Observations on some Tasmanian species of the lichen genus *Megalaria* (Lecanorales: Megalariciaceae)

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Abstract

Three species of *Megalaria* Hafellner (Lecanorales: Megalariciaceae) are described and discussed, with special emphasis on apothecial pigments and ascospore size: *Megalaria laureri* (Th.Fr.) Hafellner, *M. melaloma* (C.Knight) Kantvilas comb. nov. and *M. subtasmanica* Kantvilas sp. nov. The names *Catillaria tasmanica* Rasänén, *Patelloea scutata* Rodway and *Patellaria biclipea* Shirley are considered synonyms of *Megalaria melaloma*.

Introduction

The genus *Megalaria* (Lecanorales: Megalariciaceae) was introduced by Hafellner (1984) to accommodate the distinctive crustose lichen, *M. grossa* (Pers. ex Nyl.) Hafellner. This widespread species had previously been included within *Catillaria* A.Massal. and *Catinaria* Vain., but study of the ascus structure of these genera revealed that *M. grossa* was clearly different, having an ascus with an amyloid tholus penetrated almost completely by a conical to barrel-shaped, non-amyloid axial body (masse axiale). In contrast, *Catillaria* and *Catinaria* have asci with a uniformly amyloid tholus, although additional anatomical differences further separate these superficially similar genera.

The introduction of a new genus led to the reappraisal of other species included within obviously heterogenous groups such as *Catillaria* as generally applied in the sense of A. Zahlbuckner; that is, essentially crustose lichens with lecideine apothecia and one-septate, hyaline ascospores. Thus, other species were soon added to *Megalaria* by Schreiner and Hafellner (1992), Hafellner in Nimis (1993), Ekman and Tonsberg (1996), Fryday (2004a, 2004b), Galloway (2004), Kalb (2007) and Lendemer (2007). Ekman and Tonsberg (1996) discussed the delimitation of the genus, which they characterised by the crustose thallus, lecideine apothecia with a proper excipulum of radiating hyphae lacking enlarged cells at the outer edge, the presence of greenish, K- green, N+ reddish pigments in the epithecium, simple or sparingly branched paraphyses, one-septate, ellipsoid, hyaline, non-halonate, single-walled ascospores, and an ascus with an amyloid tholus pierced by a conical to barrel-shaped axial body surrounded by a narrow, usually more intensely amyloid adjacent zone. The photobiont of *Megalaria* is thought to be the chlorococcoid algal genus *Dictyosporopsis* Geitler (Tschermak-Woess 1984). A good general account of the genus is also offered by Galloway (2007).

A related genus, *Tasmidella* Kantvilas, Hafellner & Elix, was described by Kantvilas et al. (1999). It differs from *Megalaria* primarily by having simple, double-walled ascospores and bacilliform to filiform (rather than ellipsoid to ampulliform) conidia. These authors (op. cit.) also discuss the systematic position of *Megalaria* and *Tasmidella*, maintaining...
both in the family Megalariaceae. More recently, Kalb (2007) segregated the genus *Catillochroma* Kalb from *Megalaria*, on the basis of its having a layered excipulum with a prosoplectenchymatous outer layer and an inner layer of interwoven hyphae ins persed with crystals. Two species of this genus are represented in the Tasmanian flora and were previously included within *Megalaria*: *C. melanotropa* (Nyl.) Kalb and *C. pulverea* (Borrer) Kalb.

*Megalaria* is a genus of cool, moist, oceanic climates (Ekman & Tonsberg 1996). It appears to be well represented in cool temperate areas of the Southern Hemisphere, where it occurs chiefly as a wet forest epiphyte, but also on rocks, soil, wood and bark in other vegetation types. Two taxa from Campbell Island were described recently by Fryday (2004a), whereas Galloway (2007) deals with 11 taxa from New Zealand (some of which are now placed in *Catillochroma*). Collections of *Megalaria* are well represented in Australian herbaria, usually under a variety of 'dust-bin' names such as *Catillaria*, and a glance at the early Australian lichen literature indicates that several species of the genus have been described in the past (under *Lecidea*, *Patellaria*, *Catillaria* and other genera). To unscramble this plethora of names and collections will require a long and demanding study. The aim of the present paper is more limited in focus, being to ascribe names to three of the more common and widespread species that are frequently cited in the course of Tasmanian floristic, ecological or conservation studies, and to account for some of the older names in the literature that have fallen into disuse.

