



KANTVILASIA (LECANORALES, ECTOLECHIACEAE), A NEW FOLIICOLOUS LICHEN GENUS FROM TASMANIA

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Abstract: The new genus and species *Kantvilasia hians* (Lecanorales, *Ectolechiaceae*) is described from leaves of *Atherosperma moschatum* at the margin of a cool-temperate rainforest in western Tasmania. Notes are provided on characterization, distribution, habitat, associated species, the opening mechanism of campylidia and likely dispersal processes of conidia. © 2000 The British Lichen Society

Introduction

While the study of foliicolous lichens in tropical and subtropical regions continues to be a popular and productive field of research, leaf-inhabiting species at higher latitudes, often confined to relictual pockets of comparatively low diversity, have not been ignored. Interesting communities have been reported from the east coast of the Black Sea (Vězda 1983) and from southern and south-western Europe (Foucault *et al.* 1982; Sérusiaux 1993; Puntillo & Vězda 1994; Puntillo & Ottonello 1997, and others), while New Zealand supports quite a rich foliicolous flora that extends to the most southerly parts of South Island (see Malcolm & Galloway 1997). Although this element of the Tasmanian flora has long been overlooked, it is currently under investigation (McCarthy, Kantvilas & Vězda, unpublished data).

Recently, specimens of an unusual taxon that could not be assigned to any known genus were collected by Dr Gintaras Kantvilas on leaves of the tree *Atherosperma moschatum* at the margin of a cool-temperate rainforest in western Tasmania. The genus belongs in the family *Ectolechiaceae* because of the combination of a chlorococcoid photobiont, apothecia with a hamathecium of anastomosing filaments and *Sporopodium*-type asci and the presence of campylidia. However, the status and circumscription of this family are somewhat uncertain, and there is doubt concerning its separation from *Pilocarpaceae* (Lücking *et al.* 1994). Described here as new to science, the currently monotypic *Kantvilasia* is characterized by its thalline and ascomatal anatomy, monosporous asci, muriform ascospores, campylidial structure and the occurrence of simple conidia.

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Methods

Hand sections and squash preparations were examined in water, and in Lugol's iodine (with and without pretreatment with 10% KOH). Measurements of algae, thalline and prothalline hyphae, hamathecial filaments, excipular hyphae and hypothecial cells, ascus walls, conidiogenous cells and conidia were made at $\times 1000$ magnification; those of entire asci and ascospores were made at $\times 400$ magnification. In the species description, ascomatal and ascospore dimensions are presented as mean values with extreme values in parentheses; total numbers of ascomata, asci and ascospores measured are in square brackets, for example [$n=75$].

Natural compounds were characterized by high-performance liquid chromatography (HPLC) using a sample microtube with retention index values calculated from benzoic acid and soloninic acid controls (Feige *et al.* 1993; Elix *et al.* 1997). The HPLC was coupled to a photodiode array detector for ultraviolet spectroscopic comparisons. By this means the ultraviolet spectra observed for the various components eluting in the HPLC chromatogram were recorded and computer-matched against a library of ultraviolet spectra recorded for authentic metabolites under identical conditions.

Taxonomy

Kantvilasia P. M. McCarthy, Elix & Sérus. gen. nov.

Thallus crustaceus, foliicola, epicuticularis, laevigatus, algis chlorococcalibus. Apothecia plerumque innata. Excipulum proprium plusminusve vestigiale, e hyphis radiantibus constans. Epithecium algas non continens. Hypothecium paraplectenchymaticum. Paraphyses anastomosantes. Asci monospori, rostrati, tholo amyloideo, structura ut in *Sporopodium*. Ascospores incolorate, muriformes. Campylidia adsunt. Conidia simplicia.

Typus: *Kantvilasia hians* P. M. McCarthy, Elix & Sérus.

Thallus crustose, foliicolous, epicuticular, smooth. *Photobiont* chlorococoid. *Apothecia* mostly innate, with a thin, proper exciple and a convex disc. *Proper exciple* greatly reduced, prosenchymatous, consisting of radiating hyphae. *Epithecium* not containing algae, granules or crystals. *Hypothecium* paraplectenchymatous. *Hamathecium* of richly anastomosing paraphyses; apical cells hyaline, not or very slightly swollen. *Asci* rostrate, 1-spored; apex IKI+ dark blue, *Sporopodium*-type. *Ascospores* colourless, muriform. *Campylidia* erect, with a \pm horizontal, acute apex (when dry), with lateral flaps folded inwards and covering the conidiogenous layer (when dry); not containing algae. *Conidia* simple.

