

Standard Paper

Lecanactis (Roccellaceae) in Tasmania, with the description of a new saxicolous species and a revised key for the genus in Australia

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Abstract

The lichen genus *Lecanactis* Körb. in Tasmania comprises six species: *L. abietina* (Ach.) Körb., which is widespread and pan-temperate; *L. latispora* Egea & Torrente and *L. neozelandica* Egea & Torrente, both shared with New Zealand and with the former recorded here from the Auckland Islands for the first time; *L. mollis* (Stirt.) Frisch & Ertz, shared with Victoria and New Zealand; *L. aff. dilleniana* (Ach.) Körb., a European species recorded provisionally for Tasmania on the basis of several sterile collections; *L. scopulicola* Kantvilas, which is described here as new to science and apparently a Tasmanian endemic. This new taxon occurs in rocky underhangs and is characterized by a thick, leprose thallus containing schizopeltic acid, and 3-septate ascospores, $19\text{--}30 \times 4.5\text{--}6 \mu\text{m}$. Short descriptions and a discussion of distribution and ecology are given for all species. A key for all 11 Australian species of the genus is provided, including *L. subfarinosa* (C. Knight) Hellb. and *L. tibelliana* Egea & Torrente, which are recorded for Australia for the first time, and *L. platygraphoides* (Müll.Arg.) Zahlbr., a first record for New South Wales. *Lecanactis spermatosporea* Egea & Torrente and *L. sulphurea* Egea & Torrente are also included.

Key words: biodiversity, lichenized Ascomycetes, lichens, taxonomy

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Introduction

The genus *Lecanactis* (Roccellaceae) consists of c. 25 species of lichenized Ascomycetes, widely distributed throughout the world in temperate to tropical latitudes, especially in oceanic climates (Jaklitsch *et al.* 2016). The genus has had a rather complex taxonomic history which has seen it gradually subdivided, with well-defined groups of taxa being segregated into distinct genera. Initially this was based on anatomical and morphological data, which saw, for Tasmania at least, the delimitation of the genera *Bactrospora* (Egea & Torrente 1993a), *Cresponea* (Egea & Torrente 1993b) and *Lecanographa* (Egea & Torrente 1994). More recently, molecular data have been applied, leading to a further subdivision of *Lecanactis* (Ertz *et al.* 2014), albeit with no nomenclatural consequences for the Tasmanian biota, other than the inclusion of the bysoid *Sagenidium molle* Stirt. in *Lecanactis* (as *L. mollis*).

Lecanactis is characterized by: a crustose, leprose or bysoid thallus containing *Trentepohlia* as the photobiont; apothecioid ascomata that are typically black but may be heavily covered with a grey pruina and usually contain a dark brown, K+ greenish pigment in the cupulate excipulum; 8-spored hemiamyloid asci of the *abietina*-type (nomenclature after Torrente & Egea (1989)), where a faint amyloid reaction is observed in the tholus surrounding a small, blunt ocular chamber; transversely septate, thin-walled, non-halonate, hyaline ascospores; simple to sparsely

branched and anastomosed paraphysoids; and ellipsoid to bacilliform conidia, borne in immersed, sessile or emergent pycnidia. Most taxa have a characteristic secondary chemistry with schizopeltic, gyrophoric or lepranic acid being commonly encountered.

McCarthy (2020) records eight species of *Lecanactis* for Australia, with all but three having a tropical distribution. Galloway (2007) records six species for New Zealand. The most recent taxonomic investigations were undertaken by Egea & Torrente (1994) who revised the genus worldwide, and by Kantvilas (2004) who recorded three species for Tasmania. Species of *Lecanactis* and related genera are frequently associated with narrow ecological niches or fragmented, relict vegetation types, and are therefore often significant for nature conservation and land management (e.g. Kantvilas 2004; Kantvilas *et al.* 2020). This is certainly the case in Tasmania where several of the species are confined to cool temperate rainforest, which is the climax, old-forest vegetation for much of the island. In this paper, the Tasmanian species are reviewed and a further species of *Lecanactis* is described, one which grows in highly sheltered rocky underhangs. The Tasmanian species were considered in a broader, continental context, leading to the discovery of several new records for Australia, which are also reported here. In total, eleven *Lecanactis* species are accepted as occurring in Australia (including Tasmania) and a key to distinguish them is provided.

Material and Methods

The study is based chiefly on collections of the author, housed in the Tasmanian Herbarium (HO), with reference to selected

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specimens from other herbaria as indicated in the text. Data for those taxa for which specimens were unavailable were drawn from the literature as cited. Anatomical observations and measurements were based on thin, hand-cut sections of the thallus, apothecia and pycnidia, mounted in water, 10% KOH (K), Lugol's iodine, ammoniacal erythrosin and/or lactophenol cotton blue. Ascospore measurements are presented in the format 5th

percentile–average–95th percentile, with outlying values in brackets and *n* signifying the number of observations. Chemical analyses were undertaken by thin-layer chromatography using standard methods (Orange *et al.* 2010); solvent A was the preferred routine medium. Selected critical chemical analyses were confirmed by Prof. J. A. Elix, Canberra using high-performance liquid chromatography (Elix *et al.* 2003).

