

A NEW BYSSOID LICHEN GENUS FROM TASMANIA

Gintaras KANTVILAS*

Abstract: The genus *Jarmania*, based on the single species *J. tristis*, is described. The new genus is characterized by a byssoid-leprose thallus, immarginate apothecia, asci of the *Bacidia*-type, strongly anastomosing paraphyses and septate, acicular ascospores. The new species is corticolous and is known only from cool temperate rainforest in Tasmania.

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Introduction

The byssoid lichen habit, where the thallus is comprised of loosely interwoven threads and appears rather cottony, is known from a wide range of families and orders of the lichen-forming fungi. Hafellner & Vězda (1992) reviewed the known genera, spanning orders as diverse as the Lecanorales, Opegraphales, Arthoniales and Gyalectales. Thallus organization in byssoid lichens falls into two broad anatomical and morphological types: one where the thallus is dominated by lichenized photobiont filaments, typically *Trentepohlia*; the other where the cottony thallus is formed by fungal hyphae, interspersed with a usually coccoid photobiont.

Although byssoid lichens occur in many parts of the world and in a wide range of habitats and vegetation types, the development of this thallus type appears to be particularly prevalent in rainforests, and probably mostly in the tropics and subtropics. However, the cool temperate rainforests of the Southern Hemisphere are also the centres of distribution of some byssoid genera, for example *Sagenidium* (Henssen *et al.* 1979) and *Roccellinastrum* (Henssen *et al.* 1982; Kantvilas 1990).

With the exception of the alpine, saxicolous species *Cystocoleus ebeneus*, all the other byssoid lichens that occur in Tasmania are confined to or centred in cool temperate rainforest (Kantvilas 1994). These are *Coenogonium implexum* (Gyalectaceae), *Conotremopsis weberiana* (Stictidaceae), *Roccellinastrum flavescens*, *R. lagarostrobi* and *R. neglectum* (Roccellinastraceae) and *Sagenidium molle* (Opegraphaceae). In addition, Kantvilas & James (1987) included the basidiolichen *Dictyonema sericeum* as a byssoid lichen on account of its finely filamentous structure when sterile.

In the present paper, the discovery of a further byssoid lichen from the cool temperate rainforests of Tasmania is reported. This taxon, which cannot be ascribed to any known genus of lichens, is described within the new genus, *Jarmania*.

Materials and Methods

The study is based mainly on specimens collected by the author and housed at HO and BM. Anatomical investigations and measurements were made on hand-cut sections mounted in water.

*Tasmanian Herbarium, G.P.O. Box 252C, Hobart, Tasmania 7001, Australia.

in 10% KOH, in 0.5% ammoniacal erythrosin, and in Lugol's Iodine with and without pre-treatment in 10% KOH and 50% HNO₃. Chemical constituents were identified by Prof. J. A. Elix (ANUC) using standard methods of TLC (e.g. Culberson 1972) and HPLC (Feige *et al.* 1993).

Taxonomy

Jarmania Kantvilas gen. nov.

Thallus byssoideus-leprosus, alga virides coccoideas continens. Apothecia immarginata, subglobosa, excipulo absentio vel excluso, hymenio incolorato, paraphysibus dense anastomosantibus, ascis octosporis, ad *Bacidia* pertinentibus. Ascospores hyalinae, filiformes-aciculares, multiseptatae. Pycnidia ignota.

Holotypus: *Jarmania tristis* Kantvilas

Thallus byssoid-leprose. *Photobiont* a unicellular green alga. *Apothecia* immarginate, subglobose. *Excipulum* absent or excluded from a very early stage. *Hymenium* colourless, densely conglutinated; paraphyses densely anastomosing, with tapered, non-capitate apices; asci eight-spored, of the *Bacidia*-type. *Ascospores* hyaline, thin-walled, filiform-acicular, multiseptate, lacking a perispore. *Pycnidia* unknown.

Etymology. The new genus is named in honour of Dr S. Jean Jarman of Hobart, Tasmania, in recognition of her significant contributions to the knowledge of Tasmanian vegetation, in particular cool temperate rainforest, and who inspired, encouraged and assisted me for many years in my research on the lichen flora of Tasmania.

