New species of foliicolous lichens from “La Amistad” Biosphere Reserve, Costa Rica

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Abstract

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Four new foliicolous lichen species are described from the Biosphere Reserve "La Amistad" (Cordillera de Talamanca), Costa Rica: *Byssoloma carneum* with yellowish apothecia and crystalline exciple; *Fellhanera tubulifera* with tubular, campylidia-like pycnidia; *Porina flavopapillata* with subglobose, reddish perithecia provided with short, irregular, yellowish squamules and 15-septate ascospores; and *Trichothelium chlorinum* with minute, greenish perithecia provided with short, irregular setae and 3-septate ascospores. Based on new collections, *Badimia tuckermanii* is emended to cover an essentially neotropical taxon and excluding the paleotropical *B. elixii*.

1. Introduction

The foliicolous lichen biotas of Costa Rica are rather well studied and shelter about 400 species, which corresponds to 50 % of the world's biotas and 80 % of all species known from the Neotropics (Lücking 1995, 2003, Lücking & Kalb 2000). The discovery of new species in this rather small country seems not very likely; nevertheless, there are extensive areas that are difficult to access and harbour pristine, unexplored vegetation. The largest of these is "La Amistad" International Park, adjacent to "Chirripó" National Park and south of the capital San José, covering an area of c. 2000 km^2 in the Cordillera de Talamanca and the western parts of Panama (Herrera 1992). Together with a number of other protected areas, it forms the "La Amistad" Biosphere Reserve (Herrera 1992). Its Costa Rican part is divided into two administrative "Areas de Conservación" (AC): the AC "Amistad Caribe" and the AC "Amistad Pacífico", the dominant element being "La Amistad" International Park.

In the course of an ecological study to elucidate the distribution of foliicolous lichens in different vegetation types of "La Amistad" International Park, we unexpectedly discovered some new species, which are described herein. In addition, we found a species of *Badimia* which is identified with the supposedly extinct *B. tuckermanii,* and, based on the new material, the circumscription of that species is emended.

2. Description of the newly discovered and emended species

Badimia tuckermanii (R. Sant.) Lücking, Lumbsch & Elix *(Pilocarpaceae)* – Fig. 1A

Badimia tuckermanii was described from Cuba as *Lecidea palmicola* (nom. illeg.) by Tuckerman (1866: 277) and later also reported for Costa Rica (Santesson 1952). The species was only known from these two collections and believed to be extinct (Lücking 1995), before supposedly new gatherings were reported from New Caledonia (Lücking & al. 1994, Lücking & Kalb 2001). In the present material from "La Amistad", we found an unknown species of *Badimia* similar to *B. dimidiata* (Bab. ex Leight.) Vězda, differing from the latter by yellowish crystals in the excipulum and a slightly different chemistry (HPLC: usnic acid, zeorin, 3-O-methylasemone).

A comparison with the material from New Caledonia and the two existing collections of *B. tuckermanii* demonstrated that two taxa were involved: the new Costa Rican material corresponds indeed to *B. tuckermanii,* while the disparate populations from New Caledonia differ by their smooth thalli and the lack of 3-O-methylasemone, a substance otherwise only known from *B. montoyana* Lücking (Lücking & al. 1994).

The New Caledonian taxon was therefore described as *B. elixii* Lücking & Kalb (2001), while *B. tuckermanii* s.str. must be emended as follows: thallus pale bluish grey, almost smooth to sparsely and irregularly verrucose; 3-O-methylasemone present; apothecia with yellowish to orange-yellow disc and yellowish crystals in the excipulum; distribution neotropical (Costa Rica, Cuba).

Selected specimens examined. – Costa Rica: Puntarenas: "La Amistad" International Park, Pittier Station, 9°01'N, 82°56'W, 1996, *Schubert 329* (herb. Schubert), *337* (herb. Lücking), *340* (USJ), *351* (CR), *358* (CR), *361* (ULM), *364* (USJ).

Byssoloma carneum Schubert, Greber & Lücking, **sp. nova** *(Pilocarpaceae)* – Fig. 1B, 2A

Holotype: Costa Rica, Puntarenas, "La Amistad" International Park, Las Alturas Station, 8°57'N, 82°50'W, *Greber 98* (CR; isotypes: ULM, herb. Greber).