Notes. *Kantvilasia* is characterized by its foliicolous habit, the presence of chlorococoid algae in its thallus and the occurrence of innate, dark bluish grey to almost black apothecia that do not have epithelial algae, but have a reduced exciple that does not subtend the hypothecium. The campylidia are \pm erect, do not contain algae and produce minute, simple conidia.

Four tropical genera of *Ectolechiaceae* also produce simple and broadly ellipsoid, oval or subglobose conidia; the conidia of other genera are elongate and variously septate (sometimes with distinctive appendages) or simple and filiform. The pantropical *Sporopodium* has a thick exciple, epithelial algae and globose thallus cells (Santesson 1952; Lücking 1992), and the monotypic *Logilvia* has, like *Kantvilasia*, a reduced exciple, but its apothecia are yellowish and contain epithelial algae (Vězda 1986). *Loflammia* has reddish, sessile apothecia with a thick, parenchymatous exciple that continues below the

hypothecium (Vězda 1986). Finally, *Sporopodiopsis sipmanii* Sérus., the type species of a recently described, Palaeotropical genus, has hemiangiocarpic apothecia with a prominent margin that, at first, completely covers the disc (Sérusiaux 1997). When the genus was described, apothecia were unknown for a second species, *S. mortimeriana* Sérus.; they were eventually found in further collections also made in Papua New Guinea (Sérusiaux, unpublished data). Interestingly, they are similar to those of *Kantvilasia*, although the epithecium is filled with brownish, non-refracting granules. However, both species of *Sporopodiopsis* have exceptionally elaborate campylidia in which the conidiogenous layer is folded so that the conidia develop in 2 or 3 locules and can be dispersed together with associated algae (Sérusiaux 1997).

Etymology. The new genus is named in honour of Dr Gintaras Kantvilas (Tasmanian Herbarium, Hobart) in recognition of his many outstanding contributions on the taxonomy, floristics and ecology of Tasmanian lichens.

Kantvilasia hians P. M. McCarthy, Elix & Sérus. sp. nov.

Thallus albidus, pallide griseus vel pallide viridigriseus, 15–25 µm crassus, prothallo distincto, substantium argopsino simili continens. Apothecia matura atrocyanea vel atra, valde convexa, (0.19–)0.25(–0.32) mm diametro, epruinosa. Excipulum proprium 20–40 µm crassum, non inspersum. Epithecium griseoviride vel atrogriseoviride. Hypothecium atrogriseoviride vel nigroviride, 50–80 µm crassum. Hymenium 50–90 µm crassum, non inspersum. Asci clavati vel cylindroclavati, 58–80 × 22–34 µm. Ascosporae latae vel elongatae ellipsoideae vel breviter cylindricae, (37–) 50(–68) × (16–)22(–28) µm. Campylidia plusminusve erecta, grisea vel atrogrisea, 0.29–0.48 mm lata, 0.25–0.45 mm alta, ubi madefactus tumida, aperta. Conidia late ellipsoidea, ovalia vel obovata, 5–8 × 3–4.5 µm.

Typus: Australia, Tasmania, c. 2 km SW of Stormont, 41°31'S, 146°00'E, alt. 800 m, on leaves of *Atherospema moschatum* at edge of rainforest, 27 June 1999, G. Kantvilas 306/99 (HO 445410—holotypus; CANB, LG, hb. Lücking—isotypi).

(Figs 1 & 2)

Thallus whitish, pale grey or pale greyish green, sometimes with a faint blue tint, 15–25 µm thick, comprising ± round, dispersed or contiguous patches, 1–4 mm wide, or forming continuous colonies to 20 mm wide and covering much of the leaf surface; thallus surface smooth, dull, not or only sparingly cracked. *Algae* chlorococcoid; cells 5–12 µm diam. *Mycobiont hyphae* hyaline, long-celled, anastomosing, 2–3(–4) mm wide. *Prothallus* usually distinct, silvery grey, bluish grey or bluish black, delimiting larger colonies and linking dispersed thalline 'islands'; hyphae similar to those of thallus, but hyphal walls often bluish grey.

