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Notes on *Mycomicrothelia* (*Arthopyreniaceae* s. lat.), with two new species

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Abstract: Descriptions are provided for two new species, *Mycomicrothelia lateralis* Sipman from Norfolk Island and *M. triangularis* Aptroot from Puerto Rico, both characterized by lateral ostioles and uniseriate ascospores. Based on the examination of additional fresh material, the genus *Ornatopyrenis* is included in *Mycomicrothelia* and the new combination *Mycomicrothelia queenslandica* (Müll. Arg.) Sipman & Aptroot is made. *Ornatopyrenis muriformis* Aptroot is proposed as a synonym of *M. decipiens* (Müll. Arg.) R. C. Harris.

Key words: Ascomycetes, lichens, distoseptate, Puerto Rico, Norfolk Island, *Mycomicrothelia*, *Ornatopyrenis*

Introduction

The genus *Mycomicrothelia* (*Arthopyreniaceae* s. lat.) was reintroduced by Hawksworth (1985) in a revision of the genus *Microthelia*. He presented an improved definition of the genus and accepted 26 species. His treatment greatly facilitated the recognition of the group. Consequently, numerous new records were reported, especially from tropical regions. Thus additional information on the variability and distribution of the species became available, and several additional taxa were recognized (Harris 1989; Aptroot 1991, 1995; David & Hawksworth 1995; Sérusiaux & Aptroot 1998; Fröhlich & Hyde 2000; Komposch *et al.* 2002; Wang *et al.* 2004). During the examination of additional fresh material, it became apparent that the genus *Ornatopyrenis* is synonymous, and special attention was paid to the delimitation of *Mycomicrothelia*. Moreover two undescribed, rather similar species were found independently by us in material from Norfolk Island and in the field in Puerto Rico respectively. They are described in the genus *Mycomicrothelia* below.

A new key to the species of the genus *Mycomicrothelia* has been compiled, based on a compilation of recent publications and a re-examination of the specimens readily available to us. It will be available on the internet to allow continuous updating at the address <www.bgbm.org/Sipman/keys/Mycomicrothelia.htm>.

Material and Methods

All relevant specimens kept in ABL and B were re-investigated, as well as a selection of specimens from E, GB, NY, STU, hb. Berger, hb. Diederich and hb. Etayo. Microscopic examination was made primarily on tap water mounts. Lugol's solution was used to test for amyloid reactions. A *c.* 5% KOH-solution was then applied to test the colour reactions of the excipulum and to observe any changes in the spore structure. Chemical investigation was restricted to UV-tests.

Results

The taxonomic position of *Ornatopyrenis*

The genus *Ornatopyrenis* was described by Aptroot (1991) for the species *Microthelia queenslandica* Müll. Arg. and placed in the

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Trypetheliaceae, apparently because of its similarity with *Megalotremis*, although it did not show a clear relationship to any of the other genera of this family. Hawksworth (1985) had already discussed the taxonomic position of this species and postulated an affinity with *Pyrenulaceae* or *Melanommataceae*. Harris (1995) considered the genus to be a possible synonym of *Mycomicrothelia*, which he assigned to the *Arthopyreniaceae*. An additional species, *O. muriformis*, was published by Aptroot *et al.* (1997). Our investigations have demonstrated that the genera *Mycomicrothelia* and *Ornatopyrenis* are very similar. They share the following characters:

1 Thallus without a supracortical layer, completely endophloeodic, sometimes forming whitish or pinkish patches, or indistinct and not discolouring the bark surface, sometimes bordered by dark hypothallus lines ('border lines'). Symbiotic algae are sometimes clearly present, sometimes not.
2 Perithecia usually single, simple, regularly scattered, occasionally coalescing in small groups; exciple carbonized, dimidiate, often with a basal fringe, originating inside the thallus, finally completely exposed, sometimes with only the ostiole exposed, sometimes becoming sessile or even raised due to erosion of surrounding bark; carbonized parts composed of densely intertwined hyphae, in thin section dark (reddish) brown, mostly K+ more or less strongly olivaceous; ostioles central, occasionally lateral.
3 Hamathecium gelatinous, I−, clear or in a few Neotropical species inspersed with *c.* 1–5 µm wide droplets or grains, with *c.* 2 µm wide, sparsely septate, branched and anastomosing filaments, scarcely branched at ascus level, said to be pseudoparaphyses; asci clavate to subcylindrical, I−, wall gradually thickening towards the tip, with a small ocular chamber *c.* 25% of ascus width.
4 Spores 8 per ascus or inconstantly in somewhat reduced number, after a juvenile, hyaline stage, olivaceous grey, becoming brownish with age, with one (sub)central euseptum, where they are constricted, and where a torus ring can sometimes be seen; internally an endospore layer can be seen against the spore wall in certain stages of spore development; it can protrude into the locule and form rings or pseudosepta, which are usually transverse or occasionally longitudinal; outer surface at some stage verruculose or spinulose, more clearly so in older spores, covered with a more or less distinct gelatinous sheath (halo); lower locule often distinctly smaller than upper locule.
5 Pycnidia common in some species, absent in others, often concentrated along the hypothallus border lines. Most pycnidia are empty and pycnospores are not always known in species where pycnidia occur.
6 The species usually grow on smooth bark of young stems or branches in exposed, humid conditions. They tend to colonize large surfaces with a mosaic of individuals.

