

## *Protoparmelia capitata* (Ascomycota: Parmeliaceae): new record for South America

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### ABSTRACT

The sterile corticolous crustose lichen *Protoparmelia capitata* (Ascomycota: Parmeliaceae), recently described for southeastern North America, is reported as a new record for South America in the Serra da Jiboia mountain range, near the municipality of Santa Teresinha, in the state of Bahia, in northeastern Brazil. This species is locally common and is probably closely related to *P. isidiata*, which has the same pigmentation and medullary chemistry, *P. capitata* differing from *P. isidiata* in that the former features soredia rather than isidia.

**Key words:** Alectoronic acid, sorediate species, new record, Serra da Jiboia, Santa Teresinha, Bahia, northeastern Brazil, *caatinga*, Atlantic Forest

## Introduction

*Protoparmelia* is the main crustose genus in the family Parmeliaceae, which encompasses numerous foliose and fruticose genera and species. The name of the genus suggests that it is the ancestor of the family, and phylogenetically it is indeed a sister clade to the remainder of the genera now classified in the Parmeliaceae (Arup *et al.* 2007; Papong *et al.* 2011). It has the characteristic cupular exciple, a synapomorphic character common to all Parmeliaceae (Henssen 1995), and a character absent from a similar family, Lecanoraceae. Many *Protoparmelia* species share a unique character that is often overlooked: the presence of multiple cilia on the exterior surfaces of their ascospores (Brodo & Aptroot 2005). In addition, *Protoparmelia* species closely resemble *Lecanora* (the type genus of Lecanoraceae), except that all *Protoparmelia* species have a brown pigment in the cortex, much as in another Parmeliaceae genus, *Neofuscelia*.

With the recent inclusion of the polysporous species that were formerly classified in the genus *Maronina* (Papong *et al.* 2011), the genus *Protoparmelia* now comprises approximately 30 species (Kalb 1984; Poelt & Leuckert 1991; Poelt & Grube 1992; Ryan *et al.* 2004; Aptroot *et al.* 1997; Brodo & Aptroot 2005; Cáceres 2007; Boom *et al.* 2007; Elix 2007; Lendemer & Lumbsch 2008; Papong *et al.* 2011) and occurs all over the world. Although most *Protoparmelia* species are saxicolous, a few are corticolous. In the tropics, one species, *P. isidiata* Diederich, Aptroot

& Sérus., is widespread and often locally common. It was described for Papua New Guinea (Aptroot *et al.* 1997) where it occurs with the related *P. pulchra* Diederich, Aptroot & Sérus., with which it clearly forms a species pair. *Protoparmelia isidiata* was subsequently reported for Brazil (Aptroot 2002), Australia (Elix 2007) and North America (Lendemer & Lumbsch 2008) and it is locally common, for instance, in Costa Rica (unpublished, *e.g.*, specimens Aptroot 60835, 60836, 60840 in the Herbarium of the National Biodiversity Institute, in Heredia, Costa Rica [code, INB] and the Herbarium of the Advice bureau for Bryology and Lichenology, in Soest, the Netherlands [code, ABL]). Recently, a third species with identical medullary chemistry (alectoronic acid) was described in the same species complex, *viz.* the sorediate *Protoparmelia capitata* Lendemer & Lumbsch recorded for North America (Lendemer & Lumbsch 2008).

The Serra da Jiboia mountain range of Brazil is in a transitional area between Atlantic Forest and *caatinga* (shrublands) vegetation, with a maximum elevation of 800 m. This fragment of Atlantic Forest is located within the municipality of Santa Terezinha, Bahia, NE Brazil, near the border with the municipality of Castro Alves, both municipalities being in the state of Bahia, in northeastern Brazil. This area can be considered a rain-forest enclave surrounded by *caatinga* and belongs to a disjunct set of mountains that extend from the southern coast of the state toward the north and northwest, stretching into the Baía de Todos os Santos region (Queiroz *et al.* 1996).

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During a recent floristic survey of corticolous crustose lichens in fragments of the Atlantic Forest and *caatinga* in the state of Bahia, a large number of (mostly crustose) lichen species were found, several of them apparently new to science. One of the surveyed fragments was the Serra da Jiboia, in Santa Teresinha. Here, *P. capitata* was found to be quite abundant. The species is easily identified by its brown pigmentation, the huge hemispherical soralia and the presence of alectoronic acid in the medulla, which glows bright green under UV light.

