



Rare lichen taxa from Costa Rica

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Abstract

The aim of this investigation is to document five remarkable lichen species which have been collected during several visits to Costa Rica by undertaking field trips to habitats of several vegetation zones. *Pertusaria amnicola* is new to the Neotropics and three species are new to Costa Rica (*Enterographa sipmanii*, *Pertusaria borealis*, *Pertusaria torulosa*).

Key words – lichenized ascomycota – Nearctica – Neotropics – new records

Introduction:

Central America forms a continuous land connection between two large continents, North America and South America, representing both a corridor for plants and fungi/lichens and also a barrier for marine organisms colonizing either the Caribbean (Gulf of Mexico) or the Pacific Ocean. Considering its position and varying climate, Costa Rica is especially rich in vegetation zones, e.g. savannahs, rivers and coastal lines with mangroves, tropical and dry forests, in-deciduous lowland forest, in-deciduous pre-montane forest, in-deciduous montane forests (1500-3000 m) and subalpine zone with high altitudes (3000 m and above the treeline), termed also as “paramo”. For this reason, Costa Rica, has been recognized as a country with an immense variety.

The impressive lichen diversity as a consequence of extremely variable landscape topography from coastal lowland rainforests up to pre-montane, montane regions and subalpine zones at very high elevations have resulted in many new plant and lichen discoveries in Costa Rica. As a result of numerous different biotopes present, Costa Rica as a “small country” (51.100 km²) has offered researchers the opportunity to study all kinds of lichen specimens of the various vegetation zones in relatively short distances.

The aim of the present paper is to report on a number of species which have been overlooked and rarely collected in the Neotropics (South America) and also Costa Rica (Central America), which has been included in the biogeographic realms (Rich & Rich 1983: Natural History of Costa Rica) of the Neotropica (South America) and Nearctica (considering the very high mountains and “Paramos”, colonized by plant elements of North America). In contrast to newly described species which may have high interest, species recorded for a second and third time are rarely mentioned in literature, although they could be of high significance for our fragmentary knowledge of the respective ecosystems they belong to.



Fig. 1 – Collecting sites in Costa Rica. The Costa Rica map was provided by www.weltkarte.com/PUBLIC Domain Datei.

After a revision of our herbaria, we recognized some taxa which after determination turned out to be very rare or even new to the Neotropica and Nearctica of Costa Rica. The objective of this report is the presentation of some rediscovered and remarkable lichen species as a contribution to the knowledge of the lichen species inventory from Costa Rica, initiated by Lücking (2006).

Material and Methods

The specimens were collected during several visits in Costa Rica in the years 2008 and 2010 by the authors and deposited in their private herbaria.

Sections for anatomical investigations were mounted and examined at magnifications of x10-100 with a standard light microscope. Chemical examinations were made by the usual spot tests, investigations of secondary metabolites were performed by HPLC by the second author. Photographs were taken by the first author using a Canon EOS 600D-camera connected to a LM-Scope camera adapter.

Results

Pertusaria borealis Erichsen 1938.

Fig. 2A–B

Type – USA. Alaska: Kodiak Island, an Rinden, Hulten 5062 (UPS, lectotype), 5063 (HBG, syntype). Not seen.

Description – Thallus ash-grey, thin, distinct black prothallus, UV-; Medulla white; Soralia appearing as delimited, capitate and solitary fruit bodies up to a 1.4 mm diameter in our specimen, crowded and often touching each other; no apothecia.

Chemistry – Protocetraric acid, medulla K+y turning red-brown, P+y persistent.

Substrate – on bark

Known distribution – restricted to the northern hemisphere (Dibben 1980). Asia: Russia; Europe: Austria, Scandinavia, Scotland, Spain; USA (Alaska, Viereck 8658 WIS; Port San Juan; Eyerdam 599 WIS) and Washington (Thomson 16205 WIS).

Locality – Prov. Cartago, Cordillera de Talamar, La Georgina E of Villa Mills. On bark of oak trees in a montane forest near Villa Mills, subalpine region, 2700 m; 27.01.2010; N 9°33'23"/ W 83°42'10", leg. et det. G. Neuwirth 11366.

