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A new saxicolous species of *Catillaria* (lichenised Ascomycetes: Catillariaceae) from southern Australia

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Abstract

The new species *Catillaria austrolittoralis* Kantvilas & van den Boom is described from coastal rocks in southern Australia including Tasmania. It contains argopsin or pannarin, two compounds previously unreported for the genus.

Keywords: argopsin, biodiversity, lichens, pannarin, taxonomy.

Introduction

Catillaria A. Massal. is a genus of crustose lichens that is widely distributed throughout the world, not least in Australia, where the most recent checklist (McCarthy 2012) records 27 taxa. Traditionally the genus name was applied to crustose lichens with a green photobiont, apothecia with a well-developed margin lacking algal cells, mostly eight-spored asci, and colourless, 1-septate ascospores (Zahlbruckner 1927). Although this concept persists to some degree today, the study of additional characters in the latter part of the 20th Century, in particular of the ascus structure, led to a reappraisal and subdivision of many of Zahlbruckner's 'form genera' (other examples include *Lecidea* Ach. and *Bacidia* de Not.) and, as a result, the concept of *Catillaria* was refined considerably (Kilias 1981; Hafellner 1984).

Thus *Catillaria* in the strict sense is now defined as having a crustose thallus with a chlorococcoid photobiont, lecideine apothecia with a persistent margin, asci with a well-developed amyloid tholus that lacks any discernible internal structures (*Catillaria*-type of Hafellner 1984), paraphyses with capitate, pigmented apices, and hyaline, non-halonate, 1-septate ascospores. In Australia, many taxa continue to be included in *Catillaria* but, with further study, most will need to be placed elsewhere, potentially in unrelated genera such as *Megalaria* Hafellner, *Cliostomum* Fr., *Toninia* A.Massal. or *Tylothallia* P.James & H.Kilias. The same applies even in regions where the lichen biota has been comparatively well-studied and where accounts of the genus include a heterogeneous assemblage of taxa whose precise generic affinities remain unresolved (e.g. Fletcher & Coppins 2009; Hertel et al. 2007).

In our review of many specimens of *Catillaria*-like lichens, as well as *Catillaria* names, we have encountered a species that, although rather common, does not appear to have a name. We describe this lichen here as new to science.

Methods

The study is based chiefly on collections by the first author, housed mainly in the Tasmanian Herbarium (HO), and on selected collections from 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 100 observations respectively. The latter are presented in the format: 5th percentile–*average*–95th percentile; outlying extreme values are given in parentheses. Routine chemical analyses using thin-layer chromatography (t.l.c.) follow standard methods (Orange et al. 2001); solvent A was the preferred medium.

Taxonomy

Catillaria austrolittoralis* Kantvilas & van den Boom, *sp. nov.

Thallo argopsinum vel panarinum continenti, apotheciis lecideinis, pigmentosum aeruginosum destitutis, ascis typo Catillariae pertinentibus et ascosporis uniseptatis, non halonatis, 7–13 µm longis, 3–5 µm latis distinguibilis.

Mycobank no.: MB803295.

Typus: South Australia. **Kangaroo Island:** Stokes Bay, at beach NE of Stokes Bay Landing, 1 m alt., on sea-shore rocks, 19 Sep. 2012, *G. Kantvilas 514/12 & B. de Villiers* (holo.: HO; iso.: AD, BM, CANB, hb. van den Boom, MSC, UPS).

Thallus crustose, rimose-areolate in the centre, rather effuse towards the margins, pale to dull olive-brown to olive-grey, rarely pale grey, forming extensive patches