Sicut *Byssoloma annuo* sed thallo farinoso et marginibus apotheciorum byssaceis differt.

Thallus epiphyllous, crustose, dispersed, pale greenish to bluish grey, minutely farinose, up to 5 mm across and 5-10 µm thick. *Photobiont* a species of *Trebouxia*, cells solitary, globose, 3.5-5 µm diam. *Apothecia* 0.25-0.3 mm diam., rounded, slightly constricted basally. *Disc* pale yellowish brown, sometimes with a slight greenish tinge, flat or slightly concave. *Margin* distinct, 20-30 µm thick, pale chamois-coloured to white. *Excipulum* well-developed, laterally distinctly byssoid but not spreading over the thallus, inner parts more compact and encrusted with colourless crystals. *Paraphyses* branched and anastomosing, 1-1.5 µm thick. *Asci* broadly clavate, 25-29 × 10-14 µm. *Ascospores* 8 per ascus, oblong-ellipsoid to fusiform, 3-septate, 10-14 × 2.5-3.5 µm. *Pycnidia* not observed.

Notes. – *Byssoloma carneum* differs from other species of *Byssoloma* by the combination of bluish, farinose thallus, pale yellowish brown apothecia, well-developed, laterally byssoid margin and crystalline excipulum. Similarly coloured apothecia are known from *B. minutissimum* Kalb & Vězda (Kalb & Vězda 1990) and *B. annuum* (Vain.) Thor & al. (Thor & al. 2000). The former has a thallus without bluish tinge and its apothecial margin is strongly reduced, while *B. annuum* has a smooth thallus and a compact apothecial margin. *B. carneum* is most closely related to the paleotropical *B. confusum* Farkas & Vězda (Farkas & Vězda 1993), which clearly differs, however, by its blackish brown apothecial discs.

Additional specimens examined. – Costa Rica: San José, "Chirripó" National Park, 2.1992, *Lücking 92-337* (herb. Lücking); Puntarenas, "La Amistad" International Park, Pittier Station, 9°01'N, 82°56'W, *Schubert 369* (herb. Schubert), *371* (CR).