Jarmania tristis Kantvilas sp. nov.

Thallus pallide flavidus, albidoflavidus vel flavovirens, leprosus vel byssoideus, ad centrum plerumque granulato-crustaceus, ad marginem persistente byssoideus. Cellulae algarum plusminusve sphaericae, 6–9 µm in diametro. Hyphae fungales sparsim ramosae, 2–3.5 µm latae, lumenibus filiformibus. Apothecia immarginata, semper subglobose, 0.2–0.75 mm in diametro, flavido-cinerea, aliquando caeruleo-grisea suffusa, pruina crassam, flavidam, thallo concoloram habentia. Excipulum plerumque exclusum, solum in juvenibus apotheciis visum. Epithecium e granulis flavo-brunneis, in KOH diffluentibus constans. Hypothecium hyalinum vel pallide flavo-brunneolum, plerumque flavidum in KOH. Hymenium hyalinum, dense conglutinatum, 60–80 µm crassum, amyloideum. Asci octospori, 52–72 µm longi, (7.5–)8.5–10(–14) µm lati, ad typum *Bacidiae* pertinentes. Paraphyses dense anastomosantes, circa 0.75–1(–2) µm crassae, apicibus non expansis. Ascospores hyalinae, filiformes-aciculares, sigmoideae, 36–60 µm longae, 1–2 µm latae, septis 2–4, indistinctis.

Typus: Australia: Tasmania: Line 7, 0.5 km east of Olga River, 42°51'S, 145°50'E, on underside of large, inclined trunks of *Cenarrhenes nitida* in large, forested copse in buttongrass moorland, 75 m altitude, 7 March 1991, G. Kantvilas & S. J. Jarman 32/91 (HO—holotypus, GZU—isotypus).

(Figs 1 & 2)

Thallus pale yellow, whitish yellow to rather greenish yellow, leprose to byssoid, usually becoming coarsely granular crustose centrally, forming irregularly roundish colonies up to c. 100 mm wide, usually with a persistently byssoid, whitish to sometimes faintly bluish grey marginal zone, 1–2 mm wide. *Photobiont* a unicellular green alga; cells ± spherical, 6–9 µm diam., often aggregated in clumps 10–22 µm wide. *Hyphae* sparsely branched, 2–3.5 µm wide; lumina narrow and thread-like.

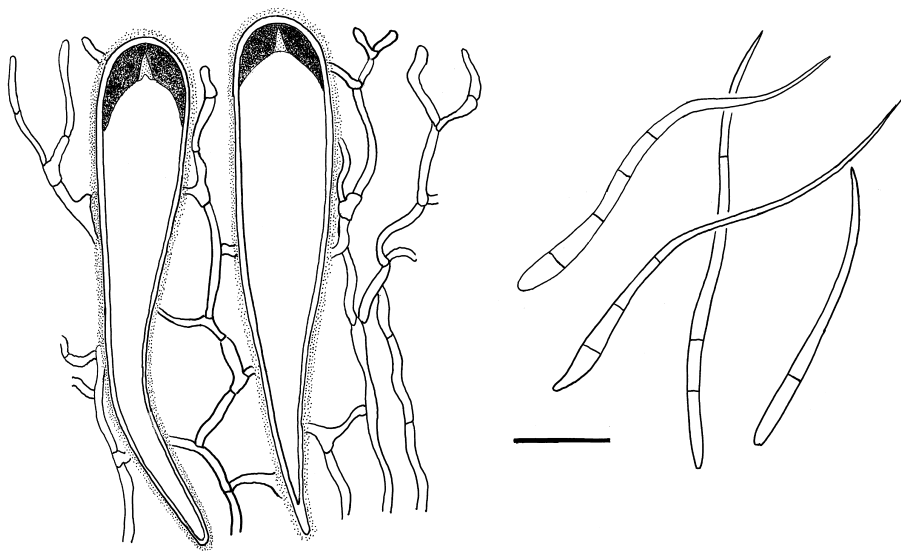


FIG. 1. Asci, paraphyses and ascospores of *Jarmania tristis* (amyloid parts stippled). Scale = 10 μ m.