Key to *Lecanactis* in Tasmania and mainland Australia

- 1 Thallus saxicolous in sheltered underhangs, typically thickly leprose 2
 Thallus corticolous or lignicolous, smooth, scurfy or byssoid, never leprose 3
- 2(1) Thallus containing schizopeltic acid (P–); ascospores 3-septate, 19–30 × 4.5–6 μm **L. scopulicola**
 Thallus containing psoromic acid (P+ yellow); apothecia unknown in Tasmania but ascospores reported as 3(–5)-septate,
 21–33 × 3.5–5 μm **L. aff. dilleniana**
- 3(1) Thallus byssoid, containing lepralic acid only **L. mollis**
 Thallus smooth or scurfy, containing schizopeltic acid (alone or with lepralic or gyrophoric acids), or gyrophoric acid alone 4
- 4(3) Exciple heavily carbonized, composed of highly gelatinized hyphae and remaining opaque with the addition of K 5
 Exciple composed of intertwined, weakly gelatinized hyphae which become clearly visible with the addition of K 8
- 5(4) Apothecial disc C+ red; thallus containing gyrophoric acid; ascospores 20–30 × 5–7 μm **L. latispora**
 Apothecial disc C–; thallus containing schizopeltic acid 6
- 6(5) Thallus containing lepralic acid in addition to schizopeltic acid; ascospores acicular to narrowly fusiform, 6–7-septate,
 32–55 × 3.5–5 μm **L. subfarinosa**
 Thallus lacking lepralic acid; ascospores fusiform to narrowly ellipsoid, mostly 3-septate 7
- 7(6) Ascospores 25–44 × 3.5–6 μm; pycnidia emergent, cylindrical with white, pruinose tips, C+ red (gyrophoric acid)
 **L. abietina**
 Ascospores 20–32 × 5.5–7 μm; pycnidia immersed, C– **L. neozelandica**
- 8(4) Thallus distinctly sulphur yellow; ascospores mostly 3-septate 9
 Thallus a shade of grey or white; ascospores mostly more than 3-septate 10
- 9(8) Ascospores 40–60 × 3.5–5 μm **L. sulphurea**
 Ascospores 25–43 × 3.5–6 μm **L. tibelliana**
- 10(8) Ascospores 40–56 × 4–5.5 μm, 5–6-septate **L. spermatospora**
 Ascospores 25–45 × 3.5–6 μm, 3–5-septate **L. platygraphoides**

The Species

Lecanactis abietina (Ach.) Körb.

Syst. Lich. Germ., 275 (1855).—*Lichen abietinus* Ach., *Kongl. Vetensk. Akad. Nya Handl.* **16**, 139 (1795); type: Sweden, Småland (lectotype, *vide* Tehler (1990)—H-ACH 447A).

Thallus crustose, thin and scurfy, whitish grey to cream-grey, sometimes with a faint pinkish tinge.

Apothecia 0.5–1.5 mm diam., lecideine, sessile and constricted at the base, typically thickly covered with a grey to yellowish grey pruina, seen in section to contain crystals that fluoresce golden whitish in polarized light, dissolve yellowish in K, but soon reprecipitate as feathery clusters of hyaline, acicular crystals. *Exciple* remaining opaque in K. *Hymenium* 70–100 μm thick. *Ascospores* 3(–4)-septate, 25–32.7–40(–44) × 3.5–4.6–5.5(–6) μm (*n* = 50).

Pycnidia conspicuous and emergent, cylindrical, 0.2–0.3 mm wide, tipped with a coarse, white pruina; macroconidia 11–17 × 2–3.5(–4) μm; microconidia 9–13(–15) × 0.8–1.2 μm.

Chemistry. Thallus K–, C–, KC–, P–, UV+ vivid white to yellowish or purplish white (schizopeltic acid (major)); tips of pycnidia C+ reddish (gyrophoric acid).

Remarks. For further descriptive data, see Kantvilas (2004), Egea & Torrente (1994) and Wolseley *et al.* (2009). Amongst the corticolous species of the genus, *Lecanactis abietina* is best recognized by the combination of schizopeltic acid in the thallus, the conspicuous, cylindrical pycnidia with C+ red apices (gyrophoric acid), unique for the genus, and the relatively long and narrow, 3-septate ascospores. These characters readily distinguish it from *L. latispora* and *L. neozelandica*, both of which have shorter and broader ascospores and immersed pycnidia; the former also contains gyrophoric acid in the thallus.

The ecology of *L. abietina* is discussed by Kantvilas (2004). It is a characteristic indicator species of old trees and old forests in cool temperate regions of the world. In Tasmania, it is most commonly found on the dry, flaky bark of mature *Nothofagus cunninghamii* in cool temperate rainforest, where it is associated with *L. mollis* and a diverse suite of crustose lichens, including calicioid taxa (Kantvilas 1988).