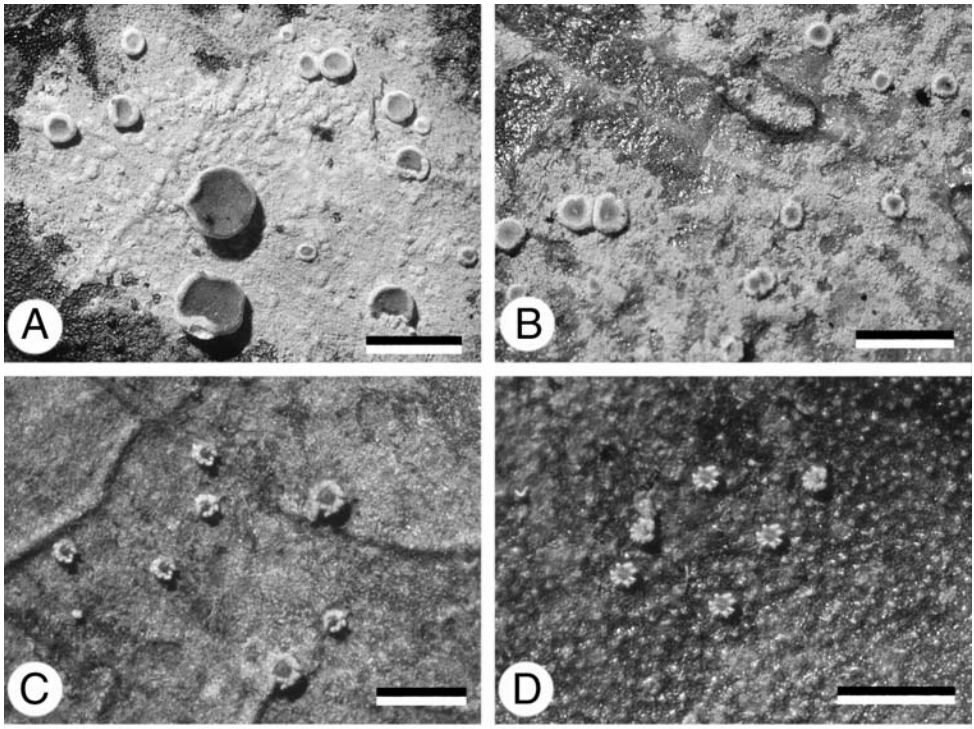

Fig. 1. A: *Badimia tuckermanii,* thallus with apothecia; B: *Byssoloma carneum,* thallus with apothecia; C: *Porina flavopapillata,* thallus with perithecia; D: *Trichothelium chlorinum,* thallus with perithecia. – Scale = 1 mm.

Fellhanera tubulifera Schubert & Lücking, **sp. nova** *(Pilocarpaceae)* – Fig. 2B
Holotype: Costa Rica, Puntarenas, "La Amistad" International Park, Pittier Station, 9°01'N, 82°56'W, *Schubert 234* (CR; isotypes: ULM, herb. Schubert).

Sicut *Fellhanera fuscatula* sed ascosporis longioribus et pycnidiis tubuliformibus differt.

Thallus epiphyllous, thin, farinose-granulose, pale greenish to greyish green, 5-15(-25) mm across, c. 15-20 µm thick. *Photobiont* a species of *Trebouxia,* cells globose, 6-9 µm diam. *Apothecia* 0.15-0.3 mm diam., rounded, constricted basally. *Disc* brown, slightly convex; margin at first distinct, later evanescent, pale brown to chamois-coloured. *Excipulum* paraplectenchymatous, 30-35 µm thick. *Hypothecium* dark brown, 40-50 µm high. *Apothecial* base blackish brown. *Hymenium* colourless, 55-70 µm high. *Paraphyses* slightly branched and anastomosing, 0.7-1 µm thick. *Asci* clavate, 40-55 × 12-16 µm. *Ascospores* 8 per ascus, 7-septate, bacillar, 25-35 × 4-5 µm. *Pycnidia* frequent, applanately tubuliform, slightly broadened basally, straight or slightly bent, 0.5-0.9 mm long and 45-60 µm diam., pale greyish brown but apically darker and with bluish tinge. *Conidial* mass brownish. *Conidia* non-septate, fusiform to narrowly pyriform, 5-8 × 1-2 µm.

Notes. – This new species of *Fellhanera* resembles typical members of the genus, in particular *F. rhapidophylli* (Rehm) Vězda, *F. subfuscatula* Lücking and *F. fuscatula* (Müll. Arg.) Vězda. The latter also has 7-septate though shorter ascospores. However, *F. tubulifera* deviates from all other species of the genus (Lücking 1997) by its peculiar pycnidia, which somewhat resemble campylidia (Vězda 1986), but differ by their radiately as opposed to bilaterally symmetrical ana-