Apothecia immarginate and strongly convex to subglobose from the beginning, 0.2–0.75 mm diam., yellowish grey, sometimes with a bluish grey tinge, with a thick yellowish pruina concolorous with the thallus, dispersed or occasionally in clusters of up to 5(–10). *Excipulum* poorly developed and present only in very young apothecia, soon excluded, hyaline, unchanged in KOH, composed of sparsely branched and anastomosing hyphae c. 0.5–1 μ m thick, imbedded in a hyaline gel not dissolving in KOH or HNO₃. *Epithecium* (2.5–)7–12 μ m thick, composed of dense yellow-brown granules dissolving in KOH. *Hypothecium* \pm colourless in very young apothecia, pale yellow-brown to brown, olive-brown to dark brown centrally, K – or K+ yellow with the darker central area usually remaining \pm unchanged. *Hymenium* colourless, amyloid, densely conglutinated, 60–80 μ m thick, unchanged in KOH. *Asci* 8-spored, 52–72 \times (7.5–)8.5–10(–14) μ m, narrowly cylindrical, of the *Bacidia*-type: tholus strongly amyloid with a faintly amyloid masse axiale with steeply convergent flanks; ocular chamber poorly developed or lacking; wall non-amyloid, c. 1 μ m thick; gelatinous outer coat amyloid. *Paraphyses* densely anastomosing, not separating easily in KOH, c. 0.75–1(–2) μ m thick, composed of rather short, often somewhat unevenly swollen cells; apices tapered, not expanded. *Ascospores* hyaline, filiform-acicular, sigmoid, very tightly spiralled in the ascus, 36–60 \times 1–2 μ m, usually broader and rounded at one end, tapering to a hair-like point at the other, indistinctly septate with usually 2–4 septa at the broader end of the spore.

Chemistry. Grayanic acid (major), usnic acid (minor/trace) and 4-O-demethylgrayanic acid (minor/trace) (J. A. Elix pers. comm.). Thallus PD+yellow-orange, K+yellow-orange, C –, UV+bright purple. The spot

