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Reinstatement of the lichenized genus *Eremothecella* Sydow

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Abstract

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The lichenized genus *Eremothecella* Sydow (syn. *Nematidia* Stirton, nom. inval.) is reinstated for four foliicolous species belonging to the *Arthonia calamicola* -group. The following new combinations are introduced: *Eremothecella palmulacea* (Müll. Arg.) comb. nov., *E. macrosperma* (Zahlbr.) comb. nov. and *E. variratae* (Sipman & Aptroot) comb. nov. *Amazonomyces* Batista & Cavalcanti represents the anamorph of the genus, and as a dual nomenclature for lichens is not permitted under Art. 59, that generic name must be placed as a synonym of *Eremothecella*.

Introduction

This paper is a modest contribution towards a better arrangement of the species belonging to the *Arthoniales*. It deals with a group of four closely related foliicolous species of lichenized fungi, previously referred to as the *Arthonia calamicola*-group. Four species are currently known in this group (Santesson 1952: 87-91; Aptroot & Sipman 1991: 237-238). I have been impressed by the distinctive characters of this group for many years, and I believe time has come to recognize it as a separate genus.

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Observations

All four species have rounded to irregular ascomata, reaching 1.0-1.5 mm in diam., thin and dark coloured but becoming almost translucent when wet, except for the asci which then appear as tiny brownish dots. Indeed, individual asci are easily seen under a hand lens or dissecting microscope (10 x): they protrude out from the ascomatal surface which can be described as scabrose. The hamathecium is formed of a compact entanglement of densely branched and anastomosing paraphysoids whose walls are slightly brown pigmented. The paraphysoid mass extends as a more or less circular plate over the thallus (mainly composed of the algal layer) which disintegrates so that no algae tissue remains under the hypothecium. The gel between the paraphysoids turn blue in iodine after pretreatment with K. The outer surface of the hamathecium, forming the epithecial layer, is even more compact and pigmented and is responsible for the reaction with K: greenish in *A. palmulacea*, *A. calamicola* and *A. macrosperma*, and purple in *A. variratae*. Asci are globose with a very distinct stalk and thick walls (especially when young when the wall can be 10-15 mm thick), without an ocular chamber, nor any apical cushion. After pretreatment with K, a thin layer turns blue in iodine between the exo- and endoascal layer. The ascospores are 8 per ascus, transversely septate, typically clavate and macrocephalic, often more or less curved and slightly constricted at the septa; they turn brown when old and their surface becomes finely roughened.

These features point to *Arthoniaceae* Reichenb. ex Reichenb., and to the genus *Arthonia* Ach. However, the isolation of asci and the globose stalked asci are more reminiscent of *Cryptotheciaceae* A.L. Smith. In this latter family, however, paraphysoids are absent and asci are said to be produced individually within the thallus, although gathered in small clusters in some species (Santesson 1952: 59-68; Awasthi & Agarwal 1969). The *Cryptotheciaceae* are still poorly understood and were not cladistically examined in Tehler's (1990) cladistic outline of *Arthoniales* focussed on *Roccellaceae*. Much more remains to be done on the main genus of the family, *Cryptothecia* Stirton, as demonstrated by a recent contribution by Thor (1991).

The *Arthonia calamicola*-group cannot be assigned to any of the generally accepted genera of *Arthoniaceae* or *Cryptotheciaceae*:

- Like *Arthonia*, *Arthothelium* Massal. is heterogeneous; the type species (*A. spectabile* Flotow ex Massal.) has stromatoid ascomata with uniascal locules and a hamathecium of undifferentiated brown plectenchyma. It is pertinent here as it has globose, thick-walled asci with a distinct stalk, reminiscent of those of the *Arthonia calamicola*-group. Cladistic analysis (Tehler 1990) clearly demonstrates that *Arthothelium* does not belong to the *Arthoniales*.

- *Cryptothecia* Stirton and *Stirtonia* A.L. Smith have similar asci but lack any hamathecial tissues and plectenchyma forming genuine ascomata.

- *Arthonia* Ach. is without doubt heterogeneous as currently circumscribed; the species group that includes the type of the generic name (*A. radiata* (Pers.) Ach.) has subclavate asci with a short stalk quite distinct from that in the *A. calamicola*-group, and develops compact ascomata in which asci are produced

side by side and cannot be observed individually under a hand lens or dissecting microscope.