The only clear difference between these two genera is in the endospore development. In *Mycomicrothelia* a thin endospore layer is visible in young spore stages; this has usually disappeared by the time that the warty ornamentation has developed. In *Ornatopyrenis* the endospore is much more conspicuous and more persistent; in well-developed spores it forms a variable number of additional, irregular pseudosepta. These are of a different structure from that of the primary septum, and disappear later, so that old, decaying spores show only a single septum.

Since the difference concerns the modification of a structure already present in the genus *Mycomicrothelia*, the species characterized by it may form a paraphyletic group and the phylogenetic independence of *Ornatopyrenis* is considered unproven. Therefore it is proposed here to include it in *Mycomicrothelia*. The two species described below with filiform asci and lateral ostioles might be more distantly related to the main species group of *Mycomicrothelia*.

Infrageneric groups

Within the genus *Mycomicrothelia* three further rather disparate species or species groups can be distinguished. The new species *M. lateralis* and *M. triangularis* are characterized by their cylindrical asci with uniseriate spores. *Mycomicrothelia melanospora* produces elongate-ellipsoid conidia, which are finally 1-septate, brown and 13–14·5 × 5·5–6·5 µm. In *M. wallrothii* the conidia are also very large and ellipsoid, but polarilocular, hyaline, and (9–)11–12·5 (–14) × 4–6·5 µm. DNA analyses are probably required to determine whether these and *Ornatopyrenis* are paraphyletic units inside *Mycomicrothelia* or whether they deserve a separate generic status.

Taxonomic notes

Mycomicrothelia decipiens (Müll. Arg.) R.C. Harris

Mem. New York. Bot. Gard. **49:** 78 (1989).—*Anthracothecium decipiens* Müll. Arg., *Bot. Jahrb. Syst.* **6:** 415 (1885); type: Cuba, *C. Wright* 130 (G—holotype!).

Ornatopyrenis muriformis Aptroot, *Biblioth. Lichenol.* **64:** 123 (1997); type: Papua New Guinea, Madang prov., Gogol valley, *c.* 30 km W of Madang, Tgubi logging site, *c.* 125 m, 145°28′E, 5°08′S, flood-plain forest along Gogol river, on tree, 13 August 1992, *Sipman* 35978 (B!—holotype; ABL!—isotype).

Mycomicrothelia queenslandica (Müll. Arg.) Sipman & Aptroot comb. nov.

Basionym: *Microthelia queenslandica* Müll. Arg., *Rep. Australas. Assoc. Advancem. Sci.* **6:** 455 (1895).—*Ornatopyrenis queenslandica* (Müll. Arg) Aptroot, *Biblioth. Lichenol.* **44:** 128 (1991); type: Australia, Queensland, *Knight* 71 (G!—lectotype, Hawksworth 1985).

Mycomicrothelia lateralis Sipman sp. nov.

Mycomicrothelia peritheciis singulis, circa 0·4–0·5 mm latis et 0·1–0·2 mm altis, ostiolis lateralibus, ascis cylindricis, circa 130 × 10 µm, ascosporibus uniseriatis 18–22 × 6–7 µm superficie verruculoso.

Typus: Norfolk Island, Mt Pitt Reserve, track from Red Road to Mt Bates, 220 m alt., relatively natural forest on gentle slope, on treelet stem, 6 December 1984, *H. Streimann* 34411 (B!—holotypus; CANB, H—isotypi).

(Fig. 1B & D)

Thallus whitish, UV+ whitish, *c.* 1–3 cm wide, with dark brown border lines, seemingly associated with scattered *Trentepohlia* in the bark cells.

Perithecia regularly scattered, mostly single, occasionally 2–4 coalescing in irregular lines, low-conical to hemispherical, mostly somewhat elongate and *c.* 0·3–0·4 × 0·5 mm, without fringe and 0·1–0·2 mm high, with lateral ostiole; when mature sessile and free of thallus, black; involucrellum dark brown, K+ very dark olivaceous. *Hamathecium* clear, filaments *c.* 1 µm wide, anastomosing above the asci. *Asci* I−, *c.* 130 × 10 µm. Apices with ocular chamber. *Ascospores* uniseriate, 18–22 × 6–7 µm, elongate, greyish brown, bilocular with almost equal locules, conspicuously constricted at the septum, in I with two additional pseudosepta, with rounded ends, with verruculose surface consisting of warts that are partly orientated in rows.

Pycnidia present near the border lines, *c.* 0·3 mm in diameter, with weakly carbonized wall; phialides *c.* 7 × 1 µm; conidia bacilliform, simple, hyaline, *c.* 3 × 0·5 µm.

Distribution and ecology. Known only from the type specimen collected in Norfolk Island in the SW Pacific Ocean, which covers large areas of smooth bark with a mosaic of thalli.

