

Porina pilifera (Porinaceae), a new foliicolous lichen from Costa Rica (Central America)

Gerhard NEUWIRTH and Kristian PFALLER

Abstract: *Porina pilifera* Neuwirth sp. nov. is described from Costa Rica. It is similar to *P. palmicola*, but differs in having smaller ascospores $27\text{--}36 \times 3\text{--}4 \mu\text{m}$. *Porina pilifera* is only known from the type locality in tropical Central America, where it grows on the leaves of palm trees.

Key words: lichens, lowland rain forest, new species, *Porina*

Introduction

Porina is well known as the genus with the highest diversity of foliicolous species in Costa Rica (Lücking 1992). The *Porina epiphylla* group (Santesson 1952; Hafellner & Kalb 1995; Harris 1995) comprises a large number of foliicolous, corticolous and saxicolous lichens, characterized by their perithecial and thallus anatomy (Lücking & Vězda 1998).

Only a few papers on the lichen flora of La Gamba and the adjacent Esquinas rainforest in Costa Rica have been published (Breuss 2000, 2001, 2004), but lichen collections from the nearby regions of the Osa peninsula and Corcovado National Park have been cited in several papers, for example Elix, Lumbsch & Lücking (1995), Lücking (1995), Lücking & Serusiaux (1996), Matzer (1996) and Komposch (2005).

During a visit to the tropical station at La Gamba in the south of Costa Rica in August 2004, the first author had the opportunity to collect foliicolous lichens as part of a current biodiversity project. A new foliicolous

species belonging to the *Porina epiphylla* group was collected and is described below.

Material and Methods

Sections for chemical tests were mounted in KOH and examined at magnifications of $\times 10\text{--}100$ with a standard light microscope. Microscopic measurements were made at $\times 400$ magnification on sections mounted in water. For scanning electron microscopy the samples were air dried, mounted with double-sided adhesive tape containing carbon on an aluminium stub, sputtered with 10 nm Au/Pd (Med 020 Balzers Liechtenstein) and examined with a Fieldemission-Electron-Microscope (FESEM Gemini 986, Zeiss, Oberkochen, Germany).

The Species

Porina pilifera Neuwirth sp. nov.

Thallus epiphyllus, tenuis, continuus, cinereo-viridis, tomentosus, tomentum hyphis densis thallo concoloribus. Perithecia 0.2–0.3 mm diam., hemispherica vel subglobosa, thallo tenuiter tecta, paries externus $35 \mu\text{m}$ crassus, fuscus, KOH+ rubescens, paries internus prosoplectenchymaticus. Ascosporae 7-septatae, $27\text{--}36 \times 3\text{--}4 \mu\text{m}$, angustae oblongae vel fusiformae, hyalinae. Paraphyses simplices $75\text{--}90 \mu\text{m}$. Algae ad *Phycopeltis* sp. pertinent. A *Porina palmicola* Malcolm & Vězda ascosporis minoribus differt.

Typus: Central America, Costa Rica, Prov. Puntarenas, La Gamba, Esquinas rain forest, near a waterfall on palm leaves, 70 m alt., 2 August 2004, G. Neuwirth 7036 (CR—holotypus; WU—isotypus); 7046, 7469 (hb. G. Neuwirth—paratypi).

(Figs 1–3)

G. Neuwirth: Rabenberg 41, A-4910 Ried im Innkreis, Austria.

K. Pfaller: Department of Anatomy, Histology and Embryology, Division Histology and Embryology, University of Innsbruck, Müllerstr. 59, A-6010 Innsbruck, Austria.