The most important apomorphy of the *A. calamicola*-group is the extraordinary type of conidia. Pycnidia are lacking in *Cryptothecia* and *Stirtonia*; in the *A. radiata*-group, the conidia are filiform, non-septate, straight or slightly curved and do not exceed 10 mm in length. In the *A. calamicola*-group, they are filiform, multiseptate (50-100 septa) and when fully mature reach 450 x 2-3 mm. No other species or group of species in *Arthoniales* s.l. has such extraordinary conidia. Moreover the pycnidia are seen as slightly convex ellipsoid patches on the thallus surface with a dark brown or black wall under which the conidia are arranged in parallel rows. Indeed, they are produced only on the base at one edge of the pycnidium and are produced towards the other edge. In fact, the length of the pycnidium is almost the length of the conidia! Conidiogenous cells are not numerous (less than 100), arise from conidiophores or directly from the innermost wall cells (not clearly seen), are subcylindrical and measure around 10 x 2-3 mm. Conidia are enteroblastically produced and arise singly; they reach their full length as a long filiform, non-septate cylinder with a rotunded apex and the septa eventually appear. The conidial mass is maintained under the outer wall of the pycnidium and is responsible for the hog-backed appearance of fully mature pycnidia. No observations have been made to document how the conidia are expelled.

History

The first author to recognize these unique pycnidia was Stirton (1879: 109) on the basis of rather poor collections from Amazonia. He introduced the generic name *Nematidia* Stirton, with two species (*N. excelsior* Stirton and *N. tenella* Stirton) for them; unfortunately it was not validly published as it lacked any diagnosis or description. Santesson (1952: 71) examined the original material of *N. tenella* and reported that it was an *Arthonia* with pycnidia but without ascomata. The material of *N. excelsior* is presumed to be lost (Santesson 1952: 71). While I have not examined any material cited by Stirton, I am convinced from his species descriptions that he was dealing with anamorphs of the *Arthonia calamicola*-group, either of *A. calamicola* or of *A. palmulacea*, so far the only species of that group known in South America. Stirton was unsure as to the biology of the fungi he was working on; he could not decide whether they were lichenicolous or truly lichenized. From my observations, there are no reasons to assume that the pycnidia belong to a lichenicolous coelomycete fungus growing on the thallus of an *Arthonia*.

Working on specimens from Java, Zahlbruckner (1928: 121) was also surprised by the unique features of these pycnidia and raised the same question as Stirton. Santesson (1952: 91) questioned the measurements of conidia made by Stirton and Zahlbruckner; although I have not seen 600 mm long conidia (as mentioned by Zahlbruckner, loc. cit.) in *Arthonia calamicola*, I can guarantee they reach at least 450 mm!

These unique pycnidia were described as a genus of "imperfect lichens", *Amazonomyces*, by Bastita & Cavalcanti (in Batista & Peres 1964: 90-91) with a single species, *A. palmae*. The description and figure provided (loc. cit.: 100) are excellent and perfectly match this group of lichens. Batista & Cavalcanti were the first authors to realize that, in this group, the conidia are produced only on one edge of the pycnidium.

Batista and his coworkers have published not less than 37 new genera of "imperfect lichens", mainly from Amazonia (see Vobis & Hawksworth 1981: 267); these genera have been generally overlooked and their names are not even checked for priorities in the process of description of new tropical taxa by most lichenologists, although they are catalogued (with species names) in Hawksworth (1972). This is quite unfortunate because, through my own experience of tropical lichens, I am now convinced that these fungi truly occur and that they were properly described. The original material is not readily available for study, but I am nevertheless working on a reassessement of these names on the basis of the published descriptions and illustrations. The first results indicate, for example, that both *Lyromma nectandrae* Bat. & Maia and *L. dolicobelum* Cavalcante have no other available names, the former being a rather common, albeit inconspicuous species, found on three continents, the latter being a rare but spectacular species in Amazonia; *Pyriomyces protii* Bat. & Maia is a synonym, either of a *Fellhanera* Vezda or *Byssoloma* Trev. species; *Didymopycnomyces hyalinus* Cavalcante & Silva is a synonym of *Dimerella epiphylla* (Müll. Arg.) Malme; *Tauromyces catenulatus* Cavalcante & Silva is a synonym of *Gyalectidium filicinum* Müll. Arg.; etc.

Nomenclature

The earliest validly published generic name for this group of lichens is *Eremothecella* Syd.; it is formally reinstated here to accomodate the four species belonging to the *Arthonia calamicola*-group.

Amazonomyces must be treated as a synonym; as Art. 59 of the International Code of Botanical Nomenclature does not apply to lichenized taxa, no separate anamorph names can be retained. Names based on types without ascomata are mere synonyms, not alternative anamorph names.

