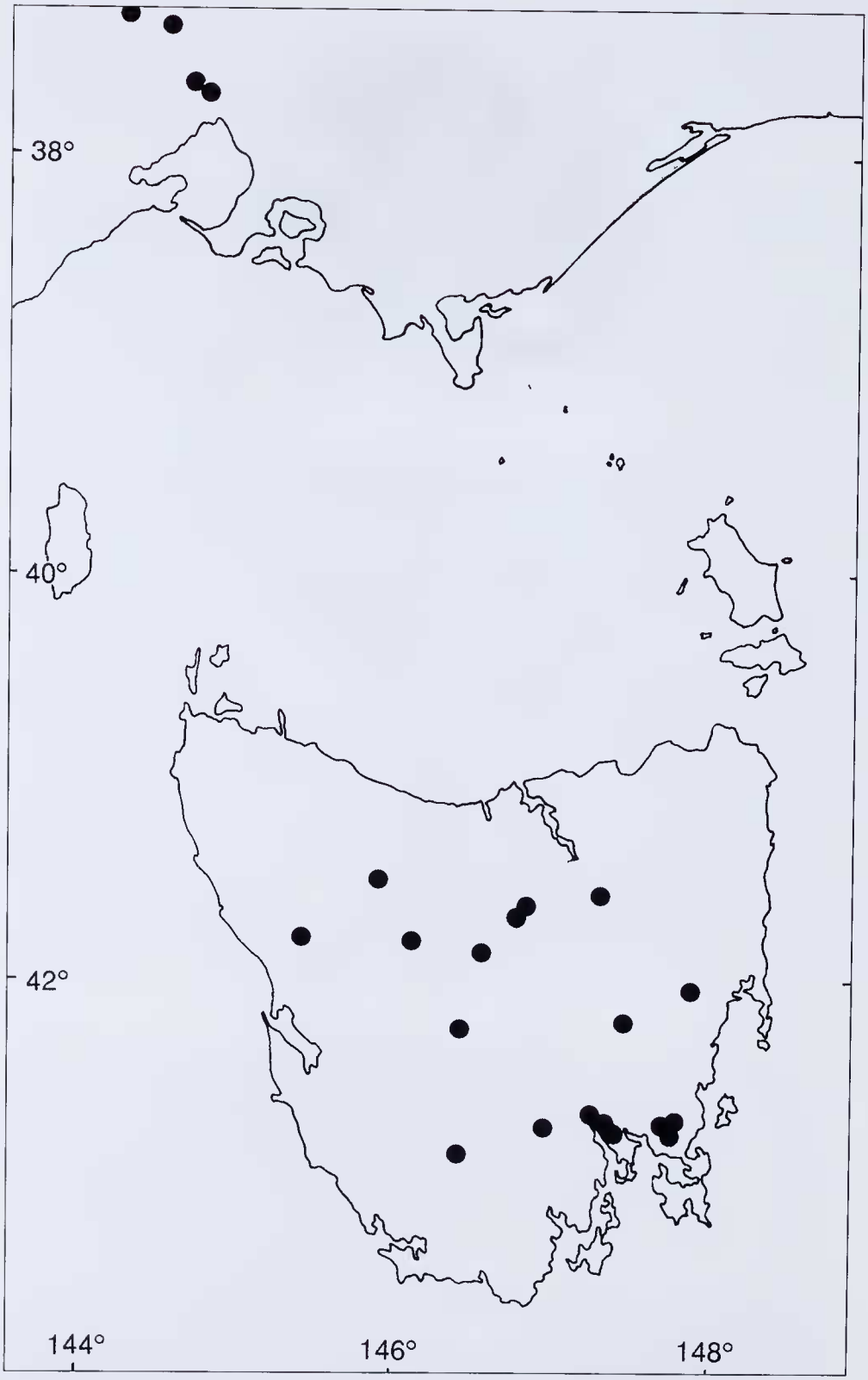


Fig. 4. Distribution of *Lempholemma polyanthes* in Australia.

cupressiforme, Racomitrium crispulum, Thuidium sparsum, Triquetrella papillata and species of *Grimmia.* In rainforest, it was recorded from tufts of *Zygodon intermedius* mixed with unidentifed leafy hepatics.

Lempholemma polyanthes appears to be widespread in Tasmania, mainly in the central, northern and eastern Jurassic dolerite-dominated provenance. Significantly, it has not been recorded from the south-west of Tasmania, despite intensive, albeit localised, study in that region. There at least part of its typical ecological niche is occupied by a superficially similar although unrelated taxon (containing *Gloeocapsa* as the photobiont), which represents an undescribed genus (A. Henssen, P.M. Jørgensen & G. Kantvilas in prep.). The true extent of its distribution on the Australian mainland is unknown, and the species is known to us only from a few older herbarium collections from Victoria (Fig. 4).

Morphological variation in the species appears to be related mainly to moisture availability. Individuals from the wettest habitats, such as semi-inundated rocks in stream beds, have a loose, well developed thallus of spreading lobes and discrete thalline strands. In contrast, most individuals from drier sites, such as boulders in eucalypt forest, are very compact and densely granular. The iodine reactions of the hymenium are confined to the hymenial gel enveloping the asci and paraphyses, and the ascus wall itself displays no amyloid reactions. Pycnidia are very obscure or at least difficult to locate in this lichen; all observations recorded were as a result of fortuitous sectioning of many granules and lobe apices. Essentially lobules containing pycnidia are not unlike those with apothecial initials, except that the latter tend to have brownish apices from a very early age. In contrast, pycnidial lobules tend to be a little more black and glossy. Ostioles could not be detected by low-power microscopy, but appear to be both lateral and apical.