### Material and Methods

The study is based on specimens collected by the author and housed in the Tasmanian Herbarium (HO), with some duplicates distributed to BM, CANB, GZU and herb. Vézda. Anatomical investigations were conducted on hand-cut sections of thalli and apothecia mounted in water, 10% KOH (K), Lugol's iodine, concentrated HNO₃ (N) and concentrated HCl (H). Measurements of ascospores are based on 100–200 observations each and are presented in the format: lowest value–mean–highest value. Chemical constituents were examined by thin-layer chromatography using standard methods (Orange *et al.* 2001). Terminology for apothecial pigments and the procedures for their identification and characterisation follows Meyer and Printzen (2000). Nomenclature of ascus types follows generally acceptable accounts (e.g. Hafellner 1984, Purvis *et al.* 1992).

### Taxonomy


Thallus crustose, effuse to patchy, smooth to rather unevenly warty, or composed of tiny, scattered granules to c. 0.2 mm wide, whitish grey, lacking isidia or soredia, ecorticate, mostly delimited by a black prothallus; photobiont a unicellular green alga with cells globose, 6–14 μm diam.

Apothecia to 0.9 mm diam., scattered or in irregular clusters of 2–3, superficial, highly basally constricted to sometimes almost subpedicellate; disc plane at first, later convex, matt, black or rarely brown-black, epruinose; margin concolorous with the disc, persistent but sometimes obscured in oldest, most convex apothecia. Excipulum in section 60–80 μm thick, composed of radiating, branched and anastomosing, conglutinated hyphae 1.5–2 μm thick, at the outer edge with a thin, ±discontinuous band of grey-green to blackish green pigment, K±intensifying greenish, N± crimson, within with a dilute to very concentrated purple-pink pigment, ±intensifying in K, N± pale orange, extending beneath and subtending the hymenium and hypothecium. Hypothecium 40–100 μm thick, not inspersed with oil droplets, purple-brown to purple-pink, K+ intensifying pink, N+ pale orange above, dilute greenish grey, K±intensifying green, N+ crimson below. Hymenium 70–90 μm thick, not inspersed, mostly hyaline but overlain with a continuous or patchy layer to c. 20 μm thick of blackish green and purple-pink pigments (as in the excipulum). *Asci* 8-spored, clavate, 60–85 × 14–22 μm, with a well developed amyloid tholus penetrated almost entirely by a conical massa axiale bordered by a narrow, more intensely amyloid zone (i.e. approximating the *Biotora*-type); ocular chamber usually not developed. Paraphyses lax in K, simple or occasionally branched and anastomosing, 1–2 μm wide; apices capitulate, 4–5 μm wide, persistently conglutinated with epitheimal pigments (as above). Ascospores ellipsoid to ovate, 1-
septate, (15--)16–19.6–24(-26) × 7–8.6–10 μm. Pycnidia not observed. Figs. 1A, 2A.

**Chemistry:** no substances detected by t.l.c.

**Remarks:** Megalaria laureri was first recorded for Tasmania by Wetmore (1963) on the basis of a dubious statement by Almborn (1948), and has been maintained in various checklists since (e.g. Kantvilas 1994, McCarthy 2008). However, no Tasmanian specimens of the species have been available for study until now, and it is likely that the concept of the species employed by Almborn (1948) is different to that in use today. The record from Queensland (McCarthy 2008) cannot be confirmed.