New to the Nearctica of Costa Rica.



Fig. 2A – *Pertusaria borealis*, thallus with soralia up to 1.4 mm (Neuwirth 6682).

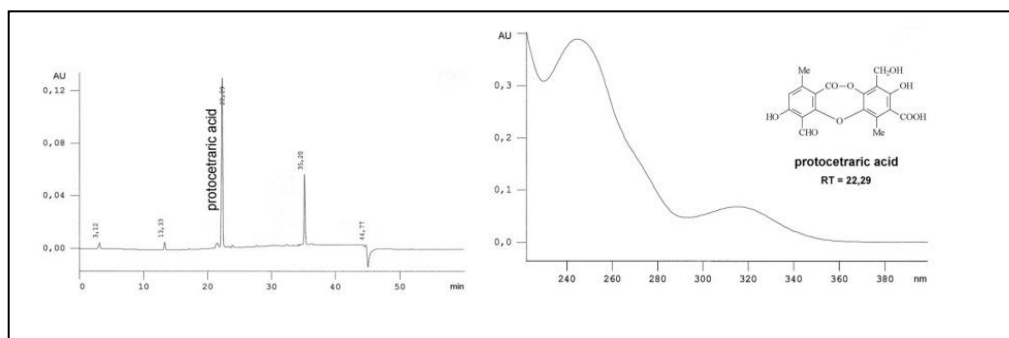


Fig. 2B – Chromatogram and UV-spectrum of protocetraric acid from *Pertusaria borealis*, obtained by HPLC analyses.

Pertusaria amnicola Elix & A.W. Archer 1997.

Fig. 3A-F

The specimen is characterized by the following features:

Description – Thallus grey-greenish, smooth; often with hyphae growing on the surface. Apothecia 0.6–1.2mm in diameter, disciform with distinct margins, prominent; E pithecium olive to brown, K+yellow; hymenium colorless, 120–180 μm , Hypothecium brown, 50–90 μm . Asci clavate, unitunicate, 150–180 μm ; upper parts and tholi J+ blue. Paraphyses simple; Ascospores 2(1)/ ascus; 75–93 x 30–35 μm .

Chemistry – spot tests: Cortex and medulla K+ yellow turning red, KC–, C–, P+ yellow, UV–. HPLC: Salazinic and consalazinic acid (depsidones; no depsides).

Substrate – on bark.

Locality – Punta Leona, Playa Blanca, 30.01. 2010; leg. E. Stocker-Wörgötter, det. J. Elix, G. Neuwirth. New to the Neotropics.

Known distribution – so far only known from Lord Howe Island in Australia (type locality, H. Streimann 56035, CANB).



Fig. 3A – *Pertusaria amnicola*, thallus with hyphae growing from the surface (Stocker-Wörgötter 3872). Total width of photo 4.2 mm.



Fig. 3B – *Pertusaria amnicola*, thallus surface and apothecia 1.3-1.5 mm in diameter (Stocker-Wörgötter 3872).

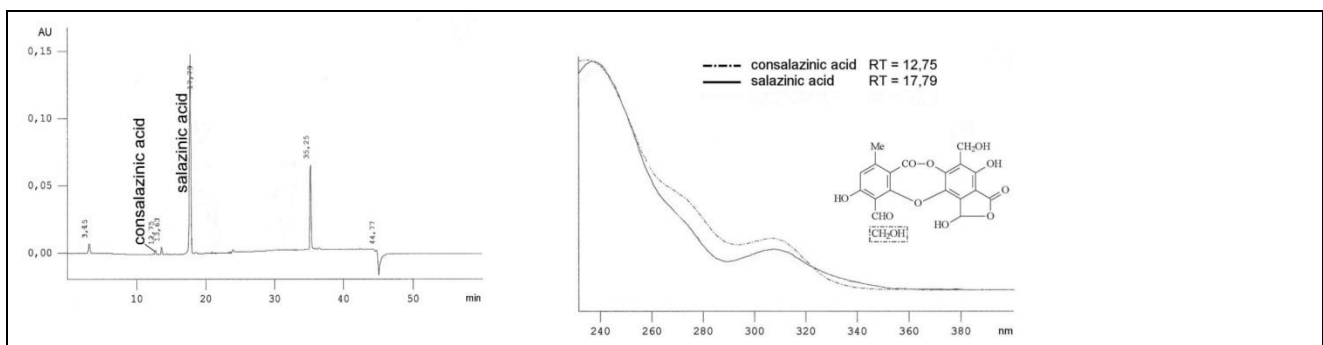


Fig. 3C – Chromatogram and UV-spectra of salazinic and consalazinic acids of *Pertusaria amnicola*, obtained by HPLC analyses.

