

***Sclerophyton puncticulatum* sp. nov. (lichenized Ascomycota, Opegraphaceae) from New South Wales, Australia**

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Abstract

Sclerophyton puncticulatum P.M.McCarthy & Elix (lichenized Ascomycota, Opegraphaceae) is described from bark in montane rainforest in northern New South Wales, Australia. Some older reports from Australia of other *Sclerophyton* species are re-assessed.

Sclerophyton Eschw. (Opegraphaceae) includes 14 species known from bark and lignum in rainforest throughout the tropics and subtropics and in coastal shrub communities at low latitudes on the Pacific coasts of North, Central and South America (Sparrus 2004). In this paper, a new species is reported from montane rainforest in northern New South Wales. Meanwhile, only two of the five species previously reported from Australia can confidently be assigned to *Sclerophyton*.

The genus has come under scrutiny by Ertz & Tehler (2011), who found it to be paraphyletic. Consequently, future studies and the availability of additional collections might see *S. puncticulatum* transferred elsewhere, possibly to *Fulvophyton* Ertz & Tehler (Roccellographaceae).

Methods

Observations and measurements of photobiont cells, thalline and ascomatal anatomy, asci, ascospores, pycnidial anatomy and conidia were made on hand-cut sections mounted in water and treated with 10% potassium hydroxide (K). Calcium oxalate was detected by treatment of thalline and pseudostromatal sections with a 10% aqueous solution of sulfuric acid; it forms colourless, needle-shaped crystals. Asci were also observed in Lugol's Iodine (I), with and without pretreatment in K. Chemical constituents were identified by thin-layer chromatography (Elix 2014) and comparison with authentic samples.

***Sclerophyton puncticulatum* P.M.McCarthy & Elix, sp. nov.**

Mycobank No.: **MB 825500**

Characterized by the combination of the thin, off-white to greenish white, richly rimose, corticolous thallus containing psoromic acid (major), gyrophoric acid (minor) and calcium oxalate; punctulate, brown-black ascomata, 60–80(–100) μm wide above, and fully immersed in thalline pseudostromata that are simple and rounded to elongate or sparingly to richly branched and dendroid; a brown-black hypothecium; asci of the *Opegrapha*-type; sparingly branched and anastomosing paraphysoids; colourless, elongate-fusiform, 3-septate ascospores, 35–51 \times 3–4.5 μm , thick-walled and lacking a perispore; and curved-filiform conidia, 10–18 \times c. 0.5 μm .

Type: Australia, New South Wales, Northern Tablelands, Gibraltar Range, Washpool Natl Park, 78 km E of Glen Innes, 29°28'10"S, 152°21'01"E, 895 m alt., on bark of sapling in mixed rainforest with scattered *Eucalyptus*, *J.A. Elix 37294*, 2.v.2005 (holotype – CANB).

Thallus corticolous, crustose, determinate, forming colonies to 5 cm wide, off-white to greenish white, richly rimose, but not areolate, esorediate; surface dull to slightly glossy, minutely and irregularly uneven or verruculose, to 60–100 μm thick (100–150 μm thick in

