Additions to the genus *Lecidella* (lichenised Ascomycetes: Lecanoraceae)

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**Abstract**

Two new taxa in *Lecidella* Körb. are described: *L. leucomarginata* Kantvilas & Elix, from Kangaroo Island (South Australia) and south-western Western Australia and *L. granulosula* var. *lecanorina* Kantvilas & Elix, from Kangaroo Island (South Australia) and the coast of southern New South Wales. Both display the unusual feature of an unpigmented proper excipulum, densely inspersed with crystals. A key to *Lecidella* in temperate Australia is presented.

**Keywords:** biodiversity, Kangaroo Island, *Lecidea*, lichens, temperate Australia.

**Introduction**

*Lecidella* Körb. is a genus of lichens characterised by a crustose thallus containing a trebouxioid photobiont, biatricine, typically dark coloured apothecia with a persistent proper excipulum composed of radiating thick-walled hyphae, clavate, amyloid, eight-spored asci referred to as *Lecidella*-type (Hafellner 1984; Fig. 2), an hymenium that typically separates readily in KOH, simple, hyaline, non-halonate ascospores, and curved, filiform conidia; thallus chemistry is dominated by xanthones in the majority of species (Fletcher et al. 2009; Kantvilas & Elix 2013). With 12 species (McCarthy 2014), *Lecidella* is well-represented in the Australian lichen flora, occurring mostly in temperate latitudes on rock, bark or wood. The eight Tasmanian species were recently revised by Kantvilas & Elix (2013), who also studied comparative material from elsewhere in southern Australia. Morphological and anatomical relationships with superficially similar genera, such as *Japewiella* Printzen, *Carboncea* (Hertel) Hertel, *Tasmidella* Kantvilas, Hafellner & Elix and others, were discussed therein and are not repeated here. In this paper, we describe two further taxa from temperate latitudes.

**Methods**

The study is based chiefly on collections of the authors, housed in the Tasmanian Herbarium (HO) and the Australian National Herbarium (CANB). Descriptions are based on hand-cut sections of the thallus and ascomata examined with high-power light microscopy. Mounting media included water, 15% KOH (K), Lugols Iodine after pretreatment with K (IKI), ammoniacal erythrosin and 50% HNO$_3$ (N). Dimensions of asci and ascospores are based on 30 and 70 observations respectively. The latter are presented in the format: 5th percentile–average–95th percentile; outlying extreme values are given in parentheses. Chemical constituents were identified by thin layer chromatography (Elix & Ernst-Russell 1993) and comparison with authentic samples. Nomenclature of pigments follows Meyer & Printzen (2000).

**Taxonomy**

*Lecidella leucomarginata* Kantvilas & Elix, *sp. nov.*

*Lecidellae flavovirenti* Kantvilas& Elix *fortasse similissima, sed sorediis destitutis, excipulo proprio hyalino vel pallide griseo, pigmentum deficienti, sed crystallis insperso, et ascosporis aliquantum parvioribus, 10–15 µm longis, 6–8 µm latis, differt.*

*Mycobank No.: MB810540. Typus:* SOUTH AUSTRALIA. Kangaroo Island, Western Cove, 35°44’S 137°35’E, 0.5 m alt., on bleached dead wood of *Melaleuca* in salt marsh, 27 Sep. 2013, G. Kantvilas 234/13 (holo: HO; iso: AD, BM).

*Thallus* crustose, effuse, bright lemon-yellow, rimose-areolate, esorediate, lacking a prothallus, forming irregular, undelimited patches to 12 cm wide or more, 0.25–1 mm thick; individual areoles with upper surface unevenly verruculose and with edges mostly lifting from the substrate; photobiont cells globose, 6–18 µm diam. *Apothecia* biatricine, abundant, 0.5–1.3 mm wide, sessile, basally constricted to adnate, sometimes sunken in the thallus surface, scattered and roundish, or crowded, misshapen and fused together; disc plane at first, soon becoming convex, grey-black...
to bluish black to jet black, sometimes a little mottled, matt, epruinose. Proper excipulum colourless to pale grey or yellowish grey, rarely dark grey, sometimes piebald, glossy, sometimes a little flexuose, persistent but increasingly less obvious in older, more convex apothecia, sometimes with adhering thallus fragments, in section 25–60 µm thick, lacking blue-green pigments, composed of radiating, branched hyphae 3–5 µm thick, densely inspersed, especially towards the outer edge, with minute, yellowish brown to reddish brown crystals that fluoresce yellow in polarised light and dissolve fleetingly yellowish in K. Hypothecium 80–150 µm thick, colourless to pale yellow-brown, occasionally yellowish orange, more intensely coloured towards the base, intensifying yellow-orange in K and N, sometimes inspersed with scattered oil droplets. Hymenium 60–70 µm thick, separating readily in K, in the upper part usually dilutely greenish blue, K ± grey-green, N+ crimson and overlain by yellowish brown crystals that dissolve in K, towards the base mostly colourless. Asci 45–55 × 12–20 µm, of the Lecidella-type. Paraphyses 1.5–2 µm thick, sparsely branched; apices not markedly capitate, sometimes expanded to 2.5–4 µm, unpigmented or with a thin internal cap and a faint external blush of blue-green, N+ crimson pigment. Ascospores hyaline, (9–) 10–12.4–15 (−16) × (5.5–) 6–6.8–8 µm, broadly ellipsoid to oblong. Conidiomata pycnidia, black, emergent, resembling apothecial initials, in section with wall blue-green, N+ crimson; conidia thread-like, curved, 15–20 × 1 µm. Fig. 1A.