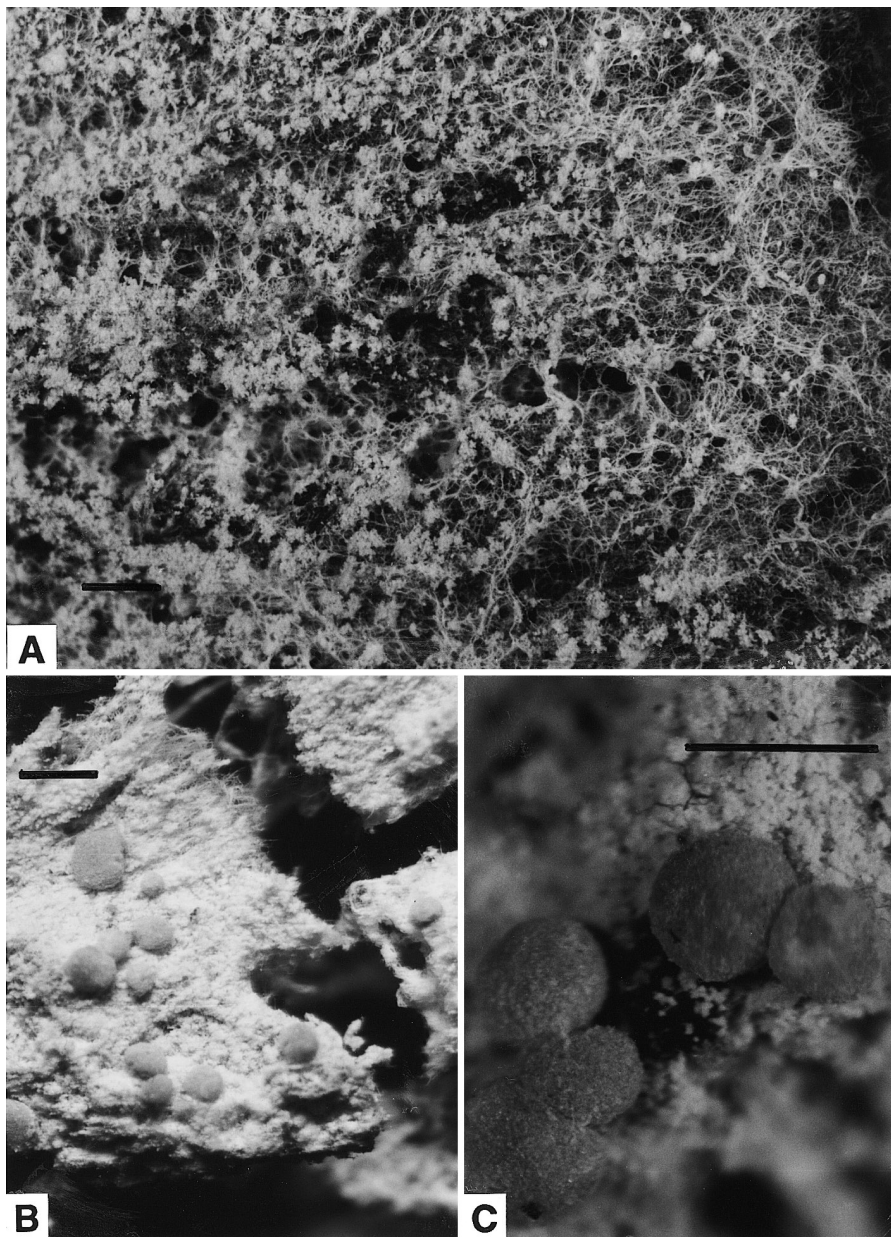


FIG. 2. *Jarmania tristis*. A, Thallus; B, Apothecia; C, Apothecia detail. Scale=0.5 mm.

tests are often rather weak. The UV fluorescence is confined to the margins of the thallus or to places where the byssoid thallus is exposed through cracks in the overlying, granular crustose layer.

Grayanic acid is a relatively uncommon substance in the Australian lichen flora, known at present only from *Neophyllis melacarpa* (F. Wilson) F. Wilson (*Cladoniaceae*).

Taxonomic position: The distinctive ascus structure of the genus *Jarmania* (Fig. 1) supports its inclusion in the family *Bacidiaceae* within the order Lecanorales. This family, as currently accepted, for example, by Hafellner (1984), Rambold (1989) and other workers, contains mostly crustose taxa, although there are also some small outlying genera with more elaborately developed thalli: squamulose (e.g. *Phyllopsora*), foliose (e.g. *Rolfidium*), fruticose (e.g. *Compsocladium*) and byssoid (e.g. *Tibellia*).

Within the *Bacidiaceae*, *Jarmania* is characterized by a byssoid-leprose thallus, immarginate apothecia in which the excipulum is highly reduced to absent, strongly anastomosing, net-like paraphyses and multiseptate, acicular ascospores. The new genus has no close relationships to *Tibellia*, the other byssoid member of the family, which differs in having apothecia with a very well-developed excipulum, paraphyses that are only slightly anastomosing, and ellipsoid, one-septate ascospores (Hafellner & Vězda 1992). Perhaps the closest relative to *Jarmania* is the monotypic genus *Compsocladium* (J. Hafellner pers. comm.), which is endemic to the highlands of New Guinea (Lamb 1956). *Compsocladium* has a distinctive, small fruticose thallus, cephalodia and stalked apothecia with a well-developed excipulum but, like *Jarmania*, it also has netted, anastomosing paraphyses and rather similar spores. The chemical composition of the new genus is also unique for the family.