Apothecia very numerous, scattered, superficial, frequently growing directly from the prothallus, not or very slightly attenuated at the base, (0.19–)0.25(–0.32) mm diam. [$n=96$], epruinose in all parts and at all stages of development, at first plane to slightly convex, with a dark bluish grey disc and a very thin, slightly paler proper exciple. Mature apothecia strongly convex, blackish, superficially without visible trace of the exciple; surface often quite rough, soft and somewhat translucent when wetted. *Exciple* pale grey (thin section), prosenchymatous, not containing crystals, 20–40 µm thick, not or scarcely subtending the hypothecium, composed of rather thin-walled,

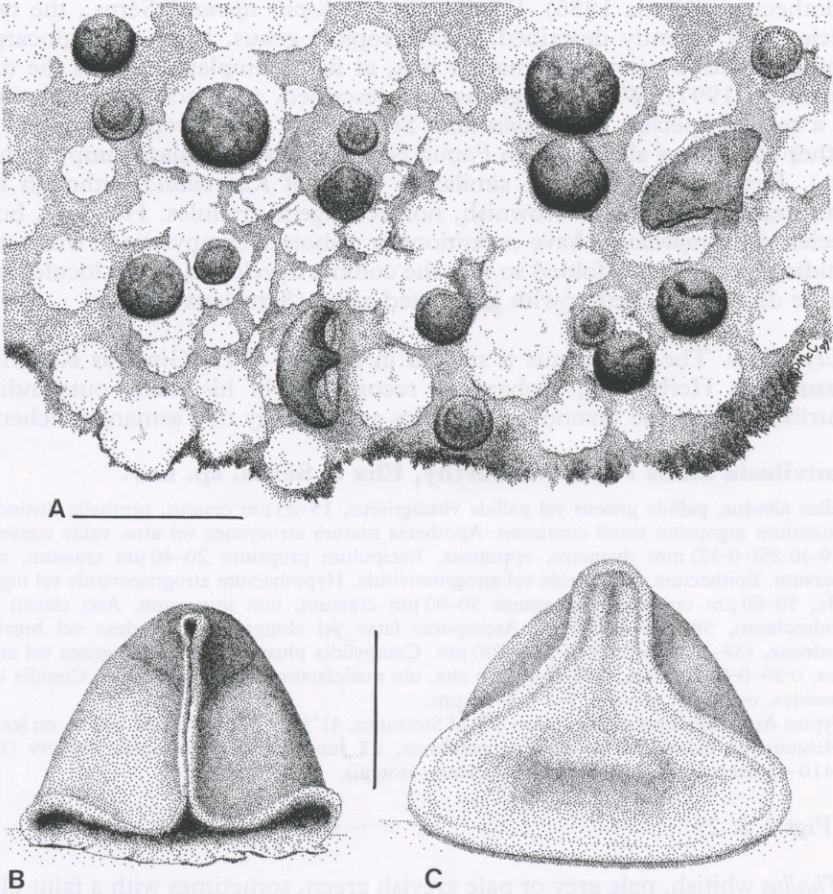


FIG. 1. *Kantvilasia hians* (holotype). A, habit of thalli, prothallus, apothecia and two campylidia; B, front view of dry campylidium; C, same campylidium after c. 30 seconds in water. Scales: A=0.5 mm; B, C=0.2 mm.

radiating hyphae; cells ellipsoid to elongate, $8-15 \times 4-6 \mu\text{m}$. *Epithecium* diffusely medium to dark grey-green, this colour extending into the upper parts of the hymenium and with faint vertical streaks extending down between the asci to the hypothecium. *Hypothecium* dark greenish grey to greenish black, colour deepening in K, then often with a purplish tone, $50-80 \mu\text{m}$ thick. *Hymenium* $50-90 \mu\text{m}$ thick, not interspersed with oil droplets, granules or crystals. *Paraphyses* richly anastomosing throughout the hymenium, $1-2 \mu\text{m}$ wide. *Asci* clavate to clavate-cylindrical, monosporous, with a tapering stalk, $58-80 \times 22-34 \mu\text{m}$ [$n=15$]; apex of submature asci with a thick tholus, sometimes containing a small, convex, ocular chamber-like extrusion of the ascoplasma (often indistinct); side walls $2-4 \mu\text{m}$ thick; ascoplasma IKI-. *Ascospores* colourless, broadly to elongate-ellipsoid or short-cylindrical, muriform, with $13-17$ transverse divisions, each transverse loculus with $4-6$

