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## New lichen species from the Pantanal in Mato Grosso do Sul, Brazil

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**Abstract:** Four species of lichens are described as new from the Pantanal area in Mato Grosso do Sul (Brazil): *Physcia microphylla*, *Physciella neotropica*, *Strigula pyrenuloides* and *Thelopsis spinulosa*.

### Introduction

The Pantanal is a wetland biome in the interior of Brazil. It is known for its rich macrofauna. Botanically, it is relatively species poor, although the marshes have trees and shrubs throughout and there are occasional forested, even somewhat rocky hills. Lichens have received only scant attention so far, but the area is not very species rich (Canêz et al. 2020).

We visited the Pantanal several times and collected in different areas. Here we describe four new species, one of which is locally the most common macrolichen, which was found on places elsewhere in the state and in the bordering state of Mato Grosso as well.

### Material and methods

In 2018, 2019 and 2020, specimens were collected by the authors, using knife or hammer and chisel, examined by 10× hand lens (Leuchtlupe with UV) and air-dried. Specimens were often selected in the field as representative of a known species or a characteristic morphology; in addition, a selection of species that cannot be recognized in the field was collected. All specimens are preserved in herbarium CGMS, with some duplicates in ABL (mainly isotypes).

Specimens were observed with an Olympus SZX7 and pictures taken with Nikon Coolpix 995. Hand-made sections of ascomata and thallus were studied in water, 5% KOH (K) and/or Lugol's reagent (1% I<sub>2</sub>) after pre-treatment with KOH (IKI). Microscopic photographs were prepared using an Olympus BX50 with Nomarski interference contrast and Nikon Coolpix 995. Chemical spot reactions are abbreviated as K (5% KOH), C (commercial bleach), KC (K followed by C), P (paraphenylenediamine), and UV refers to fluorescence at 366 nm. Thin-layer chromatography (Orange et al. 2001) has been undertaken by A. Aptroot in solvent A.

### New species

*Physcia microphylla* Aptroot & M.F. Souza, sp. nov.

**Fig. 1**

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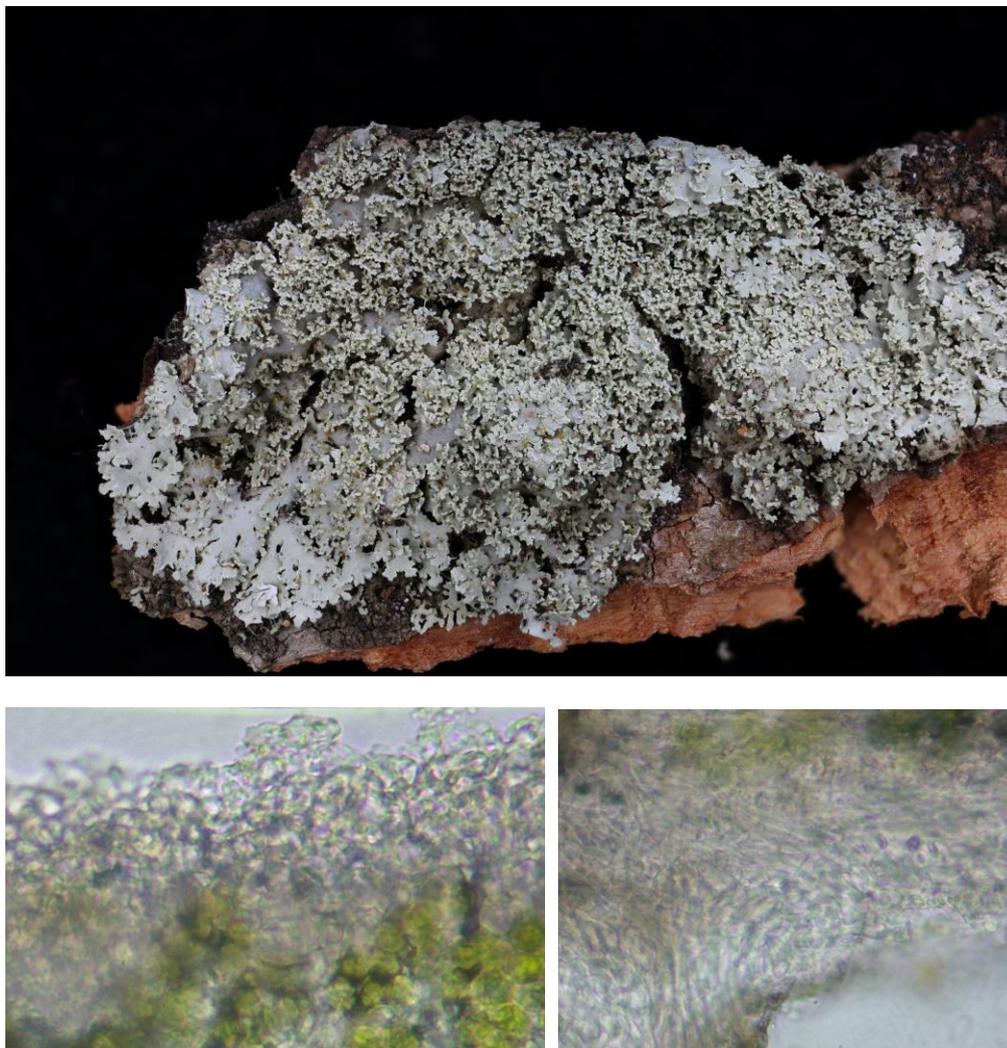