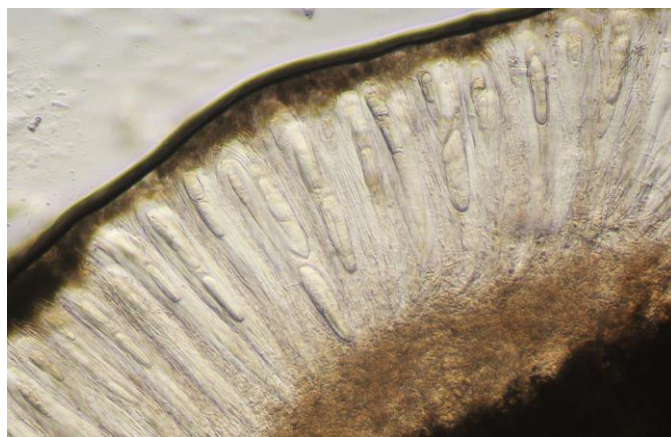


Fig. 3D – *Pertusaria amnicola*, Hymenium 160-175 μm (hyaline), Hypothecium (brown) 60-85 μm , asci up to 150 μm .

***Pertusaria torulosa* Vain. 1915**

Fig. 4A

Very rare species. We could only find one citation in Zahlbruckner Cat. Lich. Universalis 5: p. 245: *Pertusaria torulosa* Vain. In Annal. Acad. Sc. Fennic. ser. A, vol. VI, no. 7, 1915, p. 31. Insulae Antillarae, corticola.

These specimens might be the first records since Vainio one hundred years ago. Loc.: Cerro de la Muerte, Barva Volcano.

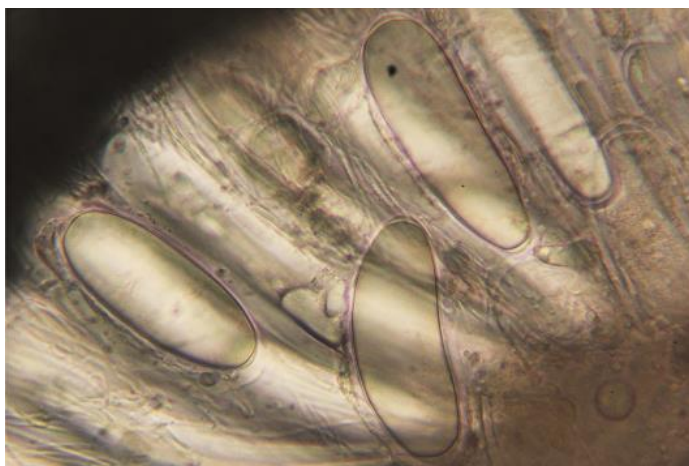


Fig. 3E – *Pertusaria amnicola*, ascospores 80-93 x 30-35 μm .



Fig. 4A – *Pertusaria torulosa*, soralia, section 10 mm wide.

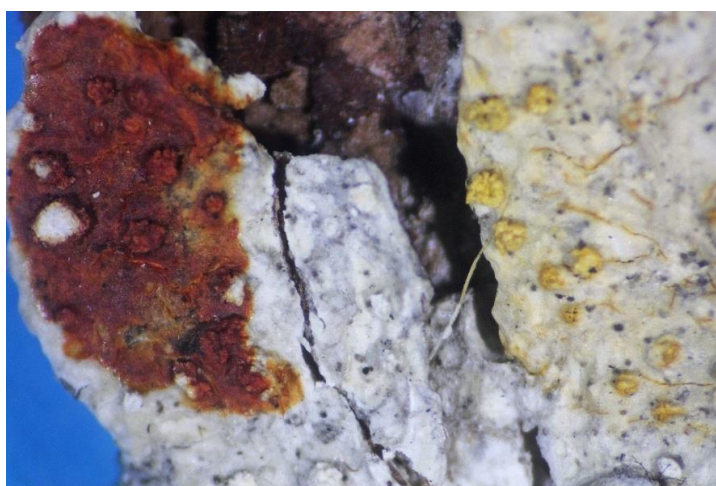


Fig. 4B – *Pertusaria torulosa*, spot tests: K+red, P+yellow, section 18 mm wide.