Selected specimens examined. **Australia:** *Tasmania:* Mt Victoria Track, 41°20'S, 147°50'E, 900 m, 1981, G. Kantvilas s. n. (HO); Boyd Lookout, 42°49'S, 146°21'E, 550 m, 1981, G. Kantvilas 547/81 & P. James (BM, HO); Meander Forest Reserve, 41°44'S, 146°32'E, 800 m, 1984, G. Kantvilas 666/84 (HO); 0.25 km N of Byron Gap, 42°02'S, 146°04'E, 950 m, 2005, G. Kantvilas 43/05 (HO); Savage River NP, E side of Baretop Ridge, 41°19'S, 145°27'E, 580 m, 2015, G. Kantvilas 75/15 (HO).

***Lecanactis aff. dilleniana* (Ach.) Körb.**

Syst. Lich. Germ., 276 (1855).—*Lichen dillenianus* Ach., *Lichenogr. Suec. Prodr.*, 57 (1798); type not seen.

Thallus leprose, to 1(–2) mm thick and spreading in continuous, undelimited patches to 30 cm wide, pale greenish grey with an orange-pink tinge when fresh, fading to pale grey in storage; photobiont cells subglobose, 10–20 × 10–18 µm, densely wrapped in fungal hyphae.

Apothecia unknown in Tasmanian specimens, reported (Egea & Torrente 1994) as being to 1.5 mm diam., with the exciple remaining opaque in K and with 3(–5)-septate ascospores, (21–)23–30(–33) × (3.5–)4–5 µm.

Chemistry. Thallus K–, C–, KC–, P+ yellow, UV– (psoromic acid).

Remarks. The Tasmanian collections are sterile and therefore only provisionally determined. They were all collected from large, overhanging bluffs of Triassic sandstone in dry eucalypt woodland in a localized part of south-eastern Tasmania. Similar habitats have been searched extensively for this lichen in other parts of Tasmania without success. Whereas psoromic acid is a frequently occurring substance, it is unknown in any other Tasmanian lichen with the above morphological characters.

Lecanactis dilleniana is widespread in Europe where it is reported to have a habitat ecology similar to the Tasmanian collections (Wolseley *et al.* 2009). The species was seen as distinct within *Lecanactis* (Tehler & Egea 1997), and resolved as a distinct lineage and placed in the genus *Psoronactis* Ertz & Tehler by Ertz *et al.* (2014). As the Tasmanian identifications are provisional, pending the discovery of fertile material, I have elected to retain them under *Lecanactis*.

Specimens examined. **Australia:** *Tasmania:* Bluff River Gorge, 42°31'S, 147°40'E, 2017, G. Kantvilas 37/17 (HO); *ibid.*, 2019, G. Kantvilas 213/19, 215/19 (HO); Eldon Road, 42°29'S, 147°27'E, 300 m, 2019, G. Kantvilas 274/19 (HO).

***Lecanactis latispora* Egea & Torrente**

Biblioth. Lichenol. **54**, 90 (1994); type: Australia, Tasmania, South West National Park, 5 km WNW of Strathgordon, along Serpentine

River below Serpentine Dam, 42°46'S, 145°59'E, c. 550 m, on leaves of *Richea pandanifolia*, 10 Mar. 1981, L. Tibell (holotype—UPS).

Thallus crustose, thin, smooth, whitish cream.

Apothecia 0.2–1.5 mm diam., lecideine, sessile, constricted at the base, thickly covered with a whitish grey, C+ red pruina. Exciple remaining opaque in K. *Hymenium* 90–120 µm thick. *Ascospores* 3-septate, (20–)21–24.7–29(–30) × 5–6.3–7 µm (*n* = 50).

Pycnidia immersed, 0.15–0.2 mm wide; macroconidia 8–12 × 2.5–4 µm; microconidia 5–8 × 1–1.2 µm.

Chemistry. Thallus and apothecial pruina K–, C+ red, KC+ red, P–, UV± faint mauve (gyrophoric acid).

Remarks. The presence of gyrophoric acid (thallus and apothecial pruina C+ red) readily distinguishes this species from the two most similar Tasmanian species of the genus, *Lecanactis abietina* and *L. neozelandica*, both of which contain schizopeltic acid. It differs further from *L. abietina* by having markedly shorter and broader ascospores, and immersed pycnidia; see Egea & Torrente (1994) and Kantvilas (2004) for further descriptive data and discussion.

Lecanactis latispora is a species of old wet forests. It was originally described from the dead leaves of the tall, rosette shrub *Richea pandanifolia*, a highly specialized microhabitat for lichens (see Kantvilas 2004), but has since been found to have a broader ecological amplitude, occurring on the dead, dry lignum of mature *Eucalyptus obliqua* and *Nothofagus cunninghamii*, as well as on the papery bark of *Leptospermum lanigerum*. Thus, habitat ecology offers little reliable assistance in distinguishing this species from the common *L. abietina* and the rare *L. neozelandica*, and chemical and anatomical investigation is mandatory. Previously regarded as endemic to Tasmania, this species is recorded here for the first time from the Auckland Islands, New Zealand, where it grew on the bark of a *Metrosideros* sp.