This species is recognised by the distinctive pigments in its excipulum, hypothecium and epihymenium. The dominant, purple-pink pigment approximates 'atra-red' of Meyer and Printzen (2000); this intensifies pinkish in K, is unchanged in H and reacts N+ orange. Also present in the epihymenium and the hypothecium is 'cinereorufa-green': K±green intensifying, H±blue-green, N+ crimson. In very occasional sections, a thin band of 'hypnorum-blue' may also be present in the upper part of the hypothecium: K+ turquoise, H±violet-blue, unchanged in N. The pigments may occur in discrete patches or overlay each other, so their detection is not always straightforward. Although

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*Figure 1. Comparison of ascospores of Megalaria species. A: M. laureri (Kantvilas 91/87); B: M. melaloma (Kantvilas 214/99); C: M. subtasmanica (Kantvilas 57/87). Scale = 10 μm.*
all these pigments may also occur in other species of *Megalaria* to some degree, the predominance of the ‘atra-red’ pigment is highly characteristic.

Additional descriptive data for this species are given by Coppins (1992) (for Great Britain, under Catillaria) and by Brodo et al. (2001) (for North America). Whereas Tasmanian specimens have the same pigments and general habit, their ascospores are relatively longer and broader [cf. 12–18 × 5–7 μm (Coppins 1992); 13–18(–24) × 5–7(–8) μm (Brodo et al. 2001)]. Thus the identification of the Tasmanian specimens is provisional at this stage.

**Distribution and ecology:** *Megalaria laureri* is widespread albeit often localised in temperate areas of the Northern Hemisphere. It appears to be uncommon in Tasmania where it is known from only two collections: one from the trunk of Banksia in wet eucalypt forest and the other from a young trunk of *Nothofagus cunninghamii* (Hook.) Oerst. in cool temperate rainforest.

**Specimens examined:** **TASMANIA.** Yarlington Tier, 42°32'S 147°18'E, 620 m alt., 8.xi.1987, G. Kantvilas 91/87 (GZU, HO); Montana Falls, 41°34'S 146°36'E, 290 m alt., 26.xi.1988, J.A. Curnow 2063 (CANB, HO, M).

**UNITED STATES OF AMERICA:** **MICHIGAN.** Alger County, W of Kingston Lake, 16.ix.1970, R.C. Harris 6055 (HO, MSC).

2. *Megalaria melaloma* (Knight) Kantvilas comb. nov.


**Type:** New South Wales ['in the neighbourhood of Sydney'], C. Knight [vol. 204, p. 24, no. 24] (WELT-holotype).


**Thallus** crustose, 50–100(–150) μm thick, generally smooth, effuse and continuous, sometimes cracked, abraded, rather gnarled and scurfy, whitish cream, glaucous grey to pale brownish, not delimited, lacking isidia or soredia, ecorticate; photobiont a unicellular green alga with cells globose, 7–10(–16) μm diam.

**Apothecia** 0.8–1(–1.5) mm diam., scattered, superficial, basally constricted; disc plane at first, later convex, matt, typically jet-black but sometimes pale greyish, brown or piebald, epruinose; margin persistent except in oldest, most convex apothecia, often rather glossy, typically concolorous with the disc, or darker when the disc is pale, rarely a little brownish at the sides. **Excipulum** in section 40–80 μm thick, composed of radiating, branched and anastomosing, conglutinated hyphae to c. 2 μm thick, with a grey-green, olive-green to bluish green, K±intensifying greenish, NH+ crimson pigment at the edge, sometimes extending within in

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**Figure 2.** Comparison of the ascus apex of *Megalaria* species, observed in dilute Lugols' iodine after pretreatment with 10% KOH (amyloide tissues stippled). A: *M. laureri* (Kantvilas 91/87); B: *M. melaloma* (Kantvilas 207/80); C: *M. subtasmanica* (Kantvilas 264/93). Scale = 10 μm.
streaks; dilute patches of a purple-brown to pinkish pigment, ±unchanged or intensifying in K, N+ pale orange sometimes also present. Hypothecium 80–200 μm thick, inspersed with oil droplets, hyaline to pale straw-coloured and typically ±pale yellowish in the lower part, in the upper part with a band c 30–50 μm thick, diffusely pigmented greyish green to olive-brown (as in the excipulum). Hymenium 80–120 μm thick, not inspersed, mostly hyaline but overlain with a continuous or patchy layer 5–20 μm thick of blackish green, greenish blue to olive-green pigment (as in the excipulum), K±unchanged or intensifying greenish, N+ crimson. Asc/8-spored, clavate, 65–105 × 20–30 μm, with a well-developed amyloid tholus penetrated ±entirely by a conical masse axiale and bordered by a narrow, more intensely amyloid zone (i.e. ±of the Biatora-type); ocular chamber blunt, not prominent. Paraphyses lax in K, simple or occasionally branched and anastomosing, 1.5–2 μm wide, with apices unpigmented, generally not capitate or sometimes swollen to 4 μm. Ascospores ellipsoid to ovate, 1-septate, (15–)16–22.5–28–31) × (7–8–10.1–12–14) μm. Pycnidia not observed. Figs. 1B, 2B.