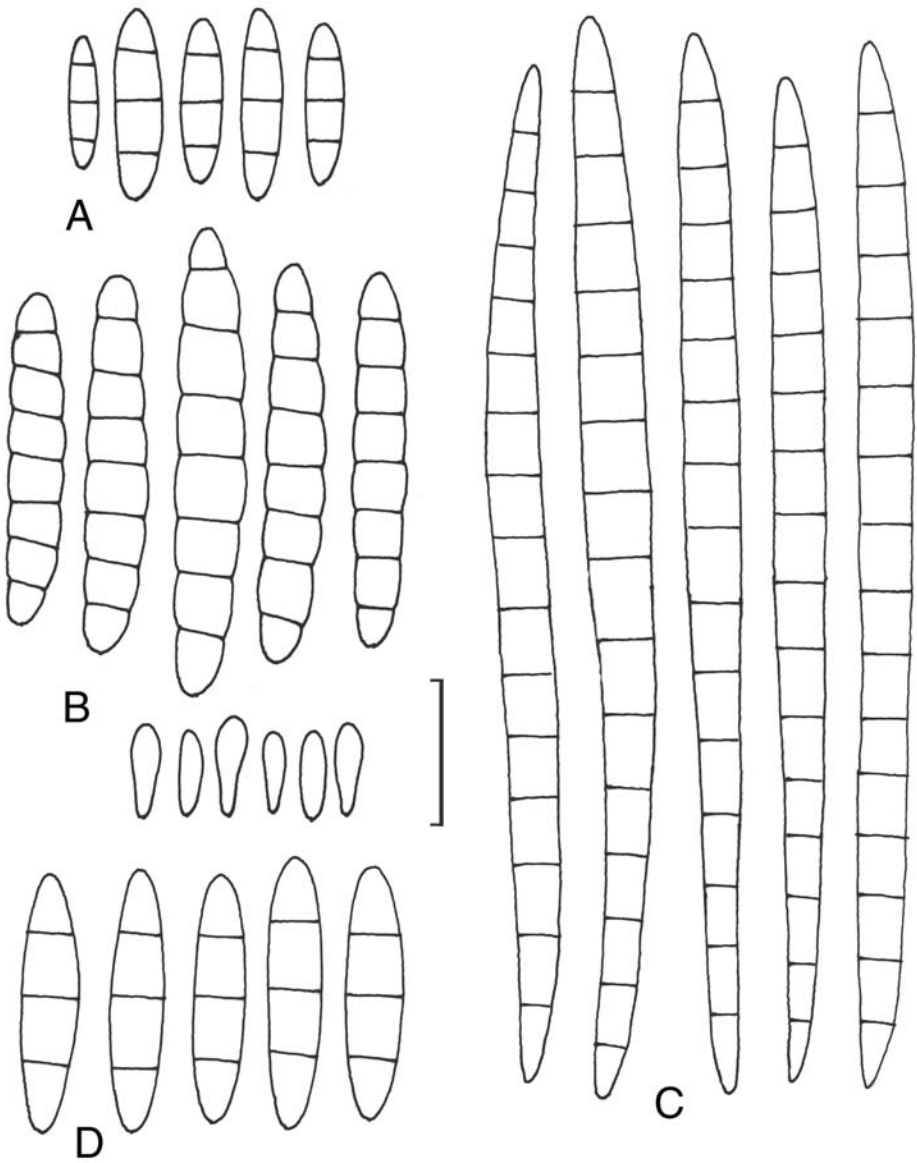

Fig. 2. A: *Byssoloma carneum*, ascospores; B: *Fellhanera tubulifera*, ascospores and conidia; C: *Porina flavopapillata*, ascospores; D: *Trichothelium chlorinum*, ascospores. – Scale = 10 µm.

tomy. The proposed relationship of certain genera producing genuine campylidia but with *Fellhanera* type apothecia (such as *Barubria, Badimiella* and *Pseudocalopadia*) with *Fellhanera* (Lücking 1999) seems to be confirmed by this new, morphologically transitional species, especially since campylidia are believed to be derived from pycnidia (Sérusiaux 1986). *F. tubulifera* is not to be confused with *Barubria fuscorubra* (Vězda) Vězda, whose bluish campylidia differ clearly in their structure.

Additional specimen examined. – Costa Rica: Puntarenas, "La Amistad" International Park, Pittier Station, 9°01'N, 82°56'W, *Schubert 350* (herb. Lücking).

Porina flavopapillata Schubert & Lücking, **sp. nova** *(Trichotheliaceae)* – Fig. 1C, 2C
Holotype: Costa Rica, Puntarenas, "La Amistad" International Park, Pittier Station, 9°01'N, 82°56'W, *Schubert 355* (CR; Isotype ULM).

Sicut *Porina rubescente* sed appendicibus peritheciorum lobuliformibus et ascosporis 15-septatis differt.