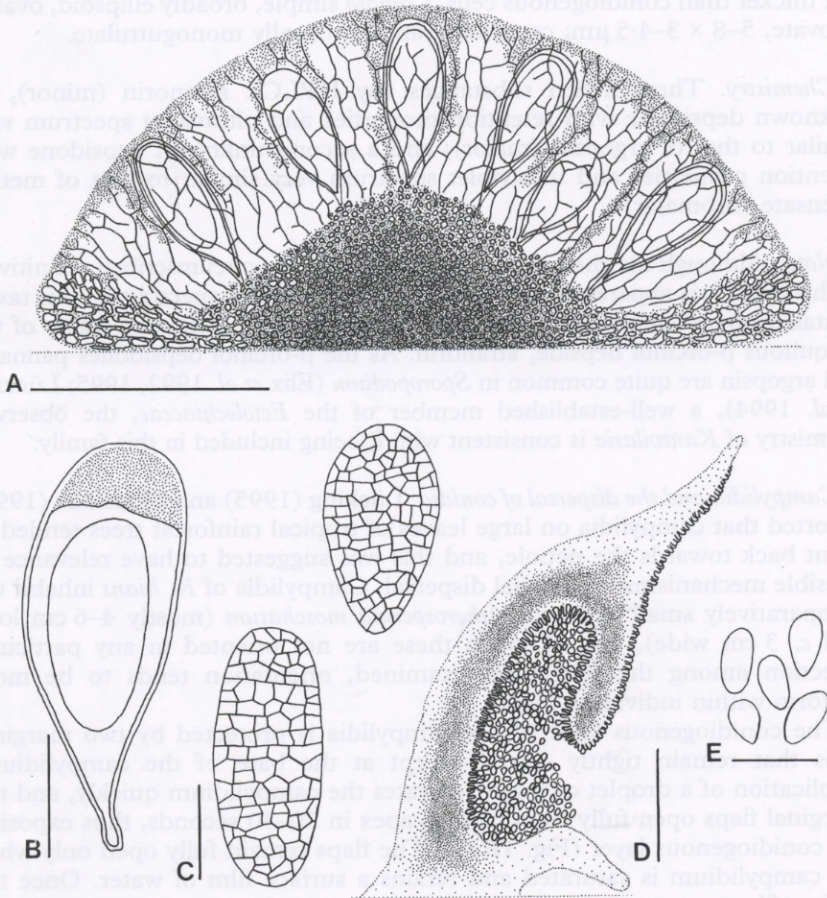


FIG. 2. *Kantvilasia hians* (holotype). A, vertical section of apothecium (semi-schematic); B, submature ascus showing the blue-stained tholus in Lugol's iodine (pretreated with KOH); C, ascospores; D, vertical section of campylidium (slightly off-centre; semi-schematic); E, conidia. Scales: A, D=0.1 mm; B, C=20 μ m; E=10 μ m.

longitudinal divisions (the first 3–5 transverse septa often remaining well-defined at maturity), lacking a perisporium, often projecting through the surface of old apothecia, $(37\text{--}50\text{--}68) \times (16\text{--}22\text{--}28) \mu\text{m}$ [$n=75$].

Campylidia moderately numerous, 0.29–0.48 mm wide, 0.25–0.45 mm tall, pale grey at the base, dark grey to blackish towards the apex; lateral flaps folded inwards and contiguous when dry, pulpy and somewhat translucent when wetted, and separating to expose the conidiogenous layer; postmature campylidia rather papery, dark grey to blackish throughout. *Conidiogenous cells* simple, 5–8 μm long, 1.5–2.5 μm wide, present on all inner surfaces including lateral flaps; outer surface of flaps with a palisade-like layer of cells similar to

but thicker than conidiogenous cells. *Conidia* simple, broadly ellipsoid, oval or obovate, $5-8 \times 3-4.5 \mu\text{m}$; contents granular, usually monoguttulate.