Chemical composition. Thiophanic acid (major), 3-O-methylthiophanic acid (± minor), atranorin (± minor), chloroatranorin (± minor), arthothelin (± minor or trace); thallus K–, C+ orange, KC–, P–, UV+ orange.

Etymology. The specific epithet refers to the distinctive colourless proper excipulum of the apothecia of this species.

Remarks. This is a distinctive and remarkable species on account of its colourless proper excipulum, a feature also seen in L. granulosula var. lecanorina (described below). One of the defining generic characters of Lecidella is the black apothecial margin, comprised of radiating, thick hyphae coated in dark pigments and becoming swollen and almost parenchymatous towards the outer edge (Kantvilas & Elix 2013). In that regard, L. leucomarginata might appear to be misplaced in Lecidella. Yet, all the other salient characters, notably the anatomy of the thallus, its chemical composition consisting of xanthones, the distinctive ascus type, the hymenium that separates readily in KOH, the hyaline, broadly ellipsoid ascospores and the thread-like, curved conidia, are consistent with Lecidella. Indeed, on close inspection, the anatomy of the excipulum can also be interpreted as being of the Lecidella-type, except that instead of being swollen with pigment, the hyphae are densely inspersed with crystals. However, there is no hint of any development of a parenchyma at the outer edge. Traces of blue-green (cinereorufa-green) pigment, characteristic of most Lecidella species, can be detected in the hymenium by the application of HNO₃.

Fig. 1. Habit of new Lecidella taxa. A L. leucomarginata; B L. granulosula var. lecanorina. Scale bar: 1 mm. — A G. Kantvilas 234/13 (holotype), B G. Kantvilas 375/13 (holotype).
which yields a crimson reaction. Perhaps the most likely alternative generic placement for this species that was considered was *Japeviella*. However, this genus has a very distinctive excipulum composed of a loose reticulum of radiating, branched and anastomosing hyphae c. 1 µm thick in a gelatinous matrix (Printzen 1999; Kantvilas & Elix 2011).

In the Australian flora, this new species appears to be most closely related to *L. flavovirens* Kantvilas & Elix, a corticolous species that likewise has a bright lemon-yellow thallus containing thiophanic acid as the major constituent, but which differs chiefly in becoming entirely sorediate. These species differ further in that *L. flavovirens* has unequivocally black apothecia, and although the proper excipulum lacks blue-green pigment, it is constructed in the typical *Lecidella* way, with the hyphae instead swollen with a dark brown pigment. In addition, the ascospores of *L. flavovirens* are also slightly longer and broader: (12–) 13–17 (–18) × (6–) 7–10 µm (Kantvilas & Elix 2013).

**Ecology and distribution.** On Kangaroo Island, this new species is known only from the type locality, where it was collected from remnant, fire-killed, bleached *Melaleuca* stags (several metres tall) in a salt marsh. The site is extremely degraded by draining, burning, some clearing and stock grazing. The habit of this *Lecidella* is very species poor with respect to lichens and the only other species with which it was associated was *Ramboldia crassithallina* Kalb, a common lignicolous lichen on Kangaroo Island. In the near vicinity of the type locality where living individuals of *Melaleuca* remain, the epiphytic flora is richer and includes species of *Ramboldia*, *Usnea*, *Lecanora* and *Parmotrema*, but no *Lecidella* was encountered. *Lecidella leucomarginata* also occurs in south-western Western Australia where it grows on the bark of *Acacia* and *Melaleuca* in open, dry sclerophyll woodland. Here associated species included *Austroparmelia prinuata* (Müll. Arg.) A.Crespo, *Divakar* & *Elix*, *Baculifera xylophila* (Malme) Marbach, *Buella* reagenza *Elix*, *Flavoparmelia rutidota* (Hook.f. & Taylor) Hale, *Haematomma eremaeum* R.W.Rogers, *Lecanora caesiorubella* Ach., *Pertusaria subarida* A.W.Archer & Elix, *Punctelia subalbicans* (Stirt.) D.J.Galloway & Elix and *Ramalina inflata* subsp. *australis* G.N.Stevens.