Specimens examined. **Australia:** *Tasmania:* Yarrington Tier, 42°32'S, 147°18'E, 620 m, 1987, G. Kantvilas 85/87 (HO, PRA); Lake Sydney, 43°17'S, 146°36'E, 680 m, 1998, G. Kantvilas 61/98A (HO); Bermuda Road, 43°04'S, 146°54'E, 480 m, 1998, G. Kantvilas 206/98 (HO); track to Nevada Peak, 42°55'S, 146°40'E, 1100 m, 2005, G. Kantvilas 41/05 (HO); Lake Skinner Track, 42°57'S, 146°41'E, 850 m, 2020, G. Kantvilas 31/20 (HO).—**New Zealand:** *Auckland Islands:* Rose Island, 1963, P. W. James 990H (BM, HO).

***Lecanactis mollis* (Stirt.) Frisch & Ertz**

Fungal Diversity **70**, 44 (2014).—*Sagenidium molle* Stirt., *Proc. Phil. Soc. Glasgow* **10**, 305 (1877); type: New Zealand, near Wellington, J. Buchanan (holotype—GLAM).

Thallus byssoid, sometimes rather compacted and crust-like centrally, pale bluish or whitish grey, paler and whitish at the margins.

Apothecia 0.5–1.2 mm diam., lecideine, shortly stipitate, thickly covered with a whitish grey pruina. Exciple remaining opaque in K. *Hymenium* 90–110 µm thick. *Ascospores* 5–6-septate, (26–)28–31.0–35 × 5–6.2–7 µm (*n* = 55).

Pycnidia not seen.

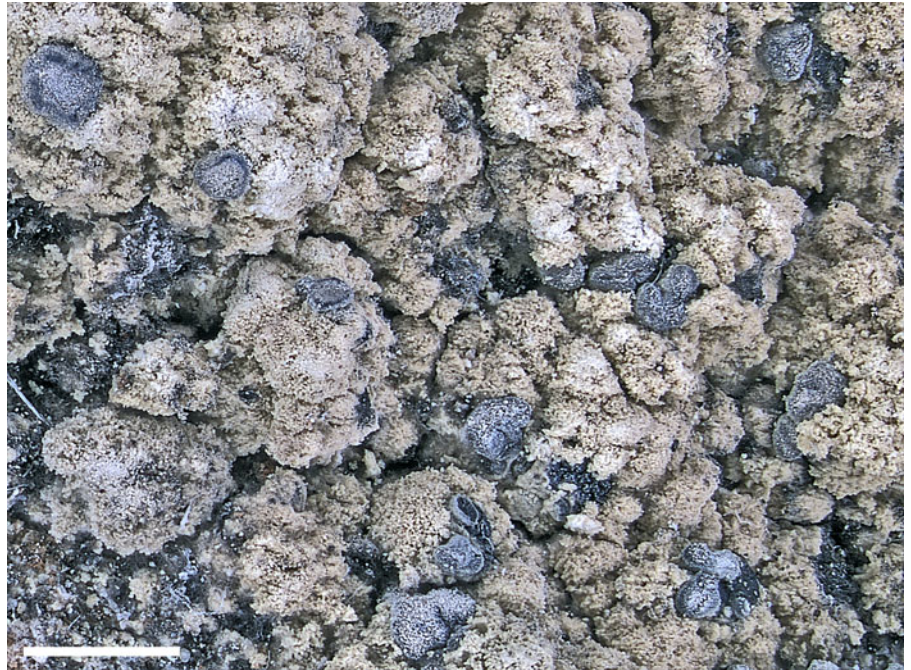


Fig. 1. *Lecanactis scopulicola* habit, showing the lumpy, leprose, pinkish thallus with scattered, grey-black, pruinose apothecia. Scale = 2 mm. Photograph: J. Jarman. In colour online.

Chemistry. Thallus and apothecial pruina K–, C–, KC–, P–, UV– (lepraric acid).

Remarks. A detailed description and anatomical illustration are provided by Kantvilas (2004). The combination of the byssoid thallus, *Trentepohlia* photobiont, apothecial anatomy and thallus chemistry readily distinguish it from other Tasmanian byssoid lichens. For many years, this species was included in the genus *Sagenidium* and discussed and illustrated under this name in the Australasian lichen literature (e.g. Kantvilas 1988; Kantvilas & Jarman 1999), but the observations of Kantvilas (2004) that it was anatomically identical with *Lecanactis* were subsequently confirmed with molecular data by Ertz *et al.* (2014).