Chemistry: atranorin detected occasionally by t.l.c.

Notes on type specimens: Knight’s type of Lecidea melaloma is an excellent and typical example of this taxon. The type specimen of Catlaria tasmanica studied consists of fourteen fragments of bark bearing a mixture of several lichen species, including two species of Megalaria. These differ clearly by their ascospore size, but are superficially indistinguishable, both having jet-black, glossy apothecia with a persistent margin, and a thin to moderately thick, whitish thallus; they also have identical apothecial pigmentation. One of the taxa is identical to M. melaloma whereas the other is the species described below as M. subtasmonica Kantvilas. Unfortunately it seems inappropriate to retain the epithet ‘tasmanica’ for the latter, even though it is the better represented of the two lichens in this specimen: the original description of C. tasmanica (Rässänen 1944) explicitly gives the spore measurements as 26–30 × 12–14 μm, indicating that the author was intending to describe what is now recognised as M. melaloma.

Rodway’s Patellaea scutata was described as a non-lichenised fungus (Rodway 1925). The type specimen is a particularly abundant and well-developed collection of M. melaloma.

Shirley’s type specimen of Patellaria biclipea, collected by the prolific Tasmanian cryptogam collector, W.A. Weymouth, has not been located, despite extensive searches of likely herbaria (Kantvilas 1988). However, the description (Shirley 1894) matches M. melaloma perfectly, and that taxon occurs in great abundance at the same locality today.

Remarks: Megalaria melaloma is characterised by the generally smooth, crustose thallus, the epuloine, usually jet-black apothecia with concolorous disc and margin, the essentially hyaline or at most dilutely pigmented excipulum and hypothecium, the predominance of greenish pigments in the epithecium and excipulum, the eight-spored ascii and the relatively small ascospores. The last two characters separate M. melaloma from M. subtasmonica (see below), which has distinctly larger ascospores (mostly 30–44 × 12–20 μm) that occur 2–6 per ascus. The lack of opaque, essentially blackish green pigments in the hypothecium and excipulum distinguish it from several other species, including the common and cosmopolitan M. grossa, which is widespread in Tasmania and mainland Australia.

Megalaria species in general are well characterised by their thallus morphology, apothecial pigmentation and ascospore size, characters that are usually cited in even the briefest of published descriptions. No other known taxa appear to combine the same characters as does M. melaloma, although the existence of some older, as yet overlooked published name for such a common and conspicuous species cannot be discounted. Thus, further synonyms may well come to light as investigations of the early collections of Australasian lichens continue.

The greenish pigmentation found in the epithecium and excipulum approximates ‘cinereo-rufa-green’ of Meyer and Printzen (2000); it reacts N+ crimson-red, H+ blue-green and intensifies greenish in K. Although the appearance of the pigment in section varies from an almost blackish green to a quite dilute pale greenish or with hints of olive or brown, these variations appear to be due to concentration alone. Sometimes the pigment may appear to have quite strong turquoise-bluish tones, but nevertheless reacts the same in K, H and N. In some specimens, additional dilute tinges of a pinkish or purple-brown pigment may also be present.
but in this taxon, it does not appear to be of taxonomic significance. This pigment approximates ‘atra-red’ (Meyer & Printzen 2000) and reacts N+ orange, but is ±unchanged in K and H.