Thallus epiphyllous, rarely marginally hypophyllous, crustose, dispersed into irregular patches, smooth, greenish and slightly nitidous, 5-25 mm across, c. 3-5 µm thick. *Photobiont* a species of *Phycopeltis*, cells angular-rounded, 7-10 × 3-5 µm, in irregular, continuous plates. *Perithecia* subglobose, 0.2-0.3 mm diam., reddish brown, around the ostiolum with a crown of 8-14 short (c. 30 µm long), yellowish to pale reddish brown lobuli. *Involucrellum* orange-brown, 25-30 µm thick, K+ reddish brown; excipulum yellowish, 10-15 µm thick, K+ weakly brownish orange. *Paraphyses* unbranched, 1-1.5 µm thick. *Asci* narrowly obclavate, 90-115 × 15-20 µm. *Ascospores* 8 per ascus, 15-septate, narrowly fusiform to almost cylindrical, partly slightly tapering, 70-80 × 3.5-4.5(-6) µm. *Pycnidia* not observed.

Notes. – The characteristics of this new species are the reddish brown, subglobose perithecia with yellowish to reddish lobuli, and the long, 15-septate ascospores. *Porina papillifera* (Stirt.) F. Schill. has similar perithecia, but their surface features scattered whitish papillae; in addition, the involucrellum is reduced, the excipulum is brownish and K-, and the ascospores are shorter (40-60 µm) and 9-13-septate (Santesson 1952). Within the *P. rufula* group (Hafellner & Kalb 1995), the most similar species is *P. ornata* Vězda (Vězda 1973), but in that species the perithecia are larger, the ascospores are different and there is an algal layer between involucrellum and excipulum. Other externally similar species are *P. triseptata* (Vězda) Lücking and *P. rubescens* (Lücking) Hafellner & Kalb (Lücking 1998), which differ by their whitish, elongate setae and shorter, 3- and 7-septate ascospores, respectively.

Additional specimens examined. – Costa Rica: Heredia, "La Selva" Biological Station, 9.1991, *Lücking 91-5522*, *91-5555* (herb. Lücking); Limón, "Hitoy Cerere" Biological Reserve, 3.1991, *Lücking 91-4697* (herb. Lücking); Puntarenas, "La Amistad" International Park, Pittier Station, 9°01'N, 82°56'W, *Schubert 285* (herb. Schubert), *317* (CR), *324* (USJ), *327* (ULM), *342* (herb. Lücking).

Trichothelium chlorinum Schubert & Lücking, **sp. nova** *(Trichotheliaceae)* – Fig. 1D, 2D
Holotype: Costa Rica, Puntarenas, "La Amistad" International Park, Pittier Station, 9°01'N, 82°56'W, *Schubert 373* (CR).

Sicut *Trichothelio albo* sed peritheciis viridibus appendicibus lobuliformibus instructis differt.

Thallus epiphyllous, crustose, thin, c. 3-20 mm across, formed by dispersed to confluent, c. 0.1-0.5 mm large patches, c. 9-12 µm thick, smooth, greyish green, slightly nitidous. *Photobiont* a species of *Phycopeltis*, cells angular-rounded, 7-10 × 3.5-6 µm, in irregular plates. *Perithecia* subglobose, 0.13-0.2 mm diam., with setae 0.2-0.25 mm, greenish, around the ostiolum with up 7-10 slightly recurved, whitish, up to 90 µm long and 30 µm broad, squamiform and relatively soft setae. Involucrellum and excipulum not well differentiated, colourless, externally covered by an algal layer which gives the perithecia the greenish colour, K-, 25-30 µm thick. *Paraphyses* unbranched, 1-1.5 µm thick. *Asci* cylindrical to narrowly obclavate, 40-50 × 5-10 µm. *Ascospores* 8 per ascus, 3-septate, narrowly fusiform, 18-22 × 3.5-4 µm. *Pycnidia* not observed.

Notes. – *Trichothelium chlorinum* is easily overlooked due to its minute perithecia. The greenish perithecia are, however, unique among the foliicolous species of *Trichothelium* and *Porina*. The

new species is perhaps most closely related to *Trichothelium album,* which differs by its completely whitish perithecia with acute, stiff setae.

Additional specimens examined. – Costa Rica: Puntarenas, "La Amistad" International Park, Pittier Station, 9°01'N, 82°56'W, *Schubert 287* (USJ), *295* (ULM), *322* (herb. Schubert), *345* (ULM), *349* (CR), *361* (herb. Lücking), *373* (CR).

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