pseudostromata; see below), not unambiguously corticate, but with an upper, hyaline, algae-free layer 12–16(–20) μm thick, composed of closely interwoven, short-celled hyphae 2–2.5 μm wide. *Algae* *Trentepohlia*, forming a continuous layer to c. 80 μm thick, interspersed with clusters of plate-like calcium oxalate crystals (H_2SO_4^+); cells ellipsoid, 9–14 \times 8–12 μm , solitary or in very short filaments; interstitial hyphae short-celled, 2–2.5 μm wide. *Medulla* to c. 50 μm thick, lacking or with sparse calcium oxalate crystals, composed of loosely arranged hyphae 1.5–2.5(–3) μm wide. *Prothallus* fimbriate, effuse, white to greyish black. *Ascomata* numerous, brown-black above, punctiform, rounded or ellipsoid and 60–80(–100) μm wide, often merging laterally to form short, unbranched 'lirellae' 0.1–0.3 mm long, fully immersed in the pseudostromata; disc epruinose, plane or very slightly convex; margin scarcely distinguishable from the disc in surface view; sectioned ascomata occasionally precipitating crystals in K (see *Chemistry*). *Pseudostromata* anatomically \pm identical to the vegetative thallus, simple and rounded to elongate or sparingly to richly branched and dendroid, weakly to moderately convex, densely interspersed with clusters of plate-like calcium oxalate crystals (H_2SO_4^+). *Proper excipulum* (thin section) medium to dark olive-brown or brown-black above, 25–40 μm thick and spreading slightly laterally (darker externally), pale to medium brown at the sides and 10–15 μm thick, medium to dark brown or brown-black at the base and 10–15 μm thick; cells periclinal laterally and at the base, 8–15 \times 2–3 μm , anticlinal and divergent apically. *Hypothecium* brown-black, 25–40 μm thick, merging laterally with the excipulum and contiguous with the substratum, KI–, K– or precipitating orange-red crystals. *Hymenium* 70–100 μm wide, 90–150 μm deep, not interspersed with granules or oil globules, KI+ blue; subhymenium hyaline to pale brown, 15–25 μm thick. *Epihymenium* poorly defined, 5–10 μm thick, pale brown, K–. *Paraphysoids* loosely to moderately conglutinate in the hymenial gel, separating further in K, 1.3–2(–2.5) μm thick, sparingly branched and anastomosing, long-celled, the septa not constricted; apices not or only very slightly swollen, hyaline to pale brown. *Asci* 8-spored, *Opegrapha*-type, narrowly clavate to cylindroclavate, thin-walled, 60–76 \times 12–16 μm ; apex rounded, with a tholus 2–3 μm thick, with or without a low-conical ocular chamber to 2 μm wide which is often, but not always, encircled by a minute amyloid ring; ascoplasma orange-brown in KI. *Ascospores* colourless, more or less in a single fascicle in the ascus, persistently 3-septate, elongate-fusiform, straight or slightly to rather strongly curved, commonly tapering more gradually towards the distal end, not constricted at the septa, (35–)42(–51) \times (3–)4(–4.5) μm [$n = 50$]; apices rounded or subacute; cells of \pm equal size throughout spore ontogeny (microcephalic); spore wall to c. 0.8 μm thick, usually noticeably thicker than the septa; perispore not visible in water, K, I or KI; contents clear. *Pycnidia* numerous, solitary, completely immersed in the thallus, 60–80 μm wide; apex punctiform, medium to dark brown; internal wall hyaline to pale brown (thin section), 4–6 μm thick, with a simple conidiogenous layer; conidiogenous hyphae 8–12 \times 0.7–1 μm . *Conidia* simple, filiform, usually slightly curved, occasionally almost arcuate, 10–16(–18) \times c. 0.5 μm . **Chemistry:** Thallus and pseudostromata K–, C–, KC–, PD+ yellow, UV–; containing psoromic acid (major) and gyrophoric acid (minor) by TLC; H_2SO_4^+ , containing calcium oxalate; in sectioned ascomata the hypothecium occasionally precipitating orange-red crystals, a potassium salt of a quinone derived from the base-catalyzed oxidation of norstictic acid.

Etymology: The epithet *puncticulatum* refers to the outwardly dot-like ascomata of the new species.

Remarks

In terms of morphology, the placement of this species in *Sclerophyton* is supported by the melanized hypothecium that merges laterally with the excipulum and is contiguous with the substratum, and rather thick-walled ascospores (Sparrus 2004). Macrocephalic ascospores were also cited as being diagnostic for the genus (Sparrus 2004). Thus, formation of the medial first septum is followed by second and third divisions close to the middle of the spore, so that the end cells remain considerably larger until they too are reduced in size with the formation of addition septa. However, since the ascospores of *S. puncticulatum* are persistently 3-septate, they are effectively microcephalic. Ascospore shape in *S. puncticulatum* remains

somewhat anomalous, being elongate-fusiform rather than narrowly ellipsoid (Sparrius 2004).