Description – Thallus grey, smooth, UV-, Soralia 0.8–1 mm (Fig. 4B).
Chemistry – Cortex and medulla K+ yellow, turning red, forming red needles; P+y (Fig. 4C); norstictic acid.

Distribution – West Indies (Vainio 1915) and Costa Rica.

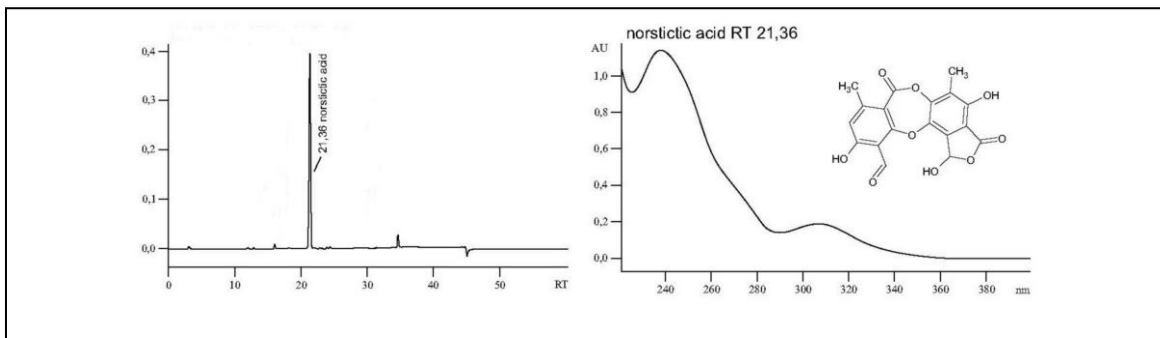


Fig. 4C – Chromatogram and UV-spectrum of norstictic acid of *Pertusaria torulosa*, obtained by HPLC analyses.

Enterographa sipmanii Sparrius 2004

Fig. 5

Third record world-wide.

Locality: Costa Rica, Punta Leon, Pacific coast, Playa Blanca; on shrubs; 30.01.2010; leg. E. Stocker-Wörgötter, det. L.B. Sparrius, G. Neuwirth.

Description – Thallus grey to whitish, UV–; with black, punctiform conidiomata spread all over the surface. Excipulum reddish (orange) brown, hymenium and hypothecium hyalin. Ascospores (5)–7–(9) μm .

Chemistry – spot tests negative.

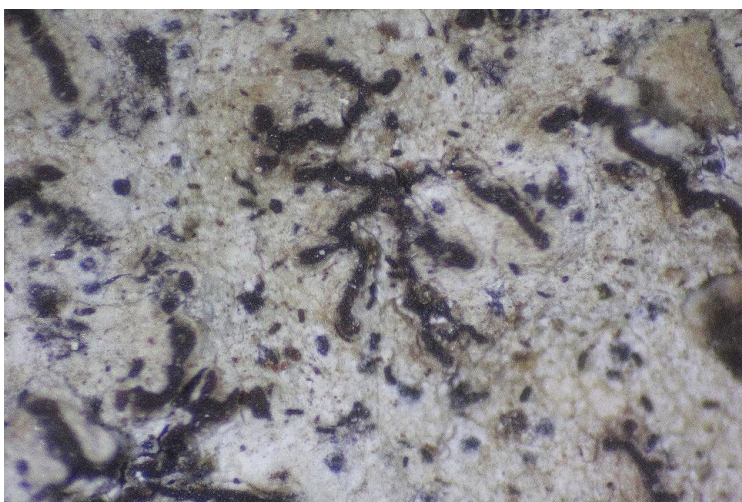


Fig. 5 – *Enterographa sipmanii*, habit. Lirellae 0.30-0.55 μm long, 0.10-0.15 μm wide. Conidiomata black, punctiform (E. Stocker-Wörgötter 1226).