Lecanactis mollis is a characteristic species of cool temperate rainforest, the climax, old-growth vegetation type for the higher rainfall areas of Tasmania. In such forests, large, eye-catching thalli up to 50 cm wide occur on the dry sides of the oldest trees, as well as on the undersides of larger canopy branches. This species has also occasionally been collected away from rainforest in wet gullies in drier areas. Its occurrence in such habitats is interpreted as being a relic of former times when rainfall was higher and wet, closed, continuous forest was more extensive. As well as being associated with a rich complement of hydrophobic lichens that includes *L. abietina*, *Cliostomum griffithii* (Sm.) Coppins, *Micarea prasinastra* Coppins & Kantvilas and species of *Chaenotheca*, *Arthonia* and *Lepraria*, the byssoid thallus of this species also provides a highly specialized habitat for additional, highly restricted lichenicolous fungi such as *Arthonia sagenidii* Kantvilas & Vězda and *Chaenothecopsis sagenidii* Tibell. *Lecanactis mollis* is also known from Victoria and New Zealand (Kantvilas 2004).

Specimens examined. **Australia: Tasmania:** Collinsvale, Myrtle Forest, 42°52'S, 147°09'E, 800 m, 1963, G. C. Bratt 308a & J. A. Cashin (HO); Mueller Rd, 3 km W of Styx Rd, 560 m, 1984, G. Kantvilas 652/84 (A. Vězda: *Lich. Sel. Exsicc.* 2012) (HO); Flash Tier near Seventeen Acre Creek, 42°36'S, 147°53'E, 300 m, 1990, G. Kantvilas 320/90 & J. Jarman (HO); track to

Mother Cummings Peak, 41°41'S, 146°31'E, 900 m, 2002, G. Kantvilas 142/02 (HO); King William Saddle, 42°13'S, 146°07'E, 820 m, 2019, J. Jarman s. n. (HO); Norfolk Rd, N of Donaldson River, 41°28'S, 145°05'E, 230 m, 2019, G. Kantvilas 56/19 (HO).

Lecanactis neozelandica Egea & Torrente

Biblioth. *Lichenol.* 54, 91 (1994); type: New Zealand, North Island, Gisborne, Urewera National Park, 22 km SE of Ruatahuna, 1.5 km S of Lake Waikareiti, along Waikareiti Track, c. 800 m, 38°44'S, 177°09'E, in mixed *Nothofagus* forest on trunk of *N. menziesii*, 17 May 1981, L. Tibell 13010 (holotype—UPS).

Thallus thin, effuse, greyish white.

Apothecia 0.2–1 mm diam., lecideine, sessile and constricted at the base, covered with a whitish grey, C– pruina, seen in section to contain crystals that fluoresce golden whitish in polarized light, dissolve yellowish in K, but soon reprecipitate as feathery clusters of hyaline, acicular crystals. **Exciple** remaining opaque in K. **Hymenium** 90–110 μm thick. **Ascospores** (2–)3-septate, (20–)22–26.7–31(–32) \times 5.5–6.3–7 μm ($n = 50$).

Pycnidia immersed, 0.1–0.15 mm wide; macroconidia not seen in Tasmanian specimens, reported (Egea & Torrente 1994) as 8–13 \times 3–3.5(–4) μm ; microconidia 5–8 \times 1–1.2 μm .

Chemistry. Thallus K–, C–, KC–, P–, UV+ vivid white to yellowish or purplish white (schizopeltic acid).

Remarks. Comprehensive descriptions are provided by Egea & Torrente (1994) and Kantvilas (2004). This species is clearly rare in Tasmania and is known there from only a single collection, from the dry papery bark of *Leptospermum lanigerum* in cool temperate rainforest (Kantvilas 2004). Anatomical and chemical observations are required to distinguish it from the superficially similar *Lecanactis abietina* and *L. latispora*, both of which may occur in the same type of habitat. It is chemically identical to