Chemistry. Three lichen substances (by HPLC): atranorin (minor), an unknown depsidone with retention properties and ultraviolet spectrum very similar to that of argopsin (major), and a second unknown depsidone with retention properties and ultraviolet spectrum very similar to that of methyl virensate (submajor).

Notes. Although the chemistry of *K. hians* cannot be circumscribed definitively at this time, it is apparent from the respective ultraviolet spectra that this taxon contains several unidentified β -orcinol depsidones in addition to traces of the ubiquitous β -orcinol depside, atranorin. As the β -orcinol depsidones pannarin and argopsin are quite common in *Sporopodium* (Elix *et al.* 1992, 1995; Lücking *et al.* 1994), a well-established member of the *Ectolechiaceae*, the observed chemistry of *Kantvilasia* is consistent with it being included in this family.

Campylidia and the dispersal of conidia. Lücking (1995) and Sérusiaux (1995) reported that campylidia on large leaves of tropical rainforest trees tended to point back towards the petiole, and this was suggested to have relevance to possible mechanisms of conidial dispersal. Campylidia of *K. hians* inhabit the comparatively small leaves of *Atherosperma moschatum* (mostly 4–6 cm long and *c.* 3 cm wide), and although these are not oriented in any particular direction among the specimens examined, orientation tends to be more uniform within individual thalli.

The conidiogenous layer of dry campylidia is protected by two marginal flaps that remain tightly closed except at the base of the campylidium. Application of a droplet of water saturates the campylidium quickly, and the marginal flaps open fully from base to apex in 20–30 seconds, thus exposing the conidiogenous layer (Fig. 1B,C). The flaps remain fully open only while the campylidium is saturated and retains a surface film of water. Once the surface film evaporates, the flaps begin to close slowly, even though the tissues of the campylidium probably remain fully saturated for some time longer. This mechanism of exposing or enclosing the conidiogenous layer confirms the importance of a flow of liquid water over the leaf surface for an efficient dispersal of conidia, both in terms of numbers and distance carried.

Campylidia are also produced by two other, far more common foliicolous lichens in Tasmania. In *Badimiella serusiauxii* Malcolm & Vězda (?*Ectolechiaceae*) the campylidia are thin and papery with a fully exposed conidiogenous layer at maturity; their appearance scarcely changes when saturated. In contrast, the campylidia of *Tapellaria phyllophila* (Stirt.) R. Sant. (*Ectolechiaceae*) look like flattened grey scales when dry; when wetted, however, they swell to resemble a deep, translucent cup that is tilted at a slight angle.

Distribution and habitat. *Kantvilasia hians* inhabits the smooth, glossy upper surface of mature leaves of *Atherosperma moschatum* (*Atherospermataceae*) at the edge of a rather narrow corridor of high-altitude, callidendrous rainforest in western Tasmania. The lichen was very abundant on several lower limbs

which protruded out of the forest into the adjacent, low, open heathland-herbfield mosaic (G. Kantvilas, pers. comm.). Currently, it is known only from the type locality; other species present are *Arthonia cyanea* Müll. Arg., *A. trilobularis* Müll. Arg., *Dimerella* sp. (hypophyllous), *Mazosia phyllosema* (Nyl.) Zahlbr. and *Strigula nitidula* Mont.

Etymology. The epithet *hians* (Latin, gaping) refers to the exposed conidiogenous layer of water-saturated campylidia (Figure 1C).

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Note added in proof: *Kantvilasia hians* has subsequently been collected at a similar latitude in southern Argentina. The specimen, identified by R. Lüicking, was found on leaves of the cupressaceous conifer *Pilgerodendron uviferum* in cool-temperate (Valdivian) rainforest. Locality details are as follows:

Argentina: *Provincia de Neuquen:* Puerto Blest, Cascada Los Cántaros, 41°05'S, 71°55'W, 13 December 1999, *M. I. Messuti* 2002 (BCRU).

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