Known Distribution – Typus: French Guiana, Iles du Salut, 10 km off the coast N of Kourou, Ile. Royale, on *Cocos* at the coast; N 5°17' / W 52°35', 5-50 m, 19.02.2033, Sipman 50651(B–holotypus, TLC).

Brazil, Pernambuco, Caruaru, Instituto Pernambucano de Pesquisas Agropecuárias (IPA), S 8°17' / W 35°58'. Caatinga (open thornbush), 500–600 m; Caceres & Lüking 00-0034b (F). (M.E. da Silva Cáceres 2007).

Porina pilifera Neuwirth 2006

Fig. 6

Three new habitats in Prov. Puntarenas, La Gamba, Esquinas rainforest, Fila-Trail, 104 m; N 08°41'55.8" / W 83°12'17.5"; 25.12.2008; Neuwirth 10119. Ibid.: 177 m, N 08°41'51.5" / W 83°12'29.7"; Neuwirth 10336, 10349; 25.12.2008. Ibid.: Waterfall-Trail, 164 m; N 08°41'43.3" / W 83°12'25.6"; 26.12.2008; Neuwirth 10236, 10244.



Fig. 6 – *Porina pilifera*, perithecia 0.3-0.4 mm in diameter (Neuwirth 10999b).

Prov. Alajuela, Llanura de los Guatusos near Los Chiles, gallery forest along Rio Frio; 35 m, 10.01.2010; Neuwirth 10999b. Second locality world-wide.

Description – Thallus covered with a dense tomentum of thin hairs formed by mycobiont hyphae.

Perithecia hemispherical to subglobose, 0.2–0.4 mm in diameter, hidden in the thalline tomentum and easy to overlook.

Known distribution – The species prefers the upper surface of palm leaves in the understory of lowland rainforests at the Pacific coast of southern Costa Rica (Neuwirth G, Pfaller K. 2006).

Type: Costa Rica, Prov. Puntarenas, La Gamba, Esquinas rainforest, near waterfall on palm leaves, 70 m alt., 2 August 2004, G. Neuwirth 7036 (CR-holotype), WU-isotype; G. Neuwirth-paratypes 7046, 7469.

Results and Discussion

The collection of *Pertusaria borealis* in Costa Rica is the southernmost of all cited localities in the world and exceptional considering the high elevation of 2700 m. The species predominantly occurs in the Boreal climatic zone in North America and Europe, except Spain (Mediterranean area) and seems to find comparable ecological conditions in montane regions to subalpine regions of the Nearctic of Costa Rica .

The distribution of *Pertusaria amnicola* is described as a rare corticolous, endemic lichen species from Lord Howe Island (Australia) and therefore the second record world-wide and new to the Neotropics. The combination of salazinic and consalazinic acids was confusing, but J. Elix and A.W. Archer confirmed the identification of the specimen.

Pertusaria torulosa is characterised by the small soralia and the occurrence of norstictic acid. This extremely rare species was cited only one time. So the rediscovery in two habitats in Costa Rica could be of importance for lichenology.

Enterographa sipmanii shows ascomata embedded in stellate clusters and differs from *E. quassiaecola* in the 7-septate ascospores, narrower conidia, J+ sky blue apothecium sections and the absence of K+ yellow and K+ green pigments in apothecia sections (Sparrius 2004).

The foliicolous species *Porina pilifera* was described as new to science by the first author in 2006. During a visit to the Esquinas Rainforest in the south of Costa Rica in 2010 the *Porina* species was collected again at three different localities in the same lowland rainforest living on palm

leaves near the type locality, but had not been published up to the present. An important, additional record represents the specimen from 2010, which documents the presence of *P. pilifera* at a second locality along the Rio Frio in northern Costa Rica, although the species was supposed to be endemic in the Bosque Esquinas (Neuwirth & Pfaller 2006).

Acknowledgements

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