Fig. 1. *Physcia microphylla*, isotype. Above, habitus; below left, upper cortex; below right, lower cortex. Width of pictures: Above 5 mm, below 150  $\mu\text{m}$ .

*Physcia* with marginal, mostly unbranched phyllidia of c. 0.1 mm diam. which are only thinly corticate and therefore appear whiter than the thallus

TYPE: BRAZIL. MATO GROSSO DO SUL: Pantanal 83 km SE of Corumbá, around Base de UFMS, alt. 90 m, 19°34'S, 57°01'05"W, on bark of roadside tree, 3 March 2019, A.Aptroot 78171 (holotype: CGMS; isotype: ABL); same details, 78179 & 78261; on roof tile, 78293; same locality, 21 August 2011, A.A.Spielmann et al. 9445; Pantanal, Moro Grande, on tree, 23 June 2020, A.Aptroot & M.F.Souza 81170 (with apothecia); Corumbá, Ladário, Fazenda Band'Alta, on tree, 27 November 2019, A.Aptroot 80602; Jateí, Parque Estadual das Várzeas do Rio Ivinhema, on tree, 28 September 2019, A.Aptroot 80284; Corumbá, Morro do Bandeira, on tree, 23 June 2020, A.Aptroot & M.F.Souza 81065; Corumbá, Bala Mandioré, on tree, 23 November 2010, A.A.Spielmann et al. 8725; MATO GROSSO: Cuiaba, Chapada des Guimarães, on sandstone, 12-18

September 2020, A.Aptroot & M.F.Souza 81732; same locality and date, on tree, A.Aptroot & M.F.Souza 81734 (paratypes: CGMS).

Description. Thallus up to c. 5 cm diam., microfoliose, loosely attached to ascending, dull, pale mineral grey, concave. Lobes 0.6–1.1 × 0.4–0.9 mm wide, tips much dissected into c. 0.2 mm diam. lobules. Central parts of the thallus with marginal mostly unbranched phyllidia of c. 0.1 mm diam. which are only thinly corticate and therefore appear whiter than the thallus. Lower cortex somewhat glossy, white to ochraceous. Rhizines rather sparse, pale, 0.3–0.5 × 0.1 mm. Upper cortex parenchymatous, hyaline but with crystals; walls thin. Lower cortex prosoplectenchymatous, almost hyaline. Apothecia not observed.

Chemistry. Thallus UV–, C–, P–, K+yellow. TLC: atranorin.

Etymology. Named after the tiny leaflets.

Ecology and distribution. On trees, mostly exposed roadside trees, rarely on stony substrates, in the Pantanal and elsewhere in Mato Grosso do Sul; locally the dominant macrolichen; only known from Brazil but expected to occur in Bolivia and Paraguay.

Discussion. There are 34 species in the genus *Physcia* known from South America (Moberg 1990). This species is characterized by the marginal, mostly unbranched phyllidia of c. 0.1 mm diam. which are only thinly corticate and therefore appear whiter than the thallus. The upper cortex is parenplectenchymatous and the lower cortex is prosoplectenchymatous and pale.

This new species is superficially similar to the sorediate *P. millegrana* Degel. from North America (Schumm & Aptroot 2019).

The type specimen has been sequenced (ITS) and it clusters deep inside *Physcia*, so the generic affiliation of this species, which looks remarkably much like a miniature *Heterodermia*, is undisputed.

***Physciella neotropica*** M.F. Souza & Aptroot, sp. nov.

**Fig. 2**

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Corticolous *Physciella* with submarginal, hemispherical soralia, upper cortex parenplectenchymatous, hyaline but with crystals; lower cortex also paraplectenchymatous and pale.