The thallus chemistry of the species is ambiguous. Some specimens, especially those with a thicker, paler thallus, contain trace amounts of atranorin, but this compound has a sporadic occurrence in many crustose lichens and especially those growing in exposed, well-lit conditions. Thallus chemistry does not appear to be a useful character in *Megalaria* taxonomy in general (Ekman & Tonsberg 1996), with the exception of those taxa recently transferred to the genus *Catillochroma* by Kalb (2007).

Ekman and Tonsberg (1996) discuss the variation in ascus structure between *M. grossa* (the type species of the genus) and other taxa included in *Megalaria* or, currently, the related genus *Catillochroma*. In *M. melaloma* and the other species treated in the present paper (*M. laureri* and *M. subtasmanica*), the ascus approximates the *Biatora*-type. There is a well-developed, amyloid tholus almost completely penetrated by a conical masse axiale with an acute apex. Using very dilute Lugol’s solution after pretreatment with K, a narrow, more intensely amyloid zone is evident adjacent to the masse axiale, although the internal differentiation of the tholus can be difficult to discern. The ocular chamber is relatively short and blunt to ±absent (see Figs 2A–C).

**Distribution and ecology**: *Megalaria melaloma* is a common and widespread epiphyte in a wide range of wet forest types, including *Nothofagus*-dominated cool temperate rainforests and *Eucalyptus*-dominated sclerophyll forests. Although apparently preferring hosts with smooth bark (for example *Acacia*, *Atherosperma*, *Pittosporum*, *Pomaderris*), it may also occur on more fibrous substrata such as on *Bedfordia* or species of *Myrtaceae*. Rarely it has been found on rocks or charcoal. It is typically a component of a rich association of crustose and small foliaceous lichens, including *Thelotrema lepadinum* (Ach.) Ach., and species of *Parmelia*, *Pertusaria* and *Mycoblastus*. Also commonly present in such lichen communities are several species with a superficially similar appearance to *M. melaloma* (i.e. with a whitish crustose thallus and black, lecideine apothecia), including *Megalaria subtasmanica* Kantvilas, *Bacidia wellingtonii* (Stirt.) D.J.Galloway, *Sarrameana albidoPlumbea* (Hook.f. & Taylor) Farkas and *Hafella* species; to distinguish these lichens unequivocally requires microscopic examination of apothecial sections and squashes.

Specimens studied are from Tasmania, Victoria, the A.C.T. and New South Wales, indicating a south-eastern Australian distribution.


3. *Megalaria sub tasmanica* Kantvilas sp. nov.

Thallo crustaceo, effuso, apothecis nigris, typice ad marginem pigmento viridulo tinctis, excipulo hypothecioque interne praecipue hyalinis, a *Megalariae melalomae* similissima sed ascosporismaioribus, (24-)30~44(-46) pm longis, 12-20(-21) pm latis different.

**Type**: **AUSTRALIA**: TASMANIA. Little Fisher River, 41°45’S 146°20’E, on *Atherosperma moschatum* in rainforest, 850 m alt., 15.v.1987, G. Kantvilas 57/87 (HO – holotype).