often 10–30 cm wide but frequently interrupted by other crustose lichens; individual areoles 0.1–0.35 mm wide, to *c.* 150 µm thick, irregularly angular, plane to rather convex or bullate, appressed or, at times, lifted away from the substratum; cortex absent; photobiont cells globose, 8–15 µm diam. *Apothecia* lecideine, sessile, basally constricted, 0.2–0.4 (–0.5) mm diam., scattered; disc black, matt, mostly plane, sometimes becoming convex in older apothecia; proper excipulum concolorous with the disc, inrolled when young, persistent, in section 8–20 (–30) µm thick, opaque dark brown, unchanged in K, N± orange-brown, annular and not continuous beneath the hypothecium, composed of compacted, cellular hyphae 3–7 µm wide. *Hypothecium* 25–60 (–80) µm thick, colourless to pale yellowish, inspersed with oil droplets. *Hymenium* 30–45 (–50) µm thick, colourless, separating readily in water and KOH, overlain by a dark brown epihymenium 6–8 µm thick composed of the uppermost, pigmented cells of the paraphyses; pigment K–, N–. *Asci* 8-spored, 25–35 (–40) × (8–) 10–12 µm, clavate, of the *Catillaria*-type, with a prominent amyloid tholus lacking any internal differentiation, an apically truncate or concave ascoplasm and lacking an ocular chamber. *Paraphyses* simple or occasionally bifurcate at the apices, 1.5 (–2) µm thick; apices very markedly capitate, 4.5–6 (–7) µm wide, with an internally brown-pigmented apical cell. *Ascospores* (7–) 7.5–*9.8*–12.5 (–13) × (3–) 3.5–*4*–4.5 (–5) µm, hyaline, thin-walled, non-halonate, 1-septate, ellipsoid, occasionally a little constricted at the septum. *Pycnidia* immersed, rather infrequent, resembling black apothecial initials. *Conidia* narrowly ellipsoid to fusiform, 2–3.5 × 0.8–1 µm. **Fig. 1, 2A–C**.

Chemistry. Argopsin or pannarin detected by t.l.c.; the former tends to be the more common chemical race. The thallus is P+ orange in both cases.

Etymology. The specific epithet refers to the distribution of the species on the southern coast of Australia.

Remarks. The main characters of the new species, notably the lecideine apothecia, the *Catillaria*-type asci, the capitate paraphyses and the non-halonate, 1-septate ascospores, indicate unequivocally that it belongs to the genus *Catillaria* in the strict sense. However the presence of argopsin or pannarin makes the new species unique within *Catillaria* s.str. According to Kilias (1981), in his detailed revision of the saxicolous *Catillaria* species in Europe, no lichen products are found in *Catillaria* species, and the same was observed by Fletcher & Coppins (2009) in their account of British species, and Hertel et al. (2007) for the Sonoran region. These chemical compounds may occur within the family Catillariaceae, but only in *Halecania* M.Mayrhofer (van den Boom 2009), a genus that is distinguished by its lecanorine apothecia and halonate ascospores (Mayrhofer 1987). Moreover, a dark brown proper excipulum is never observed in *Halecania*. In some *Halecania* species, for example *H. rhypodiza* (Nyl.) Coppins, the apothecia appear biatorine, but a thalline margin can often be observed in very young apothecia, or algal cells can be detected in the lower parts of the excipulum.

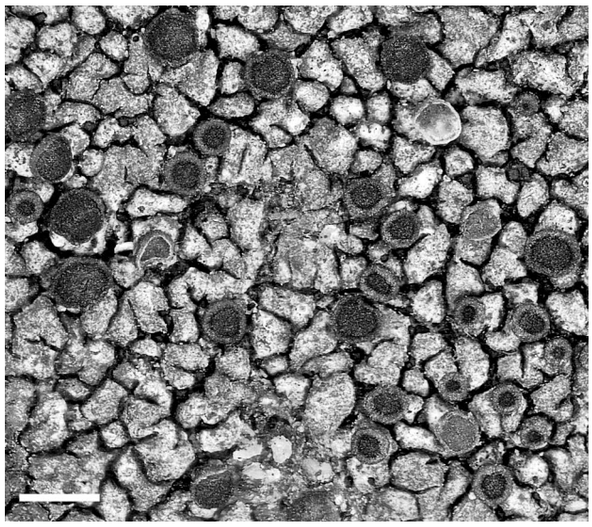

Fig. 1. *Catillaria austrolittoralis* (holotype): habit. Scale bar: 0.5 mm.

In the field, *C. austrolittoralis* resembles the chiefly Northern Hemisphere species, *C. chalybeia* (Borrer) A.Massal., in so far as both occur in the same habitats, have a dark, areolate thallus and similar apothecia, but the latter is distinguished by lacking chemical compounds, having a dark brown hypothecium, and typically having blue-green epithecial pigments. Also superficially similar is *C. subviridis* (Nyl.) Zahlbr., which also occurs in the supralittoral zone in the Northern Hemisphere, but that species has larger ascospores (10–16 × 4.5–6 µm), smaller apothecia [0.1–0.2 (–0.3) mm] and lacks any chemical compounds (Fletcher & Coppins 2009).

Being so abundant, it would be reasonable to expect that this species would have been described previously. However, an examination of the protologues of possible taxa, and study of selected type specimens, particularly of taxa described in the 19th Century by J. Müller Argoviensis, has not revealed any older names.