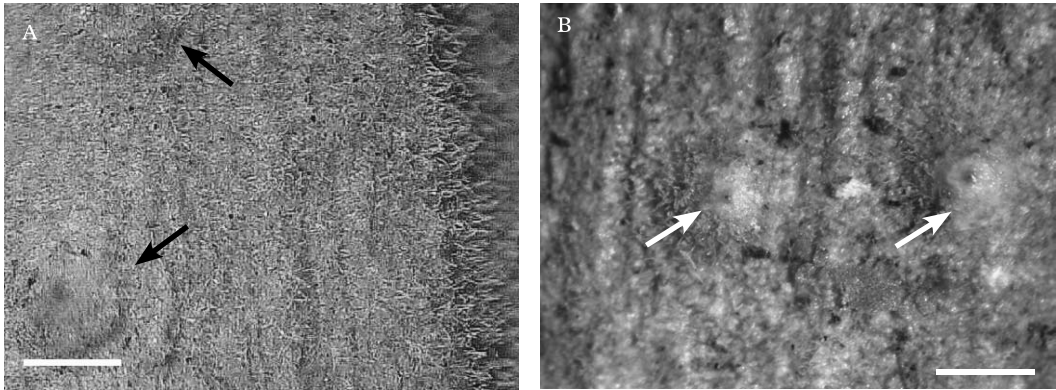


FIG. 1. *Porina pilifera*. A, thallus with tomentum and two perithecia; B, perithecium with brown spot and ostiolum: Scales: A=0.2 mm, B=0.4 mm.

Thallus greenish-grey, thin, foliicolous, adhering slightly to the upper surface of the leaf, continuous, margin bright, no visible prothallus, irregularly shaped, up to 4 cm diam.; thallus and perithecia completely covered with a dense tomentum of hairs 0.1–0.2 mm (–0.5 mm) long formed by thallus hyphae originating from the hyphal network growing on the surface of the photobiont. *Photobiont* a *Phycopeltis* sp., irregular, netlike and correlating with the thallus structure; perithecia covered by a thalline layer.

Perithecium 0.2–0.4 mm diam., subglobose when young, hemispherical at maturity, covered by a thalline layer, tomentose, K+ red-brown, single, ostiolum with dark brown spot and light brown margin, mature perithecia applanate at ostiolum. In section the perithecial wall consists of two

parts: the outer wall covered by a thalline layer, and a yellow-orange, K+ red inner wall (called “*Porina* yellow” by Hafellner & Kalb 1995). A distinct layer of calcium oxalate crystals, 10–15 µm thick, is visible between the outer wall and the algal cells (“*crystallostratum*” Hafellner & Kalb 1995); the inner perithecial wall contains proso-plectenchymatous cell structures. *Asci* and *paraphyses* of the ascohymenial fungus develop along with the growth of the perithecium, the gelatinous substance is part of the perithecial nucleus. *Paraphyses* unbranched, 75–90 µm long. *Ascospores* 8 per ascus, oblong to narrowly fusiform, some needle-shaped, hyaline, 27–(30)–36 × 3–4 µm; 3–5 septate when young, 7-septate at maturity.

Notes. The new species is an addition to the *Porina epiphylla* group showing some features of thallus structure and spore septation resembling *Porina palmicola*, but differing by having longer hairs on the thallus (0.1–0.3 mm) and on the base of the perithecia (bristle hyphae, up to 0.5 mm) developing into a dense tomentum and by the smaller ascospores. The length of hairs is, however, difficult to compare, because no measurements are cited in the literature, but single hairs seem to be longer than those of *P. palmicola* (0.020–0.025 mm, measured

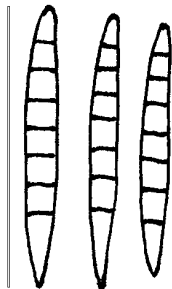


FIG. 2. *Porina pilifera*, ascospores. Scale=36 µm.