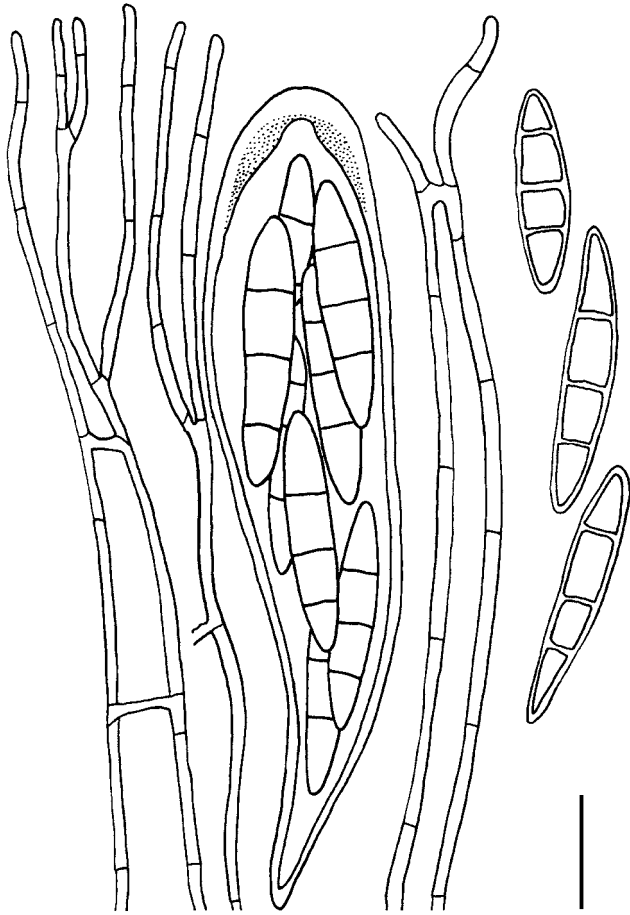


Fig. 2. Asci, paraphysoids and ascospores of *Lecanactis scopulicola* after pretreatment in K, with amyloid parts stippled. Scale = 10 μ m.

L. abietina, which has characteristic, emergent, C+ red pycnidia and longer, narrower ascospores, 25–44 \times 3.5–6 μ m. Indeed, its spores are similar in size to those of *L. latispora*, but that species differs by containing gyrophoric acid.

Specimen examined. **Australia:** *Tasmania:* Manuka Swamp, Huon River, 42°56'S, 146°21'E, 320 m, 1991, G. Kantvilas 91/91 (HO).

***Lecanactis scopulicola* Kantvilas sp. nov.**

Mycobank No.: MB 837340

Thallo leproso, pallide flavescenti, acidum schizopelticum contenti et ascosporis triseptatis, 21–30 μ m longis, 5–6 μ m latis recognita.

Typus: Australia, Tasmania, southern slope of South Sister, 41° 32'S, 148°10'E, 640 m, on rock in shaded underhangs of dolerite cliffs and boulders, 31 August 2006, G. Kantvilas 324/06 (holotypus—HO; isotypus—H).

(Figs 1 & 2)

Thallus leprose, pale yellowish, forming soft cushions 0.5–2 mm thick and to 25 mm wide, contiguous in a continuous lumpy thallus to c. 200 mm across, or rather dispersed over the substratum and intermixed with other lichens; prothallus absent; photobiont *Trentepohlia*, with cells subglobose, 10–20 μ m diam., occurring

singly or in short chains or clumps; medullary hyphae 3–4 μ m wide, clothed in crystals that dissolve K+ pale yellowish and then reprecipitate in feathery clusters of hyaline, acicular crystals.

Apothecia to 1.3(–2) mm diam., lecideine although sometimes appearing \pm zeorine due to adhering yellowish thalline fragments, mostly neatly discoid, single or occasionally in clusters of 5–10, regenerating on moribund apothecia and then somewhat distorted in shape; disc plane at first, later convex, grey-brown to dark grey to blackish, coarsely whitish pruinose; proper exciple black at the upper edge, commonly grey-brown on the underside, coarsely whitish pruinose, clearly evident in young, plane apothecia but later becoming reflexed and inconspicuous, in section cupulate, opaque black-brown, K+ opaque olive green, 30–80 μ m laterally, 120–200 μ m at the base. *Hypothecium* yellowish brown, K+ olive greenish, 25–60 μ m thick, poorly differentiated from the exciple. *Hymenium* 85–100 μ m thick, hyaline, overlain by a yellow-brown epithelial layer of crystals that fluoresce in polarized light, dissolve in K and reprecipitate in feathery clusters, occasionally divided by vertical bands of dark tissue to 50 μ m wide, extending upwards from the hypothecium. *Paraphysoids* 1.5–2 μ m thick, simple to sparingly branched and anastomosed; apices not expanded. *Asci* 8-spored, 68–82 \times 15–20 μ m, of the *abietina*-type: hemiamyloid, with the tholus and wall not amyloid apart from faintly amyloid 'shoulders' adjacent to a rather blunt ocular chamber. *Ascospores* fusiform, hyaline, occasionally grey when overmature, 3-septate, (19–)21–24.8–30 \times (4.5–)5–5.3–6 μ m ($n = 50$).

Pycnidia not found.

Chemistry. Schizopeltic acid (major) with traces of demethylschizopeltic acid, porphyritic acid, methylporphyric acid and lepranic acid; thallus K–, KC–, C–, P–, UV+ yellowish.

Etymology. The specific epithet refers to the habitat of the new species (*scopulum*, Latin for a cliff or crag).

Remarks. Exclusively saxicolous species of *Lecanactis* are relatively few. The new species is distinguished from the other known species by the combination of its yellowish, leprose thallus containing schizopeltic acid and its ascospore dimensions (Table 1). The most similar species appears to be *L. proximans* from Colombia, which contains schizopeltic acid and has similar-sized ascospores but differs in its rimose-areolate thallus and its exciple, which is composed of intertwined, brown hyphae that become clearly visible with the addition of K.