Observations. This species is the first known in the genus with lateral ostioles. The perithecia are mostly somewhat elongate, not only the clypeus as in some *Mycomicrothelia* species. The ostiole is often situated in one of the far ends of the ellipse, particularly in small ascocarps. The new species also differs from all other *Mycomicrothelia* species, apart from *M. triangularis*, by its very narrow asci in which the ascospores are uniseriately arranged.

Mycomicrothelia triangularis Aptroot sp. nov.

A *Mycomicrothelia laterale* persimile differt ascosporis maioribus, 25–35 × 7–10 µm.

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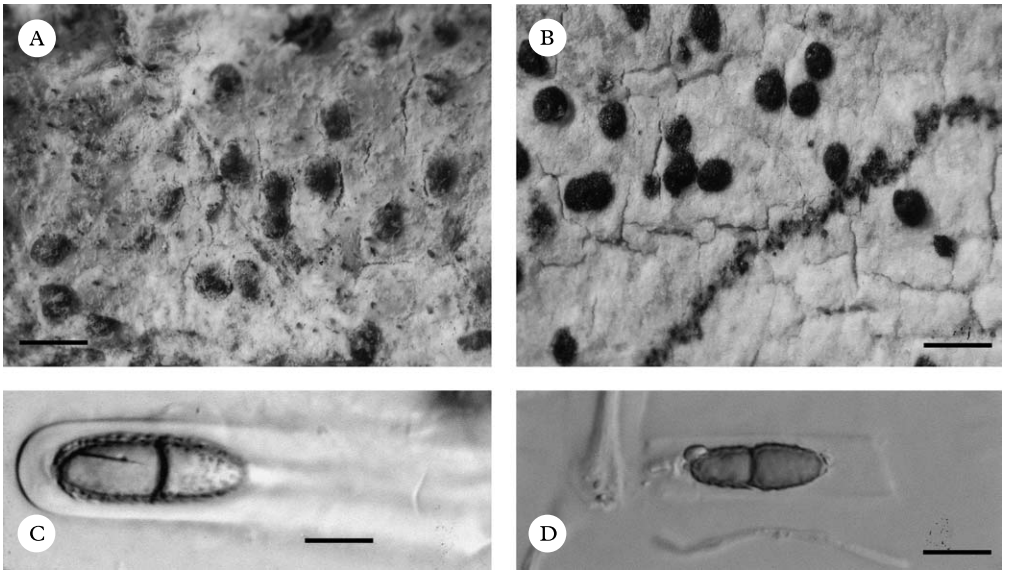

FIG. 1. *Mycomicrothelia* species. A, *M. triangularis*, habitus of holotype; B, *M. lateralis*, habitus of holotype; C, *M. triangularis*, ascus fragment showing ornamentation of ascospore, holotype; D, *M. lateralis*, ascus fragment showing ornamentation of ascospore, holotype. Scales: A & B=1 mm; C & D=10 µm.

Typus: Puerto Rico, Mayagüez, Reserva Forestal Maricao, N of Sabana Grande, along road 120, km 16–17, on tree in low mountain forest on dry serpentine, 21–31 May 1989, *A. & M. Aptroot* 24949 (B!—holotypus; ABL!—isotypus).

(Fig. 1A & C)

Thallus whitish, UV+ whitish, *c.* 2–5 cm wide, with dark brown border lines, seemingly associated with scattered *Trentepohlia* in the bark cells.

Perithecia regularly scattered, mostly single, occasionally 2–4 coalescing, low-conical to hemispherical, mostly somewhat elongate to triangular and *c.* 0·3–0·4 × 0·5 mm, without fringe and 0·1–0·2 mm high, with lateral ostiole; partly covered by a thin layer of thallus; involucrellum dark brown, K+ very dark olivaceous. *Hamathecium* clear, filaments *c.* 1 µm wide, anastomosing above the asci. *Asci* I−, *c.* 150 × 15 µm. Apices with ocular chamber. *Ascospores* uniseriate, (25–)26–29(–35) × (7–)8·5–9·5(–10) µm, long-ellipsoid, brown, bilocular with almost equal locules, not or slightly constricted at the septum, in I without additional pseudosepta, with rounded ends, with verruculose surface consisting of warts that are partly orientated in rows.

Pycnidia not observed.

Distribution and ecology. Known only from the type specimen, from Puerto Rico, on smooth bark.

Observations. This new species is very close to the preceding species in most characters, and both form a rather isolated group within *Mycomicrothelia* as presently understood. They have some characters, especially the ascospore ornamentation and narrow asci, in common with species of the non-lichenized genus *Peridiothelia* D. Hawksw. (*Pleomassariaceae*, Aptroot 2002), but differ by more fundamental characters such as the hamathecium structure (anastomosing) and iodine reactions (absent).

Excluded species

Mycomicrothelia palmicola J. Fröhl. & K. D. Hyde, *Fungal Diversity Research Series* **3**: 85 (2000). The description mentions hyaline ascospores without mucilaginous sheath.

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This excludes the species from the genus as presently understood.

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