The chemical variation in the species does not appear to be correlated to any morphological, anatomical or ecological characters. Indeed, both chemotypes have been found on the same rock types and at the same localities, and their distribution appears to be entirely random. One specimen (from Kangaroo Island) has no detectable chemistry, although it also lacks any discernible thallus and is from an unusual, slightly inland locality. Pannarin and argopsin are closely related β-orcinol depsidones, differing only by any additional chlorine atom in the latter (Huneck & Yoshimura 1996). Similar chemical variation can be observed in *Phyllopsora* species, such as *P. buettneri* (Müll.Arg.) Zahlbr. (Elix 2009).

Two *Catillaria* specimens from Western Australia (*J.A.Elix 31710, 31713*), collected at an altitude

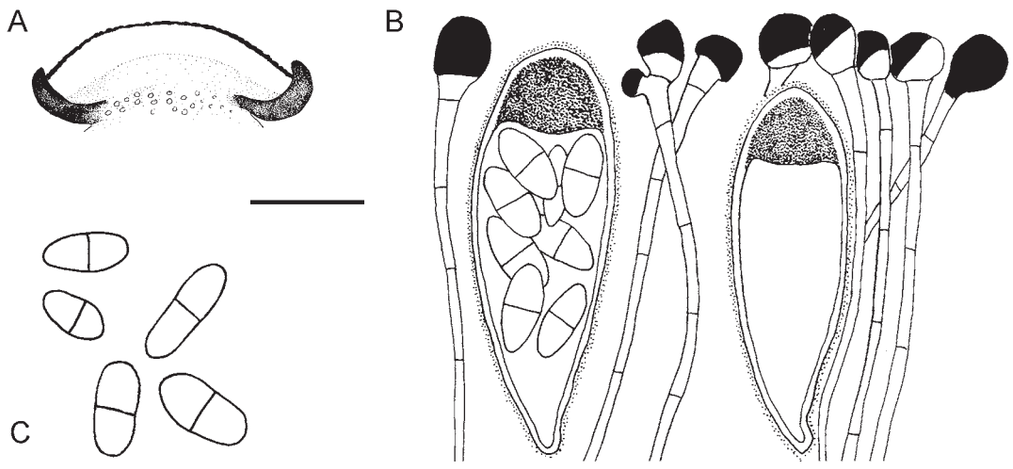

Fig. 2. *Catillaria austrolittoralis* (holotype): A vertical section of apothecium (schematic); B–C portion of hymenium and ascospores with amyloid tissues stippled. Scale bar: A 200 µm, B 10 µm.

of 365 m, are not included in our concept of *C. austrolittoralis* although they both contain argopsin and display many superficial similarities to the new species. They differ chiefly in having a thicker (to 100 µm) hypothecium that is dark brown in the upper part, and narrower ascospores, (8.5–) 9–*10*–12 (12.5) × 2.5–*2.7*–3 µm; further collections are required to ascertain their status. There are additional collections of *Catillaria*-like lichens from Tasmania that likewise await further study.

The new species is very distinctive and generally easily recognized, even in the field. However, at certain locations it may occur together with *Amandinea devilliersiana* Elix & Kantvilas, which is superficially very similar but can be distinguished microscopically by its brown, 1-septate ascospores and by the presence of norstictic acid.