Amongst the Tasmanian species of *Lecanactis*, *L. scopulicola* is particularly distinctive. The most similar species morphologically is what is referred to in this paper as *L. aff. dilleniana*. Both taxa have a leprose thallus and occur in sheltered habitats on rocky bluffs. They differ chiefly by their chemistry, with *L. dilleniana* containing psoromic acid, easily detected by the P+ yellow reaction. In addition, whereas *L. scopulicola* has been recorded exclusively from dolerite (see below), *L. aff. dilleniana* is known only from sandstone. A further, as yet unidentified collection (Kantvilas 85/09, HO), from underhangs on a dolerite pinnacle on Maria Island off Tasmania's East Coast, has a crustose thallus containing no substances detectable by TLC and 3-septate ascospores, 30–38 \times 3–3.5 μ m; this possibly represents a further undescribed species.

The concentration of schizopeltic acid may be extremely low in some sterile collections but can nevertheless be detected by noting the slow precipitation of the characteristic acicular crystals on

Table 1. Salient features of saxicolous species of *Lecanactis*.

	¹ <i>L. caesia</i> (Müll. Arg.) Zahlbr.	¹ <i>L. californica</i> Tuck.	¹ <i>L. (Psororactis) dilleniana</i> (Ach.) Körb.	² <i>L. kerguelensis</i> C. W. Dodge	¹ <i>L. proximans</i> (Nyl.) Zahlbr.	¹ <i>L. rufoatra</i> (Müll. Arg.) Zahlbr.	<i>L. scopulicola</i> Kantvilas	³ <i>L. subdilleniana</i> S. Y. Kondr. et al.
Thallus	smooth to granulose	smooth to rugulose	rimose-areolate to pulverulent or leprose	minutely areolate to granulose	rimose-areolate	dispersed-granulose	leprose	indistinct
Chemistry	nil	psoromic acid	psoromic acid	unknown	schizopeltic acid	nil	schizopeltic acid	nil
Exiple	lecidine, composed of intertwined hyphae visible in K	lecidine, remaining opaque and carbonized in K	lecidine, remaining opaque and carbonized in K	lecidine, remaining opaque and carbonized in K	lecidine, composed of intertwined hyphae visible in K	lecidine, remaining opaque and carbonized in K	lecidine, remaining opaque and carbonized in K	lecidine or lecanorine
Ascospores	21–37 × 4–5 µm, (3)–[6–7]-septate	20–28 × 5–6 µm, 3 (–4)-septate	21–33 × 3.5–5 µm, 3 (–5)-septate	10–12 × 2–3 µm, 3-septate	22–32 × 3–5 µm, 3 (–4)-septate	25–32 × 4–5 µm, 3 (–4)-septate	19–30 × 4.5–6 µm, 3-septate	27–41 × 3.5–5 µm, (1–)3(–4)-septate
Distribution	Brazil	south-western North America	Europe, ? Tasmania	Kerguelen Islands	Colombia	Brazil	Tasmania	South Korea

¹Egea & Torrente (1994)²Dodge (1948)³Kondratyuk et al. (2015)

elution of thallus squashes in K. This substance is also found in two corticolous species, *L. abietina* and *L. neozelandica*, both of which have a scurfy or effuse to rimose crustose thallus. The former differs further by its longer and somewhat narrower ascospores, whereas the ascospores of the latter are generally broader.

Ecology and distribution. The new species occurs in shaded, sheltered underhangs of cliffs and tors of Jurassic dolerite, the rock type that dominates central and eastern Tasmania. It has been observed more frequently than it has been collected, owing to the difficult nature of its habitat, typically unassailable with a hammer and chisel because of the hardness and orientation of the rock. Its range encompasses the mid-altitude (mostly < 1000 m elevation) pinnacles of eastern Tasmania that receive c. 600–1000 mm of rainfall annually and are dominated by dry sclerophyll woodland, as distinct from the higher, dolerite peaks of the southern, central and north-eastern highlands which are wetter and support alpine vegetation, moorland or wet forest. Associated species in this habitat include *Chiodecton montanum* G. Thor, *Chrysothrix candelaris* (L.) J. R. Laundon, *Diploschistes scruposus* (Schreb.) Norman, *Lecanora swartzii* (Ach.) Ach., *Lepraria eburnea* J. R. Laundon and *Porina leptalea* (Durieu & Mont.) A. L. Sm. One collection is parasitized by a species of *Chaenothecopsis*. Virtually every locality within this geographical-ecological envelope that has suitable habitat was found to support this species; westwards, as rainfall increases, the species is absent.

Additional specimens examined. **Australia: Tasmania:** Den Hill, 42°27'S, 147°05'E, 830 m, 2004, G. Kantvilas 114/04 (HO); Woods Quoin, 42°18'S, 147°05'E, 880 m, 2013, G. Kantvilas 44/13, 50/13 (HO); track to Mt Hobbs, 42°31'S, 147°31'E, 610 m, 2019, G. Kantvilas 194/19 (HO); western slopes of Tanina Bluff, 42°39'S, 147°02'E, 860 m, 2019, G. Kantvilas 269/19 (HO); Lake Hwy near Projection Bluff, 41°43'S, 146°43'E, 1100 m, 2020, J. Jarman s. n. (HO); track to Three Thumbs, 42°36'S, 147°52'E, 470 m, 2019, G. Kantvilas 191/19 (HO); Mt Forestier summit, 42°55'S, 147°51'E, 315 m, 2020, G. Kantvilas 88/20 (HO).