## Material and methods

Identification work was carried out in the Lichenology Laboratory of the Federal University of Sergipe, located in the city of Itabaiana, in the state of Sergipe, also in northeastern Brazil. Samples were examined with a stereomicroscope (EZ4; Leica Microsystems, Wetzlar, Germany) and a compound microscope (DM500; Leica Microsystems). Additional analyses were conducted at the Advice bureau for Bryology and Lichenology, in Soest, the Netherlands, also with a stereomicroscope (SZX7; Olympus America Inc., Center Valley, PA, USA) and a compound microscope (BX50; Olympus Optical, Tokyo, Japan) with interference contrast, connected to a digital camera (Coolpix; Nikon USA, Melville, NY, USA). The specimens analyzed during this study are preserved in the Herbarium of the Federal University of Sergipe Biosciences Department (code, ISE).

***Prototermelia capitata*** Lendemer & Lumbsch, Lichenologist 40: 332. 2008.

Thallus covering extensive areas of bark, crustose, ca. 0.1 mm thick, very pale brown, corticate, a bit glossy, divided into more or less rectangular areoles 0.2-0.3 mm in diameter, surrounded by a ca. 0.3 mm-wide dark brown prothallus line. Soralia covering most of the thallus, hemispherical, mostly 0.6-1.5 mm in diameter, initially of the same color as the thallus, but thereafter showing white medullae. Soredia granular, somewhat glossy, the same color as the thallus, characteristically present only on the sides of the soralia. Apothecia unknown from Brazil but known from North America (see description in Lendemer & Lumbsch 2008).

## Chemistry

Cortex with insoluble brown pigment. Medulla under UV+ (bright green), KC+ (pink), K-, P- and C-, with alectoronic acid (thin layer chromatography).

## Distribution

Known from North America (Alabama, Florida and Georgia; Lendemer & Lumbsch 2008) and now Brazil (Bahia). As far as is known at the moment, the three species of this species triplet have a different world distribution: *P. pulchra* is known only from Australasia; *P. capitata* is known from the American continent; and *P. isidiata* is pantropical.

## Discussion

This species is easily confused with those of the sorediate genus *Pertusaria* (Pertusariaceae), from which it differs by having somewhat glossy, brownish soredia and medullary alectoronic acid, which is easily detected under UV light. Sorediate *Pertusaria* species invariably contain other medullary substances (xanthenes, orcinol depsides, depsones,  $\beta$ -orcinol depsidones and depsides), which generally cause other reactions with spot tests or under UV light. The species that come closest in reaction are those with hypoprotocetraric acid, which also reacts strongly with UV light but glows white not green. This substance occurs in the common species *Pertusaria subventosa* Malme (Archer 1997), although that species often contains additional substances (which cause other reactions), such as lichexanthone (UV+ yellow). Other tropical corticolous crustose sorediate species (e.g., those in the genera *Amandinea*, *Haematomma*, *Lecanora*, *Malmidea*, *Megalospora*, *Myeloconis*, *Myriotrema*, *Ocellularia*, *Rinodina*) never contain alectoronic acid or other substances with similar reactions.