**Additional specimens examined**

**Western Australia.** Wotto Nature Reserve, First North Road, 21 km NE of Eneabba, 29°42’29”S 115°24’37”E, 275 m alt., 5 May 2004, J.A. Elix 28868 (CANB, HO, PERTH); same locality, 5 May 2004, J.A. Elix 28875 (CANB); Gwambygine Nature Reserve, 11 km S of York, 31°58’24”S 116°48’38”E, 245 m alt., 4 Apr. 2006, J.A. Elix 31756, 37406 (CANB); Walbing, Quarrel Range, Moora/New Norcia Road, 22 km S of Moora, 30°41’38”S 116°12’20”E, 275 m alt., 2 Apr. 2006, J.A. Elix 37549 (CANB); Fourteen Mile Brook Nature Reserve, 13 km NW of Narrogin along Wandering Road, 32°50’08”S 117°06’07”E, 335 m alt., 6 Apr. 2006, J.A. Elix 43229 (CANB).

**Lecidella granulosula var. lecanorina** Kantvilas & Elix, var. nov.

Respectu praesentiam chodatini, hypothecium incolorum et ascosporas 9.5–14.5 µm longas, 5–7.5 µm latas, varietatis granulosulae similis, sed excipulum proprio hyalino vel pallide griseo, pigmentum destitutum, crassitis flavo-brunneis dense inspero differt.

**Mycobank no.:** MB810541.

**Typus:** **South Australia.** Kangaroo Island, Creek Bay Farm, 35°50’S 138°06’E, 85 m alt., on rock in mallee woodland, 12 Sep. 2013, G. Kantvilas 375/13 (holo: HO).

Thallus crustose, pale yellowish grey to greyish green, minutely granular, esorediate, lacking a prothallus, forming small, irregular, undelimited “islands” 2–3 cm wide amongst other lichens; individual granules mostly 0.05–0.1 mm wide, dispersed or contiguous; photobiont cells globose, 6–18 µm diam. *Apothecia* bitorine, 0.4–0.7 mm wide, sessile, basally constricted, scattered, roundish; disc plane at first, soon becoming undulate or convex, grey to brownish grey to grey-black, sometimes a little mottled, matt, epruinose. *Proper excipulum* colourless to pale grey or yellowish grey, sometimes partly or wholly dark grey, glossy, persistent, in section 40–60 µm thick, lacking blue-green pigments, composed of radiating, branched hyphae 4–5 µm thick, densely inspersed, especially towards the outer edge, with minute, yellowish brown to reddish brown crystals that fluoresce yellow in polarised light and dissolve to form a pale yellow solution in *K*. *Hymenium* 50–75 µm thick, mostly separating readily in *K*, in the upper part overlain by a thick layer of yellowish brown granules that dissolve in *K*, usually also with patches of greenish blue, *N* + grey-green, *N* + crimson pigment, especially adjacent to the excipulum, towards the base mostly colourless. *Asci* 50–60 × 12–20 µm, of the *Lecidella*-type. *Paraphyses* 1–2 µm thick, mainly simple, occasionally sparsely branched towards the apices; apices variable, not capitate or expanded to 3.5–4.5 µm, unipigmented or with the apical cell with an internal, blue-green cap, and the subterminal cell faintly blue-green, *N* + crimson. *Ascospores* hyaline, (8–) 9.5–11.8–14.5 (–16) × 5.6–7.5 (–8) µm, broadly ellipsoid to oblong. *Conidiomata* not seen. **Fig. 1B, 2.**

**Chemical composition.** Chodatin (major), isoarothelolin (minor), thiophanic acid (minor), 2,5,7-trichlorolichenalexanthone (minor); thallus K–, *C*+ orange, KC–, P–, UV+ orange.

**Etymology.** The infraspecific epithet alludes to the fact that the apothecia, with their pale coloured proper exciple, somewhat resemble those of *Lecanora*.