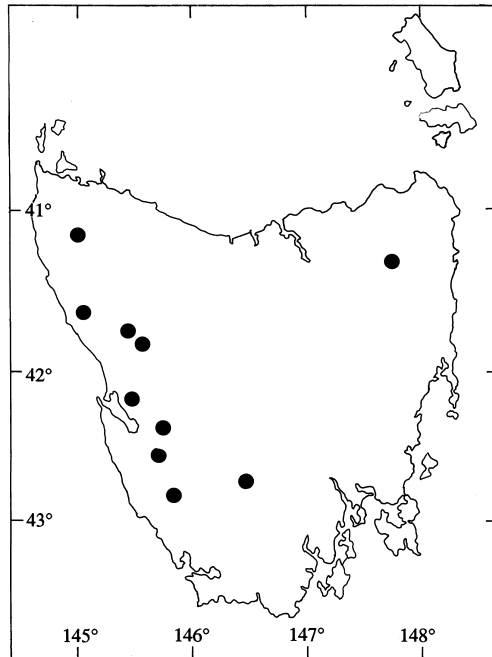
Remarks: *Jarmania* displays a rather variable thallus structure, consisting essentially of a whitish byssoid mat overlain with a granular-leprose layer. In older thalli, the granular layer coalesces into a coarse, contiguous crust, but more typically the granules are rather dispersed and the byssoid layer remains clearly visible beneath. Almost invariably, the byssoid layer is exposed at the thallus margins where it may be whitish or discoloured somewhat bluish grey.

The apothecia are very strongly subglobose and an excipulum is evident only in very young fruits, and then only in thin sections. In mature apothecia, hymenial tissue occupies the entire outer surface of the fruiting body, although well-developed fertile asci seem to be absent from these marginal areas. The asci are relatively small and highly conglutinated, and the typical *Bacidia*-form is best observed in immature asci from rather young apothecia (Fig. 1). The flanks of the masse axiale tend to be clearly convergent to a thin amyloid zone above, but some asci where this amyloid upper zone is almost absent have also been observed. In asci containing mature spores, the internal structures of the tholus become compressed and the masse axiale cannot be seen. Ascospores are very tightly spiralled and, even on release from the ascus in squash preparations, remain curved and contorted. The septa are indistinct in water, KOH and HNO₃ mounts. The paraphyses tend to be very indistinct and were best observed in erythrosin.

Jarmania is a very distinctive species in the Tasmanian lichen flora and has no known confusing species. It is well separated from the other byssoid species that occur in the flora (Jarman & Kantvilas 1995) by a wide range of characters (summarized in Table 1). In brief, only *Jarmania* combines the key characters

TABLE 1. Summary of characteristics of byssoid lichens occurring in Tasmania

Thallus colour	Photobiont	Apothecia	Ascospores	Chemistry	Habitat in Tasmania	World distribution
Coenogonium implexum	Trentepohlia	Lecideine, plane, bright orange	Fusiform, 1-septate	Nil	Smooth bark in wet sclerophyll forest and rainforest	Pantropical
Conotremopsis weberiana	Trentepohlia	Tubular, black with white pruina	Filiform, multiseptate	Nil	Dry trunks in rainforests, especially at high altitude	Tasmania, New Zealand
Cystocoleus ebeneus	Trentepohlia	Unknown	Unknown	Nil	Alpine rocks	Bipolar
Dictyonema sericeum	Scytonema	Nil (basidiolichen, rarely found fertile)	—	Nil	Over bryophytes on wet trunks and logs	Pantropical
Jarmania tristis	Coccoid green alga	Immarginate, subglobose, yellowish grey	Acicular-filiform, 2-4-septate	Usnic acid, grayanagic acid, 4-O-demethylgrayanagic acid	Dry, leaning branches in rainforest	Tasmania
Roccellinastrum flavescens	Coccoid green alga	Immarginate, subglobose, pale pink	Globose, simple	Protocetraric acid, usnic acid	Leafy shoots of conifers at alpine altitudes	Tasmania
Roccellinastrum lagarostrobi	Coccoid green alga	Unknown	Unknown	Protocetraric acid	Leafy shoots of Lagarostrobos in rainforest	Tasmania
Roccellinastrum neglectum	Coccoid green alga	Immarginate, subglobose, pale pink	Bacilliform, simple	Protocetraric acid, squamatic acid	Moist trunks in rainforest	Tasmania, New Zealand
Sagenidium molle	Trentepohlia	Lecideine, plane, black, densely white-pruinose	Fusiform, 5-septate	Lepranic acid	Dry trunks in rainforest	Tasmania, Victoria, New Zealand

FIG. 3. Distribution of *Jarmania tristis*.

of a yellowish thallus, a granular-leprose layer overlying the bysoid thallus, a coccoid photobiont, asci of the *Bacidia*-type, and acicular, spiralled spores.