Eremothecella Sydow, in Sydow & Sydow, *Ann. Myc.* 15: 236 (1917).
Type: *E. calamicola* Sydow (holotype).

Nematidia Stirton, *Proc. R. Philos. Soc. Glasgow* 11: 99-111 (1878), nom. inval. (Art. 32.1).

Amazonomyces Bat. & Cavalcanti, *Anais XIV Congresso de Sociedade Botanico de Brasil, Manaus*: 90 (1964) ["1963"].
Type: *A. palmae* Bat. & Cavalcanti (holotype).

E. calamicola Sydow, in Sydow & Sydow, *Ann. Myc.* 15: 236 (1917).
Type: Philippines, Luzon, Laguna, Mt Maquiling, Baker 3367 (S-holotype; **PAD**-isotype n.v.).

E. macrosperma (Zahlbr.) Sérusiaux, **comb. nov.**

Arthoniopsis macrosperma Zahlbr., *Ann. Crypt. Exot.* 1: 120 (1928).

Type: Java, Preanger, Tijbodas, Schiffner 3481 (W-holotype; **UPS**-isotype n.v.).

E. palmulacea (Müll. Arg.) Sérusiaux, **comb. nov.**

Arthoniopsis palmulacea Müll. Arg., *J. Linn. Soc. Bot.* 29: 238 (1892).

Type: Brazil, Upper Amazonas, Trail (G-holotype; **BM**-isotype n.v.). Pycnidia are described in this species by Santesson (1952: 88), but no conidia were seen by that author. No collections examined by me have conidia.

?*Amazonomyces palmae* Bat. & Cavalcanti, *Anais XIV Congresso de Sociedade Botanico de Brasil, Manaus*: 91 (1964) ["1963"]. Pycnidia and conidia only described, assumed to represent the anamorph of *E. palmulacea* or of *E. calamicola*.

Type: Brazil, Amazonas, rodavia Manaus-Itacoatiara, 9 May 1961, R. Garnier (**URM**-holotype; **INPA**-isotype n.v.).

E. variratae (Aptroot & Sipman) Sérusiaux, **comb. nov.**

Arthonia variratae Aptroot & Sipman, *Willdenowia* 20: 237 (1991).

Type: Papua New Guinea, Central Province, Varirata National Park, 19 March 1987, H. Sipman 22403 (B-holotype; **UPNG**-isotype n.v.).

Pycnidia unknown in this species.

For further details on nomenclature and descriptions, see Santesson (1952: 87-91) and Aptroot & Sipman (1991: 237-238).

Ecology and distribution

All species are strictly foliicolous. *E. palmulacea* is known in Central and South America and South-east Asia, including New Guinea (Lücking 1992: 27); *E. calamicola* is reported from Tanzania (Farkas 1987: 48; see map 4 on p. 49), from Central and South America (Lücking 1992: 27; Sipman 1990: 61) and from South-east Asia, including New Guinea; *E. macrosperma* is known in South-east Asia, including New Guinea and *E. variratae* is known from a single locality in New Guinea.

Santesson (1952: 91) reports a specimen from Madagascar, with pycnidia only, under the name *E. macrosperma*. The conidia are said to be slightly clavate. Further collections from that island are needed to ascertain the identity of that material.

Illustrations

All illustrations are based on the following collection of *Eremothecella calamicola*: Papua New Guinea, Central Prov., Varirata National Park, 920 m, rain forest, on leaves, 15 March 1987, J.R. De Sloover 87/L/21 (LG).