Additional notes on Australian *Lecanactis*

McCarthy (2020) records a further five species of *Lecanactis* for Australia in addition to the species treated above: *L. coniochlora* (Mont. & Bosch) Zahlbr., *L. quassiae* (Fée) Zahlbr., *L. platygraphoides* (Müll. Arg.) Zahlbr., *L. spermatorpora* Egea & Torrente and *L. sulphurea* Egea & Torrente, all recorded mainly from the wet, coastal rainforest regions of New South Wales and Queensland. The first two, neither of which is based on an Australian type, refer to a species of *Cresponea*, a genus that has been treated for Australia by Kantvilas (2020). Both names are of uncertain application as no type material has been traced for either name (Egea & Torrente 1993b) and they can therefore be deleted from the Australian census. Two further species, both originally described from New Zealand, are recorded here for Australia for the first time, whereas *L. platygraphoides*, previously known in Australia only from Queensland (McCarthy 2020), is recorded here for New South Wales. Information concerning these three significant range extensions is given below. *Lecanactis sulphurea* is also recorded and a fifth accepted species, as mentioned above, is *Lecanactis spermatorpora* (Egea & Torrente 1994).

Lecanactis platygraphoides (Müll. Arg.) Zahlbr.

Catal. Lich. Univers. 2, 541 (1924).—*Opegrapha platygraphoides* Müll. Arg., *Hedwigia* 32, 132 (1893).

Characterized by a smooth, whitish thallus containing schizopeltic acid, heavily white pruinose apothecia with an exciple composed of intertwined, branched hyphae that become clearly visible in K, and fusiform, generally curved, 3–5-septate ascospores, 25–45 × 3.5–6 µm (see also Egea & Torrente 1994). Previously known from Queensland and New Guinea (Egea & Torrente 1994), this species is recorded here from New South Wales, where it grew on *Lomatia fraseri* in *Nothofagus moorei*-dominated cool temperate rainforest.

Specimen examined. **Australia:** New South Wales: Dangar Falls, 30°40'S, 151°44'E, 1988, G. Kantvilas s. n. (HO).

Lecanactis subfarinosa (C. Knight) Hellb.

Bih. Kongl. Svenska Vetensk.-Akad. Handl. 21(3/13), 120 (1896).—*Lecidea subfarinosa* C. Knight, *Trans. New Zealand Inst.* 8, 319 (1876).

Characterized by a rather thick, whitish, verruculose-scurfy thallus with a byssoid medulla and leading edge, heavily white pruinose apothecia with a persistently opaque exciple, and acicular to narrowly fusiform, straight, 6–7-septate ascospores, 32–55 × 3.5–5 µm (see also Egea & Torrente (1994) and Galloway (2007)). The presence of both lepralic and schizopeltic acids (in combination with the above anatomical characters) is diagnostic, especially as the other Australian taxa contain either one substance or the other. This species has been recorded on the dry rough bark of old trees in *Nothofagus moorei*-dominated cool temperate rainforest and *Ceratopetalum apetalum*-dominated warm temperate rainforest.

Specimens examined. **Australia:** New South Wales: Dangar Falls, 30°40'S, 151°44'E, 1988, G. Kantvilas s. n. (H, HO, S); Mt Wilson, 1988, G. Kantvilas s. n. (HO); South East Forests NP, Goodenia Rainforest, 36°54'03"S, 149°43'00"E, 3765 m, 2010, G. Kantvilas 296/10 (HO).

Lecanactis tibelliana Egea & Torrente

Biblioth. Lichenol. 54, 110 (1994).

Characterized by a rather rugulose, sulphur yellow thallus containing schizopeltic acid, heavily greyish pruinose apothecia with an exciple composed of intertwined, branched hyphae that become clearly visible in K, fusiform, curved, 3-septate ascospores, 25–43 × 3.5–6 µm, macroconidia 12–20 × 2–3 µm and microconidia 9–13 × 1–1.5 µm (see Galloway 2007). *Lecanactis sulphurea* is superficially similar but has larger ascospores (40–56 × 4–5.5 µm) and conidia (macroconidia 25–34 × 2–3 µm; microconidia 12–23 × 0.8–1.2 µm) (Egea & Torrente 1994), although the latter were difficult to locate in both species. Previously considered endemic to New Zealand, this species is recorded here from Queensland where it grew on the bark of *Callitris macleayana* in open dry sclerophyll forest.

Specimen examined. **Australia:** Queensland: Surprise Creek trail near Wrights Lookout, 16°50'48"S, 145°38'23"E, 2018, G. Kantvilas 432/18 (ATH, HO).

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