Distribution and ecology: *Jarmania tristis* is endemic to Tasmania, where it occurs at low to medium altitudes, mostly below c. 550 m a.s.l. (Fig. 3). It has been recorded only from cool temperate rainforest communities of the thamnic and implicate types (nomenclature after Jarman *et al.* 1994) or in sclerophyllous, earlier successional stages of this kind of vegetation. The single outlying record of *Jarmania* in north-eastern Tasmania is of particular interest. It occurred there in a rather anomalous rainforest type dominated by *Nothofagus cunninghamii* and *Phyllocladus aspleniifolius*, which has been considered intermediate between thamnic and callidendrous forest (Jarman *et al.* 1984), or a specialized, vascular species-poor thamnic rainforest community (S. J. Jarman, pers. comm.). The abundant occurrence in this forest of *Jarmania tristis*, which is an excellent indicator species for thamnic and implicate rainforest, strongly supports the latter hypothesis.

The forest communities where *Jarmania* occurs have shrubby understoreys and the new species grows on a wide range of bark types on small trees and shrubs of various species, including *Anodopetalum biglandulosum* (Cunoniaceae), *Anopterus biglandulosus* (Escalloniaceae), *Cenarrhenes nitida* (Proteaceae), *Monotoca glauca* (Epacridaceae), *Nothofagus cunninghamii* (Fagaceae), *Phyllocladus aspleniifolius* (Phyllocladaceae), *Tasmannia lanceolata* (Winteraceae) and *Eucryphia milliganii* (Eucryphiaceae). *Jarmania* occurs in

sheltered, shaded microhabitats, typically on the undersides of inclined trunks and branches, and, in this respect, is rather similar in its ecology to several other byssoid lichens, for example *Sagenidium* and *Conotremopsis*, which favour habitats protected from direct contact with rain or water runnels. Rogers & Hafellner (1987) observe that this phenomenon, which is frequently seen in byssoid lichens, is an ecological specialization (which has arisen in several families and orders independently) for deriving moisture solely from humid air. However, *Jarmania* consistently favours small-diameter young trunks or branches, whereas the other byssoid lichens mentioned grow mostly on very old, large-diameter trunks.

Jarmania tristis grows in very depauperate microhabitats for lichens and is rarely associated with other species. However, lichens from the upper, moist side of the trunks and branches on which it grows, for example species of *Psoroma* and *Pseudocyphellaria*, may occasionally abutt or encroach onto the thalli of *Jarmania*. Well developed material of the parasite, *Chaenothecopsis tasmanica* (det. prov. by M. Wedin), grew on one specimen.

Additional specimens examined. **Australia:** *Tasmania:* road to Mt McCall, iii 1982, *G. Kantvilas* s.n. (HO); Anthony Road, site 471, 41°50'S, 145°36'E, xi 1992, *G. Kantvilas* 523/92 (HO); c. 3 km south of Teepookana, 42°13'S, 145°26'E, xi 1990, *G. Kantvilas* 673/90 (HO); Pieman Road, 41°44'S, 145°28'E, ii 1989, *G. Kantvilas* 26/89 (HO, hb. Vězda); Sumac Road, Spur 2, S of Arthur River, 41°08'S, 145°02'E, xi 1980, *G. Kantvilas* 682/80 (HO, hb. Vězda, BM); same locality, v 1981, *G. Kantvilas* 325/81 (HO); Butler Island Camp, Gordon River, 42°34'S, 145°41'E, i 1976, *J. M. Gilbert* 76/65 (HO); Pieman River near Corinna, 41°39'S, 145°05'E, ii 1982, *G. Kantvilas* 73/82 (HO, BM); Five Road, Florentine Valley, 42°44'S, 146°25'E, ix 1980, *G. Kantvilas* 377/80 (HO, BM); Ben Ridge Road, 41°21'S, 147°41'E, xii 1981, *G. Kantvilas* 1098/81 (HO).

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