Acknowledgments

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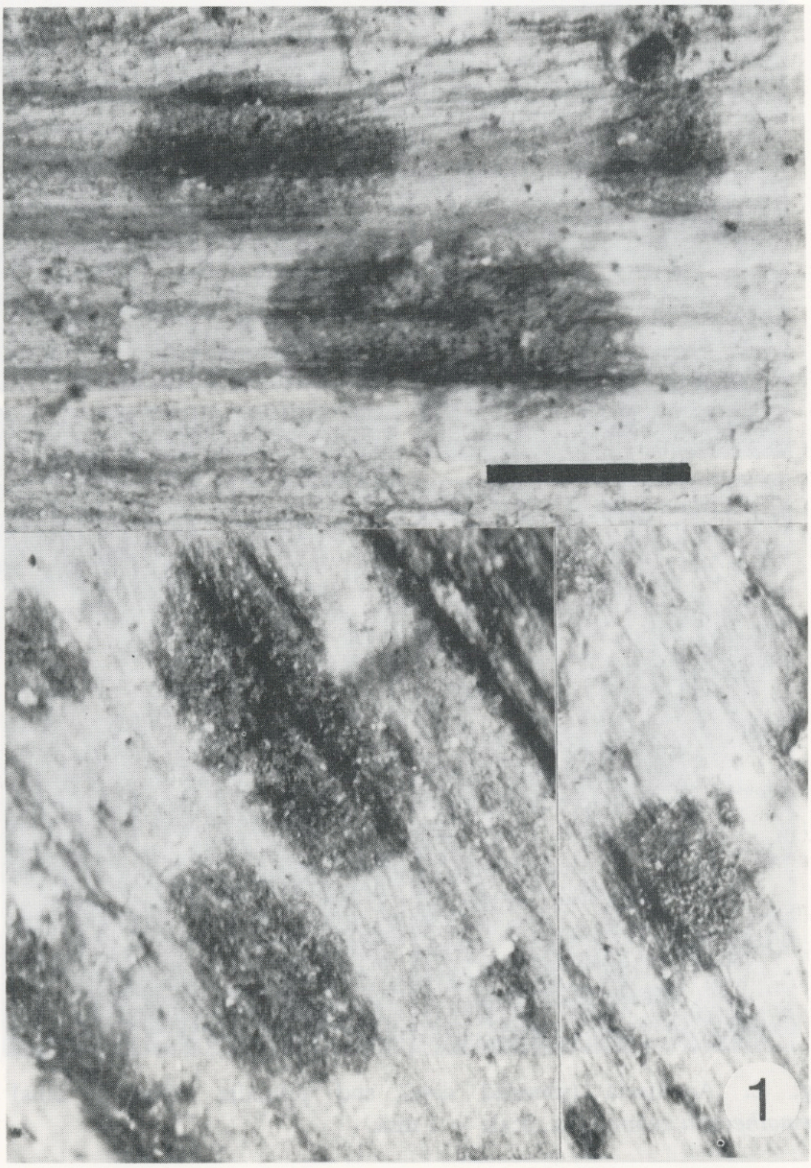

Fig. 1. Apothecia of *Eremothecella calamicola*. Individual asci are seen as black dots on the surface. Scale = 1 mm.