Specimens Examined

Tasmania: Central Plateau, Pine Lake, 41°44' S, 146°42' E, on mossy dolerite rocks at edge of alpine stream, 1200 m altitude, *G. Kantvilas 89/82*, 17.iii.1982 (HO); Grass Tree Hill, 42°47' S, 147°21' E, on moss on soil, *G.C. Bratt & G. Degelius 70/399*, 15.iii.1970 (HO); same locality, on sandstone and moss, 320 m altitude. *G.C. Bratt & J.A. Cashin 70/866*, 18.vii.1970 (HO); Nelsons Creek. Orford Rd, 42°36' S, 147°39' E, on dolerite, *G.C. Bratt 73/1348*, 23.xii.1973 (HO); Vale of Belvoir, 41°33' S, 145°53' E, on limestone outcrops in sedgeland, 800 m altitude, *G. Kantvilas 50/93*, 21.v.1993 (HO); same locality, on limestone boulders at the waterline in stream in buttongrass moorland, 840 m, *G. Kantvilas 60/87*, 16.v.1987 (HO); Derwent River near Plenty, 42°44' S, 146°56' E, on soil on dolerite, 15 m altitude, *G.C. Bratt & G. Degelius 70/275*, 12.iii.1970 (HO); top of St Peters Pass, 42°17' S, 147°25' E, on doleritic soil, 465 m altitude, *G.C. Bratt 70/1371*, 22.xi.1970 (HO); summit of Mt Direction, 42°49' S, 147°19' E, on dolerite, 441 m altitude, *G.C. Bratt 72/626*, 8.vii.1972 (HO); track to Projection Bluff, 41°44' S, 146°42' E, on moist dolerite boulders in rainforest, 1200 m altitude, *G. Kantvilas 1/94*, 3.i.1994 (HO); Douglas Creek, Pelion Plains, 41°50' S, 146°03' E, on wet dolerite rocks in stream bed, 900 m altitude, *G. Kantvilas 4/83*, 1.ii.1983 (HO); NE Ridge Track, Mt Anne, 42°56' S, 146°26' E, on wet dolerite rocks in subalpine rainforest, 1040 m altitude, *G. Kantvilas 263/82*, 12.xii.1982 (HO); Ouse River near Liawenee Canal, 41°54' S, 146°37' E, on moss and soil over wet dolerite rocks in alpine woodland, 1080 m altitude, *G. Kantvilas 66/83*, 26.v.1983 (HO); Serpentine Hill near Argent Tunnel, 41°50' S, 145°25' E, amongst mosses on serpentine outcrops in heathland, 360 m altitude, *G. Kantvilas 9/84*, 13.i.1984 (HO); Nugent to Buckland road, 42°39' S, 147°45' E, on dolerite in stream, 200 m altitude, *G.C. Bratt 70/655*, 26.iv.1970 (HO); Broadmarsh to Dromedary road, 42°40' S, 147°10' E, on moss in open grassland, *G.C. Bratt & M.H. Bratt 70/745*, 14.vi.1970 (HO); Logan Road, 41°32' S, 147°21' E, on mossy rocks in light bushland, 340 m altitude, *S.J. Jarman* , 26.vii.1995 (HO); Dunnys Creek, 42° 13' S, 146° 25' E, on mossy dolerite rocks by creek, 640 m altitude, *G. Kantvilas & P.W. James 477/84*, 5.ii.1984 (BM, HO); near Pitts Hill, 42° 37' S, 147° 41' E, on mossy dolerite rocks in open eucalypt forest, 120 m altitude, *G. Kantvilas 32/97*, 29.i.1997 (HO); c. 7 km east of Lake Leake, 42° 01' S,

147° 55' E, on moist rocks in dry sclerophyll forest, 400 m altitude, *G. Kantvilas* s.n., 24.iv.1996 (HO). **Victoria:** Braybrook, 37° 46' S, 144° 51' E, *R.A. Black*, 18.x.1900 (MEL); Kyneton, on rocks in Campaspe River, 37° 19' S, 144° 28' E, *F.R.M. Wilson* , v.1897 (MEL); Preston Reservoir, 37° 43' S, 144° 58' E, *R.A. Black*, 17.xi.1900 (MEL).

Neotypification of Synalissa cancellata

Wilson's type of this species, as with many of his collections, appears to have been lost, presumably as part of the ill-fated loan of type specimens from the National Herbarium of Victoria (MEL) to the University of Messina, Sicily, in 1907 (see Filson 1976). However, an authentic specimen exists in BRI as part of John Shirley's collection of Victorian lichens sent to him by Wilson. Although not mentioned specifically on the specimen itself, Shirley (1894) gives its locality as 'on mossy rocks, Mt Macedon'. This is the same provenance as that of the type, as given in Wilson's prologue, and may even be a part of the type collection. Given this uncertainty, the material is designated here as the neotype rather than the lectotype of *Synalissa cancellata* F. Wilson. It is well developed, typical and with abundant apothecia.

Acknowledgements

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