**Remarks.** The granular to areolate thallus containing chodatin as a major compound (an uncommon substance, not least in *Lecidella*), the predominantly colourless hypothecium and the relatively small ascospores indicate unequivocally that this new lichen is closely...
related to *L. granulosula* (Nyl.) Knoph & Leuckert as delimited and described by Kantvilas & Elix (2013), and by Knoph (1990) and Rambold (1989) (under its synonym *L. chodatti*). Yet the pale, unpigmented proper excipulum of the specimens studied is so distinctive and visually striking, and unusual for the genus as a whole (see also discussion under *L. leucomarginata* above) that we feel that they deserve taxonomic recognition. Specimens of var. *granulosula* invariably contain *cinereorufa*-green pigment in their excipulum, which is constructed of radiating, swollen hyphae typical of *Lecidella*. The new variety instead has a totally unpigmented excipulum which is densely impregnated with crystals, identical to what is displayed by *L. leucomarginata*. In his discussion of *L. granulosula* (as *L. chodatti*), Knoph (1990) mentions that crystals are seen “occasionally”, but he makes no mention of crystals being correlated with an absence of pigment or that he saw any specimens with an unpigmented excipulum. No crystals were observed in any Australian specimens of var. *granulosula* studied; we were unable to study any non-Australian material. In several species of *Lecidella*, specimens from exposed habitats tend to have more intensely pigmented apothecia. In the case of var. *lecanorina*, specimens from exposed habitats certainly have darker apothecial discs, but this does not translate into a higher concentration of blue-green pigment; the amount of pigmentation tends to be ± constant across all specimens, with most of the darker coloration of the disc deriving from crystals, and the blue-green pigment being very dilute and located mainly in that part of the epihymenium adjacent to the excipulum.

In Tasmania, there is a further, undescribed saxicolous taxon with an unpigmented excipulum.

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*Key to *Lecidella* in temperate Australia*¹

1. Growing on rock or on bryophytes overgrowing rock
2. Hypothecium yellow-brown to dark brown, with the colour intensifying in K and N
3. Vicanic present; diplococci and thuringione absent ........................................... *L. sublapicida*
4. Vicanic absent; diplococci and thuringione present ............................................ *L. carpathica*
5. Vicanic absent; diplococci and thuringione absent ............................................ *L. stigmatea*
6. Vicanic and/or thuringione absent; thuringione present ..................................... *L. berkeleyi*

1. Growing on bark or wood
8. Thallus not sorediate
9. Thallus containing atranorin only (C–); hymenium impregnated with oil droplets and crystals that do not dissolve in K ........................................... *L. destituta*
10. Thallus containing xanthones (C+ orange); hymenium not impregnated, or at most with a very thin layer of granules that dissolve in K ........................................ *L. flavovirens*
11. Hypothecium colourless to pale brownish; apices of paraphyses with an *internal* cap of pigment ........................................................................................................................................... *L. xylopora*
12. Hypothecium pale yellow-brown to yellow-orange, colour intensifying in K; apices of paraphyses unpigmented, or with an *external* cap of blue-green, N+ crimson pigment .......................................................................................................................................................... *L. montana*
13. Ascospores 7–14 × 4.5–9 µm; apices of paraphyses with an *internal* cap of pigment; excipulum in section grey-green to pale brownish, lacking blue-green pigment towards the outer edge; soredia not in discrete soralia, arising from a dissolution of the thallus .......................................................................................................................... *L. xylopora*

¹ Australian records of *L. asema* (Nyl.) Knoph & Hertel (Elix 2008, 2010) are misdeterminations of *L. flavovirens*. 

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44
This species has a well-developed, yellowish, areolate thallus containing atranorin, 2,5,7-trichloro-3-O-methylnorlichexanthone (both major) plus zeorin and isoarthothelin (minor). It grows in sheltered underhangs in dry sclerophyll forest. We have excluded it from this study pending further collections.

Ecology and distribution. This new variety is known from South Australia (Kangaroo Island) and the coast of southern New South Wales, and this widely disjunct distribution suggests that it is probably more widespread, albeit inconspicuous and overlooked. It has been recorded from sheltered aspects on coastal rocks (chiefly sandstone and laterite) where it grew in rather nutrient-enriched conditions, together with Buellia aeruginosa A.Nordin, Owe-Larsson & Elix, Candelariella vitellina (Hoffm.) Müll.Arg., Halecania subsquamosa (Müll. Arg.) van den Boom & Mayrhofer, Lecanora dispersa (Pers.) Sommerf., Ferraria fusconigrescens Nyl., Xanthoria ligulata (Körb.) P.James and species of Caloplaca and Amandinea. The type specimen is from a more inland locality in dry lowland woodland, where it grew beneath a canopy of mallee eucalypts, associated with Xanthoparmelia subprolixa (Nyl. ex Kremp.) O. Blanco et al. and species of Caloplaca.

Additional specimens examined

SOUTH AUSTRALIA. Kangaroo Island, northern end of Antechamber Bay, 35°46'S 138°04'E, 5 m alt., 22 Sep 2013, G. Kantvilas 264/13 (HO).

JERVIS BAY TERRITORY. Bristol Point, 35°08'S 159°44'E, 1 m alt., 17 Nov 2012, G. Kantvilas 606/12 (HO).

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References


Fig. 2. The Lecidella-type ascus (with amyloid portions stippled), ascospores and paraphyses (with pigmented areas stippled), as exemplified by Lecidella granulosula var. lecanorina. Scale bar: 10 µm. — G. Kantvilas 375/13 (holotype).