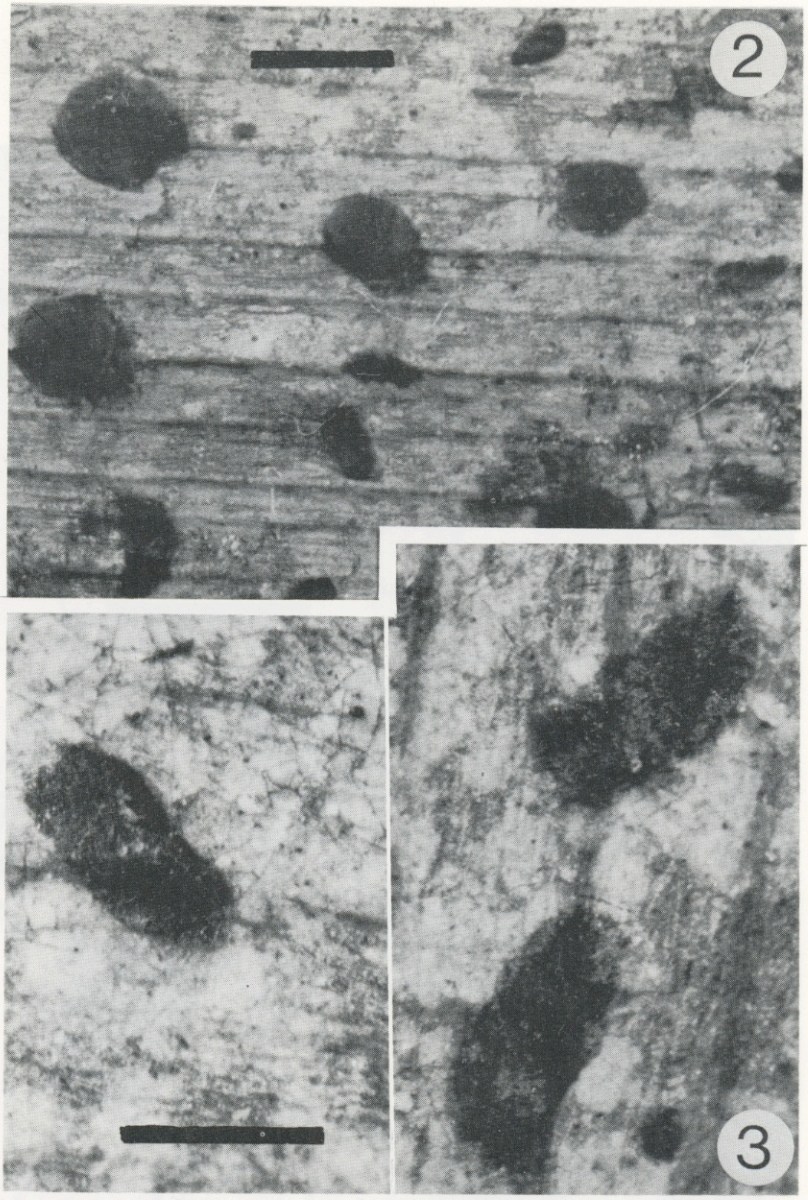

Fig. 2. Apothecia (rounded dots) and pycnidia (ellipsoid dots) of *Eremothecella calamicola*. Scale = 1 mm.

Fig. 3. Pycnidia of *E. calamicola*. Note the slightly convex shape of the left pycnidium. Scale = 1 mm.

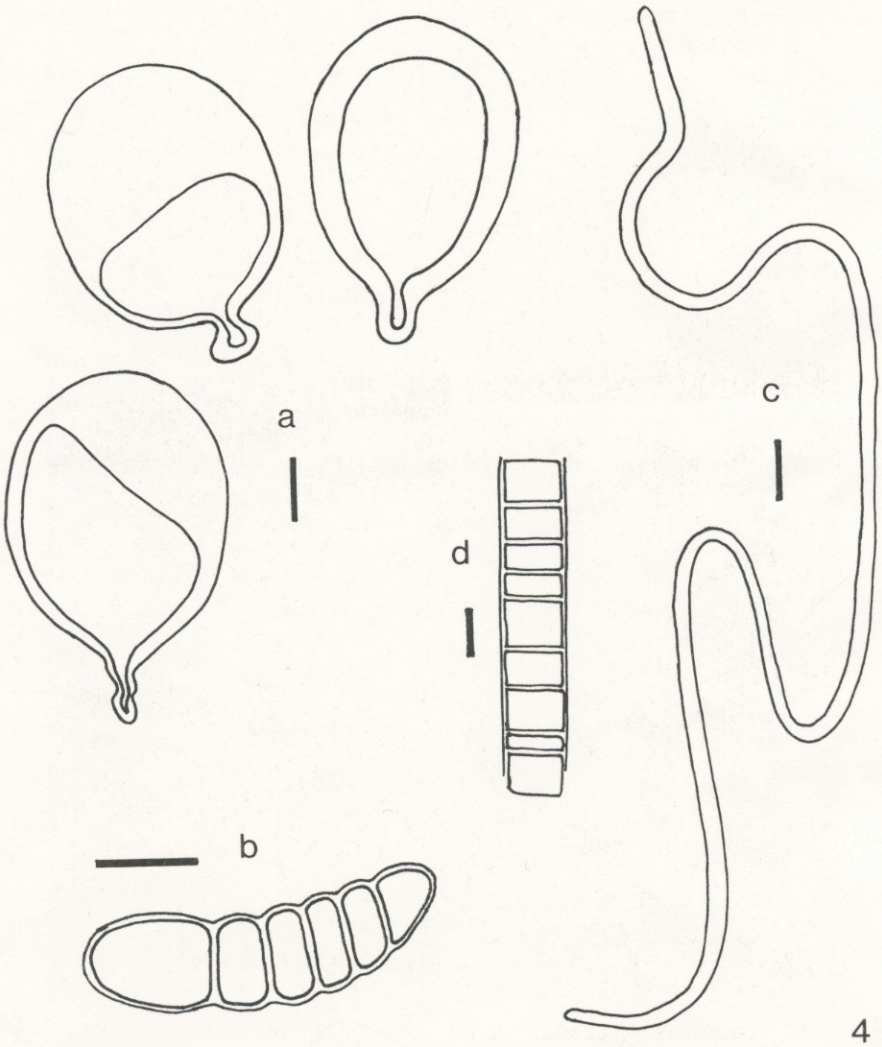

Fig. 4. *Eremothecella calamicola*. a = asci; b = spore; c = conidium (septa omitted; width slightly exaggerated); d = detail of a conidium section. Scales for a,b,c = 10 mm; scale for d = 1 mm.