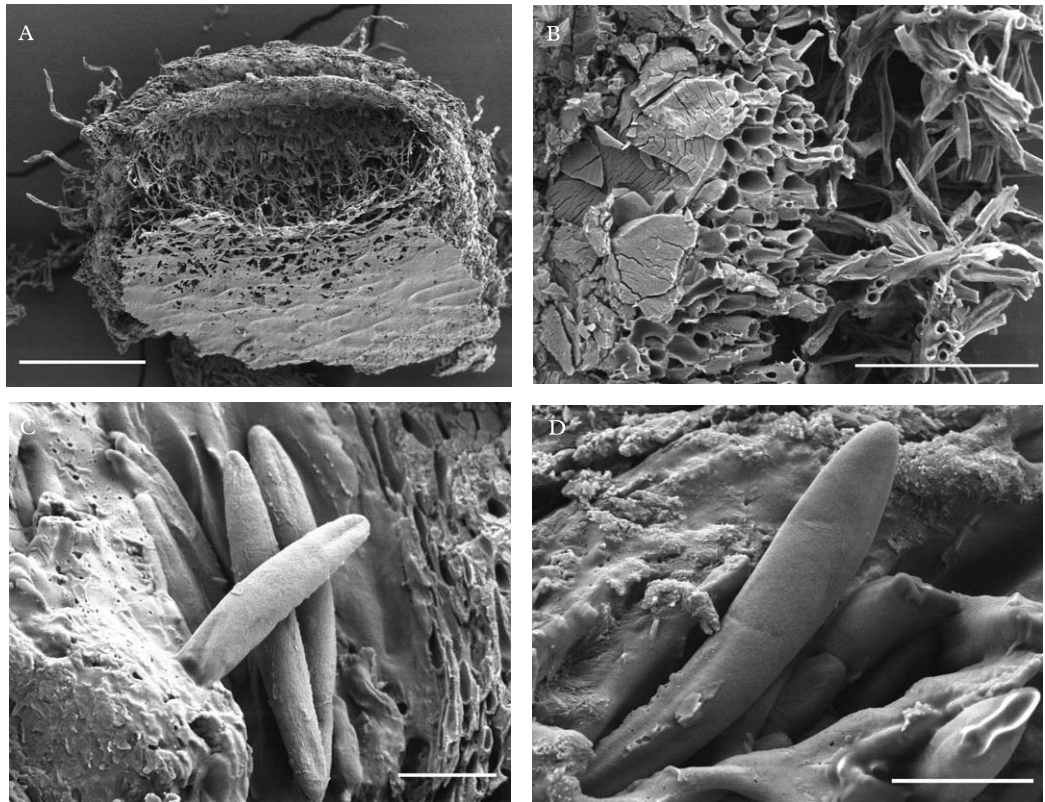


FIG. 3. SEM images of *Porina pilifera*. A, section of perithecium with bristle hyphae and involucrellum; B, section of perithecial wall with crystallostratum, prosoplectenchyma and hyphae; C, ascospores; D, single ascospore. Scales: A=100 μ m; B & C=20 μ m; D=10 μ m.

from the illustration in Vězda 2000). Kalb & Vězda (1988) describe similar, but even longer hairs on *Mazosia pilosa* with lengths of 0.8–1.0 mm and 5–6 μ m wide at the base. The ascospores of *P. pilifera* are 27–36 \times 3–4 μ m compared with 35–45 \times 3–4 μ m for *P. palmicola* (Vězda 2000). The new species also differs in its distribution (see below) from the Australasian species *P. palmicola*.

Bristle hyphae. Many of the bristle hyphae seem to change their morphological appearance during preparation. The original needle-shaped fungal hyphae assume spoon-like aspects with typical contractions. A possible explanation could be the previous treatment during preparation for electron microscopy in which specimens are exposed

to a high vacuum resulting in extreme dehydration of cells.

Porina virescens differs from *P. pilifera* in having a yellowish grey thallus and larger perithecia (0.35–)0.5–0.8 mm diam., larger 7-septate (“*virescens*” form) or irregularly (7–)8–10(–15)-septate (“*multiseptata*” form) ascospores, 41–75 \times 4–7 μ m (Santesson 1952; Lücking 1998). Other species of the *P. epiphylla* group do not develop a tomentum.

Distribution and habitat. The type locality is situated in the tropical area surrounding the village of La Gamba (Prov. Puntarenas) near a waterfall (holotypus) and in the Esquinas rain forest on a trail to the valley of Rio Bonito (paratypi).

The Esquinas rain forest (part of the Piedras Blancas National Park and called "Regenwald der Österreicher") is part of a protected area in southern Costa Rica. The forest covers 148 km² and consists mainly of narrow ridges and steep slopes covered with primary forest (Weissenhofer & Huber 2001). *Porina pilifera* was collected from the leaves of unidentified palms forming part of the understorey vegetation. The abundant palm genera in this type of vegetation are *Bactris*, *Welfia* and *Chamaedorea*, etc. and the understorey is dominated by small palms, such as *Asterogyne*, *Geonoma* (*Arecaceae*) up to 5 m (Weissenhofer 1997). *Porina pilifera* probably prefers the leaves of palm trees in tropical, perhumid lowland forests.