Thallus crustose, effuse to c. 100 µm thick, continuous, smooth to shallowly cracked to rather scurfy, typically whitish cream, occasionally dull pale brownish, not delimited, lacking soreda or isidia, ecorcitate; photobiont a unicellular green alga with cells globose, 6-10 µm diam.
Apothecia to 1(-1.3) mm diam., scattered, superficial, basally constricted; disc plane to convex, matt, usually jet-black, occasionally dark brown, brown-grey or ±piebald, epruinose; margin typically concolorous with the disc, persistent, often somewhat glossy. Excipulum in section 60–120 μm thick, composed of radiating, anastomosing, highly gelatinised hyphae 1–1.5 μm thick, mostly hyaline within, but with patchy dilute pigments, especially towards the outer edge and adjacent to the hymenium; pigment mostly grey-green, olive-brown to blue-green, K±unchanged or intensifying greenish, N+ crimson, sometimes also with a purple-brown to pinkish pigment, ±unchanged in K, N+ pale orange. Hypothecium to 200 μm thick, occasionally inspersed with oil droplets, typically hyaline to dilute straw-coloured and K-i- weakly yellowish, sometimes with a subhymenial upper band to C.80 μm thick, pigmented greenish or olive brownish (as in the excipulum). Hymenium 120–160 μm thick, not or only very rarely inspersed with scattered oil droplets, hyaline but overlain by a continuous to patchy ephymenial layer 10–15 μm thick of olive-green to blackish green pigment, K±intensifying greenish, N+ crimson (as in the excipulum). Asci elongate-clavate, at first 8-spored but typically with a few spores soon aborted and therefore generally (2–)4–6-spored, 110–140 × 26–42 μm (very few intact asci observed), with a well-developed amyloid tholus penetrated ±entirely by a conical masse axiale and bordered by a narrow, more intensely amyloid zone (i.e. ±of the Biatora-type); ocular chamber not developed. Paraphyses lax in K, simple to very sparsely branched, 1–2 μm thick; apices usually neither pigmented nor swollen, sometimes expanded to 3–4 μm and distinctly greenish. Ascospores ellipsoid to ovate, sometimes fabiform, (24–)30–35.1–44(–46) × 12–14.6–20(–21) μm. Pycnidia not observed.

Chemistry: atranorin detected occasionally by t.l.c. 

Etymology: The specific epithet refers to the close similarity of the new species with Catillaria tasmonica (= Megalaria melaloma), the name that has been frequently misapplied to the species in Tasmanian literature.

Remarks: Given the abundance of this taxon in herbarium collections, and its conspicuous nature in the field, it is surprising that no existing name could be found in the literature. Even more remarkable is the fact that its sympatric look-alike, M. melaloma, has been described previously no fewer than four times. These two taxa share a ±smooth thallus and identical apothecial pigmentation, dominated by 'cinereoruful-green' with traces of 'atra-red' (Meyer & Printzen 2000). A particularly notable character is the chiefly hyaline excipulum and hypothecium that, together with the pigment, separate these species from most other species of the genus. Megalaria subtasmanica and M. melaloma differ from each other by their ascospore size. In the former, the asci are correspondingly larger and the hymenium taller. The size character is consistent and has been confirmed in several hundred observations spanning scores of apothecial sections and specimens. In both species, the asci approximate the Biatora-type (see under M. melaloma) (Fig. 2).

Distribution and ecology: Megalaria subtasmanica is a common epiphyte of cool temperate rainforest and wet eucalypt forest. It colonises understorey trees and shrubs, including those with smooth bark (e.g. Acacia, Pomaderris), fibrous bark (members of the Asteraceae) and papery bark (Myrtaceae). Like M. melaloma, with which it frequently occurs in closely intermixed colonies (to the extent that most herbarium collections of these species are usually mixed), it is a member of a rich assemblage of foliose and crustose lichens.

The species is known at present from Tasmania, King Island and the south-west of Western Australia, but it can be expected to be more widespread.

Selected specimens examined (total = 24): TASMANIA.

Nye Bay, 43°04’S 145°41’E, 20 m alt., 4.ii.1986, A. Moscal 12059 (HO); creek crossing Strickland Avenue, 42°56’S 147°16’E, 19.vi.1963, G.C. Brett 278 & M.H. Bratt (HO); Millhouses Falls, Huon Road, 42°58’S 147°12’E, 420 m alt., 3.iii.1893, W.A. Weymouth 286c (HO); Savage River Pipeline Road by 14.5 km peg, 41°16’S 145°19’E, 8.xii.1993, G. Kantvilas 264/93 (HO); Yarlington Tier, 42°32’S 147°18’E, 620 m alt., 30.xi.1988, G. Kantvilas 585/88 (HO); King Solomon Cave, 41°33’S 146°15’E, 400 m alt., 27.xi.1988, A. Rozefelds 56 (CANB, HO); King Island, Yarra Creek Crossing, 40°00’S 144°05’E, 80 m alt., 6.1v.1999, A. Rozefelds s.n. (HO).

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References