Sclerophyton conspicuum A.W.Archer was described from bark at two localities near Darwin, Northern Territory (Archer 2003). Sparrius (2004) suggested “according to the description and illustration probably a species of *Lecanographa* (*L. aff. lyncea*)”. However, an examination of the holotype (*H.Streimann 48684*, CANB) and paratype (*J.A.Elix 22603*, CANB) confirmed an excipulum that is carbonized apically and laterally, the ascomatal base being hyaline and open, suggesting a species of *Opegrapha*. Archer & Elix (2003) reported *S. circumscriptum* (Taylor) Zahlbr. from Lord Howe Island and *S. rostratum* Egea & Torrente from the Northern Territory. The former has been re-identified as *Enterographa subgelatinosa* (Stirt.) Redinger by Sipman (2018) based on a duplicate in B which matches the two CANB specimens (*J.A.Elix 42291*, 42310). The report of *S. rostratum* is surprising, as the Australian specimen (*J.A.Elix 22607*, not “22606” as published; CANB) bears little resemblance to the species described and illustrated by Egea & Torrente (1995) from Baja California, Mexico; it is referable to *Enterographa subserialis* (Nyl.) Redinger.

Consequently, in addition to *S. puncticulatum*, two species of *Sclerophyton* are accepted in the Australian lichen flora, viz. the pantropical *S. elegans* Eschw., which was reported by Archer (2006) from south-eastern Qld, and the pantropical *S. seriale* (Ach.) Sparrius, from the Northern Territory and north-eastern Queensland (Sparrius 2004). The former has richly branched, lirelliform ascomata and ellipsoid ascospores $12\text{--}17 \times 3.2\text{--}5.5 \mu\text{m}$, the upper cell enlarged (Sparrius 2004), while *S. seriale* has a glossy, pale grey-brown thallus, whitish pseudostromata, and ellipsoid-fusiform, 3-septate ascospores $14\text{--}22 \times 3\text{--}6 \mu\text{m}$ (Sparrius 2004).

The new species is known from only the type locality in northern New South Wales, Australia.

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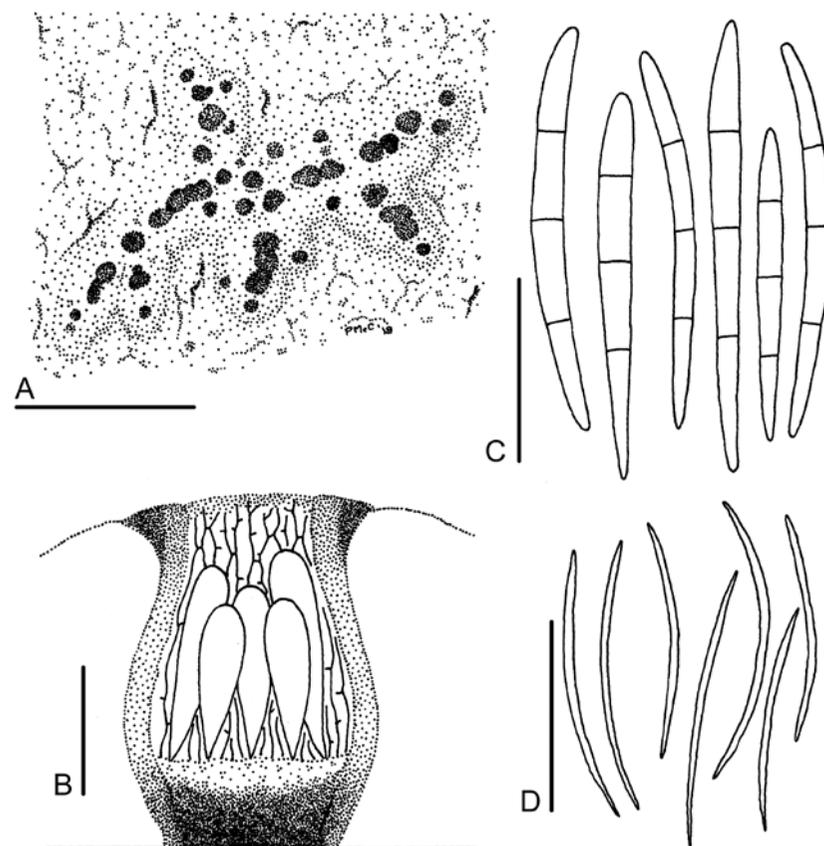


Figure 1. *Sclerophyton puncticulatum* (holotype). A, Habit of thallus and a branched pseudo-stroma, with punctiform ascomatal apices; B, Sectioned ascoma (semi-schematic); C, Ascospores; D, Conidia. Scales: A = 1 mm; B = 50 μm ; C = 20 μm ; D = 10 μm .