We thank Univ. Doz. Dr Othmar Breuss (Vienna) for correcting the manuscript, recommending references and many useful discussions. We are also grateful to Dr Robert Lücking (Chicago) for checking the attributes of *Porina pilifera* and for ratifying the new species. The first author is grateful for the invitation by the tropical station La Gamba (Dr W. Huber & Dr A. Weissenhofer, University of Vienna) to take part in the current project of biodiversity approved by MINAE and to research the lichen flora of Costa Rica.

REFERENCES

- Baumgartner, Th., González, J., Grayum, M., Estrada, A., Hammel, B., Huber, W., Jiménez, Q., Kastinger, C., Malzer, O., Morales, F., Pamperl, S., Rodríguez, A., Sánchez, J., Schembera, E., Till, W., Weber, A., Weissenhofer, A., Will, S., Zamora, N. & Zimmermann, G. (2001). An introductory field guide to the flowering plants of the Golfo Dulce Rain Forests Costa Rica. Corcovado National Park and Piedras Blancas National Park ("Regenwald der Österreicher"). *Biologiezentrum des Oberösterreichischen Landesmuseums. Staffia* **78**: 1–462.
- Breuss, O. (2000) Flechten aus Costa Rica. I. Regenwald der Österreicher (Bosque Esquinas). *Linzer biologische Beiträge* **32**: 1043–1051.
- Breuss, O. (2001) Flechten aus Costa Rica II. *Linzer biologische Beiträge* **33**: 1025–1034.
- Breuss, O. (2004) Flechten aus Costa Rica III. *Linzer biologische Beiträge* **36**: 77–80.
- Elix, J. A., Lumbsch, H. T. & Lücking, R. (1995) The chemistry of foliicolous lichens 2. Constituents of some *Byssoloma* and *Sporopodium* species. *Bibliotheca Lichenologica* **58**: 81–96.
- Hafellner, J. & Kalb, K. (1995) Studies in *Trichotheliales* ordo novus. *Bibliotheca Lichenologica* **57**: 161–186.
- Harris, R. C. (1995) *More Florida Lichens*. New York.
- Kalb, K. & Vězda, A. (1988) Die Flechtengattung *Mazosia* in der Neotropis (eine taxonomisch-phytogeographische Studie). *Folia Geobotanica et Phytotaxonomica* **23**: 199–210.
- Komposch, H. (2005) *Anisomeridium flavovulcanus*, a new corticolous lichen from Costa Rica. *Lichenologist* **37**: 519–526.
- Lücking, R. (1992) Foliicolous lichens. A contribution to the knowledge of the lichen flora of Costa Rica, Central America. *Nova Hedwigia* **104**: 56–69.
- Lücking, R. (1995) Additions and corrections to the foliicolous lichen flora of Costa Rica. The family *Arthoniaceae*, with notes on the genus *Stirtonia*. *Lichenologist* **27**: 127–153.
- Lücking, R. & Sérusiaux, E. (1996) *Musaespora kalbii* (lichenized Ascomycetes: *Melamommatales*), a new foliicolous lichen with a pantropical distribution. *Nordic Journal of Botany* **16**: 661–667.
- Lücking, R. & Vězda, A. (1998) Taxonomic studies in foliicolous species of the genus *Porina* (lichenized *Ascomycotina*: *Trichotheliaceae*)—II. The *Porina epiphylla* group. *Wildenowia* **28**: 181–225.
- Matzer, M. (1996) Lichenicolous Ascomycetes with fissitunicate asci on foliicolous lichens. *CAB Mycological Papers* **171**: 1–202.
- Santesson, R. (1952) Foliicolous lichens I. A revision of the taxonomy of the obligately foliicolous, lichenized fungi. *Symbolae Botanicae Upsalienses* **XII**: 1.
- Vězda, A. (2000) Lichenes rariores exsiccati, *Fasciculum* **41**: no. 402, p. 3; Fig. 2.
- Weissenhofer A. (1997) Untersuchungen zur Ökologie und Struktur im "Regenwald der Österreicher" in Costa Rica (Fortsetzung des Beitrages von Mag. Werner Huber, *Carinthia* II, Nr.: 186, S. 95–106).—*Carinthia* **II**, 187./107. Jahrgang: 67–80.

Accepted for publication 30 April 2006