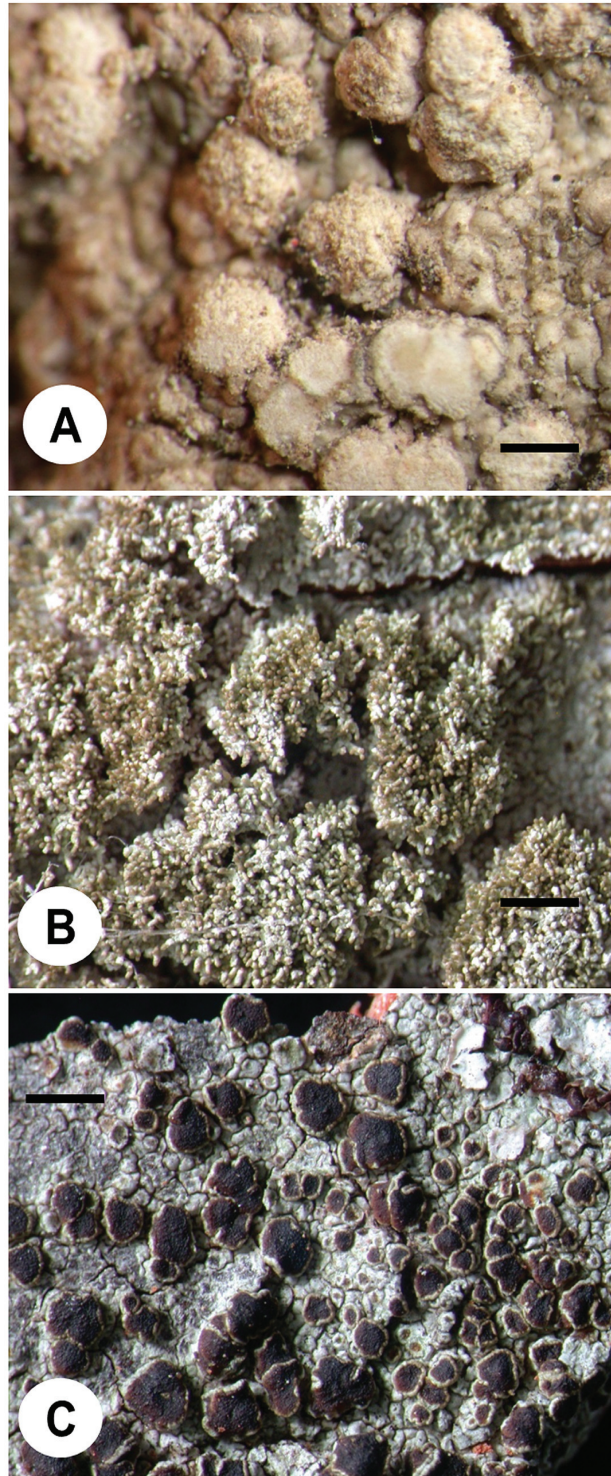
**Specimens observed – BRAZIL. Bahia, Santa Teresinha, Serra da Jiboia, on bark of tree, elevation ca. 700 m, 23 Sep 2010, M. Cáceres 7895, 7935, 7946, 7951 (all at ISE).**

Including the species newly reported here, five species of the genus *Prototermelia* are known from South America (Kalb 1984; Aptroot 2002; Cáceres 2007). They can be keyed out as follows:

### Key to *Prototermelia* species in South America

- 1a. Thallus with soredia or isidia; apothecia not known from South American specimens ..... 2
- 1b. Thallus without soredia or isidia, always with apothecia ..... 3
- 2a. Thallus with soredia. Brazil, corticolous ..... ***P. capitata*** Lendemer & Lumbsch (Fig. 1A)
- 2b. Thallus with isidia. Brazil and Costa Rica, corticolous ..... ***P. isidiata*** Diederich, Aptroot & Sérus. (Fig. 1B)
- 3a. Ascospores numbering ca. 50 per ascus. Brazil, Colombia and Costa Rica, corticolous .... ***P. multifera*** (Nyl.) Kantvilas, Papong & Lumbsch [syn. *Lecanora multifera* Nyl., *Maronea multifera* (Nyl.) Vain., *Maronina multifera* (Nyl.) Hafellner & R.W. Rogers] (Fig. 1C)
- 3b. Ascospores numbering 6-8 per ascus ..... 4

- 4a. Thallus fissured, on rock. Brazil, Chile, Argentina, saxicolous ..... *P. badia* (Hoffm.) Hafellner  
[syn. *Lichen badius* Hoffm., *Lecanora badia* (Hoffm.) Ach.]
- 4b. Thallus smooth, on bark and cactus spines. Paraguay, corticolous ..... *P. dadiola* (Müll. Arg.) Kalb  
[as “*badiola*”, syn. *Lecanora dadiola* Müll. Arg.]



**Figure 1.** A) *Protoparmelia capitata* (Brazil, M.Cáceres 7895, ISE). B) *Protoparmelia isidiata* (Brazil, A. Aptroot 13673, BOTU, ABL). C) *Protoparmelia multifera* (Brazil, A. Aptroot 13667, BOTU, ABL). Scale = 1 mm.



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