Ecology and distribution. Catillaria austrolittoralis is a common species of coastal rocks, where it is a typical component of the widespread southern Australian littoral lichen association dominated by *Tylothalia pahiensis* (Zahlbr.) Hertel & Kilias, species of *Caloplaca*, *Rinodina blastidiata* Matzer & H.Mayrhofer, *Ochrolechia* cf. *parella* (L.) A.Massal., *Flavoparmelia haysomii* (C.W.Dodge) Hale, *Xanthoparmelia conranensis* (Elix) Elix, *X. subprolixa* (Nyl. ex Kremp.) O.Blanco et al., *Xanthoria ligulata* (Körb.) P.James sens. lat. Less common associated species include *Rinodinella fertilis* (Körb.) Elix, *Buellia halonia* (Ach.) Tuck., *Amandinea coniops* (Wahlenb.) M.Choisy ex Scheid. & H. Mayrhofer, *A. devilliersiana* Elix & Kantvilas, *A. pelidna* (Ach.) Fryday & L.Arcadia [syn. *A. lecideina* (H.Mayrhofer & Poelt) Scheid. & H.Mayrhofer], *Buellia homophylia* (C.Knight) Zahlbr., *B. stellulata* (Taylor) Mudd, *Teloschistes spinosus* (Hook.f. & Taylor) J.S.Murray and numerous green *Xanthoparmelia* species. In this habitat, its dull, olive colour may be rather overshadowed by the bright white, orange and green of its associated taxa. Nevertheless, it tends to be quite common, and forms extensive colonies and mosaics covering many tens of square centimetres. Although mainly collected along the seashore, this species can, rarely, occur away from the littoral zone. Thus it has been found on coastal pinnacles, even as high as 300 m elevation. It does not display any preferences for particular rock types, although it does not occur on limestone. However, Precambrian quartzite, Ordovician conglomerate, Devonian granite, Triassic sandstone and Jurassic dolerite are all colonised, although it appears to be particularly common on granite. The new species has hitherto been recorded from Tasmania, South Australia (Kangaroo Island), the Bass Strait islands, Victoria and southern New South Wales. However, its abundance at these localities and its tolerance of a wide range of rock types suggest it could occur more widely.

Specimens examined.

I. Argopsin chemotype:

South Australia. **Kangaroo Island:** Point Ellen, 2 km S of Vivonne Bay, 4 m alt., 1985, *J.A. Elix 19595 & L.H. Elix* (CANB); Cape Willoughby, 2008, *G. Kantvilas 331/08* (HO); Antechamber Bay, sea-level, 2008, *G. Kantvilas 333/08* (HO); near King George Beach, 2 m alt., 2011, *G. Kantvilas 328/11* (AD, hb. van den Boom, HO); Windmill Bay, 1 m alt., 2012, *G. Kantvilas 493/12* (HO); Ravine des Casoars, 15 m alt., 2012, *G. Kantvilas 479/12 & B. de Villiers* (hb. van den Boom, HO).

Tasmania. Penguin, 1968, *W.A. Weber & D. McVean L-49694* (HO); Little Musselroe Bay, 4 m alt., 1983, *A. Moscal 2963* (HO); Spring Beach, 1992, *H. Mayrhofer 11257 & E. Hierzer* (GZU, HO); Prosser River, sea-level, 1993, *G. Kantvilas 40/93* (hb. van den Boom, HO); Whalers Lookout, Bicheno, 50 m alt., 2000, *G. Kantvilas 497/00* (HO); Low Head, 10 m alt., 2001, *G. Kantvilas 969/01* (HO); Grants Point, 10 m alt., 2001, *G. Kantvilas 211/01* (HO); Goat Island, 10 m alt., 2001, *G. Kantvilas 1148/01* (HO); summit of Mt Murray, 315 m alt., 2006, *G. Kantvilas 269/06* (HO); Spiky Beach, 2 m alt., 2011, *G. Kantvilas 120/11* (HO); Cape Huay, 100 m alt., 2012, *G. Kantvilas 306/12* (HO); Blowhole Point, Marion Bay, 2 m alt., 2012, *G. Kantvilas 341/12* (HO).

New South Wales. Boulder Bay, S of Tathra, 20 m alt., 2012, *L.H. Cave 1786* (HO).

II. Pannarin chemotype:

Tasmania: Sloop Rocks, near St Helens, 1963, *G.C. Bratt 812 & M.H. Bratt* (BM, HO); Spiky Bridge, seal-level, 1984, *G. Kantvilas 167/84 & P. James* (BM, HO); White Beach, sea-level, 2000, *G. Kantvila*s 84/00 HO); Sulphur Creek, 2000, *G. Kantvilas 158/00, 159/00* (HO); Rocky Cape, 10 m alt., 2001, *G. Kantvilas 1159/01* (HO); Redbill Point, Bicheno, 3 m alt., 2002, *G. Kantvilas 459/02* (HO); Bicheno, near the Gulch, 3 m alt., 2002, *G. Kantvilas 460/02* (hb. van den Boom, HO); Wineglass Bay, sea-level, 2003, *G. Kantvilas 731/03* (HO); Maignon Blowhole, Tasman Peninsula, 40 m alt., 2006, *G. Kantvilas 360/06* (HO).

Bass Strait, Cape Barren Island: The Corner, 1969, *J.S. Whinray s.n.; MEL 1068311 pp* (HO).

Victoria: *c.* 2 km SW of Mallacoota township on Betka Road, *V. Stajsic 5704 pp* (HO).

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