TYPE: BRAZIL. MATO GROSSO DO SUL: Campo Grande, Vila Planalto, 19°22'59"S, 54°53'44"W, on bark of tree in garden, 10 July 2020, A.Aptroot & M.F.Souza 81460 (holotype: CGMS; isotype: ABL).

Description. Thallus up to c. 5 cm diam., microfoliose, closely attached, dull, pale greenish grey, convex. Lobes 0.6–1.1 × 0.4–0.6 mm wide, tips not much dissected. Soralia hemispherical, submarginal, 0.4–0.8 mm diam., soredia granular, greenish grey. Lower cortex somewhat glossy, white to ochraceous. Rhizines rather sparse, pale, 0.3–0.5 × 0.1 mm. Upper cortex parenplectenchymatous, hyaline but with crystals; walls thin, cells c. 6 µm diam. Lower cortex prosoplectenchymatous, pale, cells smaller (c. 4 µm diam.) than those of the upper cortex. Apothecia not observed.

Chemistry. Thallus UV–, C–, P–, K–. No substances detected.

Etymology. Named after the occurrence in the neotropics.

Ecology and distribution. On trees, mostly exposed roadside trees, found in the Pantanal and elsewhere in Mato Grosso do Sul (even though only one specimen is cited here); only known from Brazil but expected to occur in Bolivia and Paraguay.

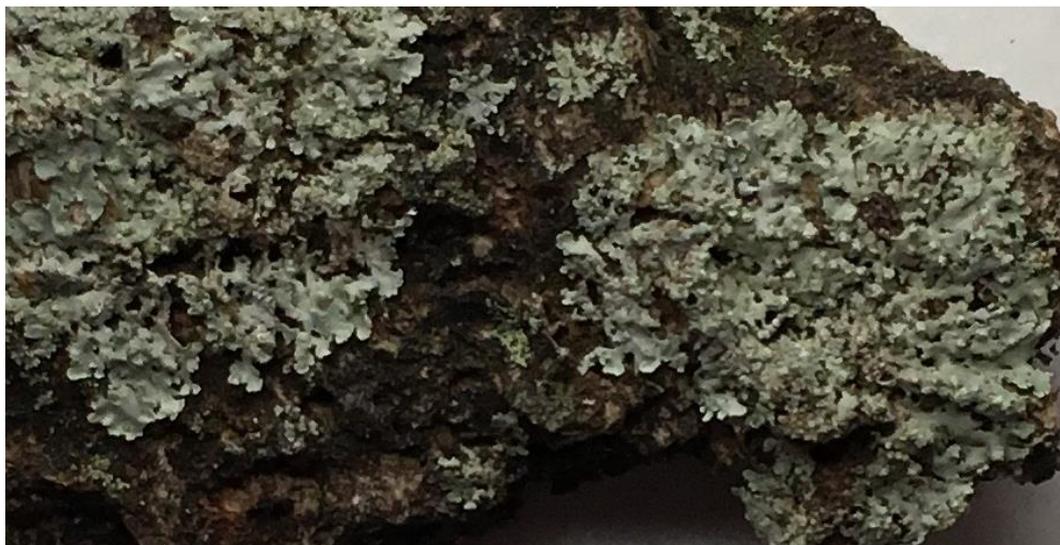


Fig. 2. *Physciella neotropica*, part of holotype. Habitus. Width of picture 30 mm.

Discussion. There are only four species known in the genus *Physciella*, which is mostly a northern temperate group, of which only *P. chloantha* (Ach.) Essl. has been reported from South America (Scutari 1992). The new species is characterized by the submarginal, hemispherical soralia.

*Strigula pyrenuloides* Aptroot, sp. nov.

Fig. 3

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Corticolous *Strigula* with thallus ochraceous grey, with pseudocyphellae, UV-negative, pycnidia black, thallus-covered, conidia 1-septate,  $7.5\text{--}10.5 \times 4.5\text{--}6.5 \mu\text{m}$ , ellipsoid to broad ellipsoid, septum thickened, both poles with a c.  $6\text{--}9 \times 1\text{--}1.5 \mu\text{m}$  gelatinous appendage.

TYPE: BRAZIL. MATO GROSSO DO SUL: Pantanal 83 km SE of Corumbá, around Base de UFMS, alt. 90 m,  $19^{\circ}34'S$ ,  $57^{\circ}01'05''W$ , on bark of tree along river, 3 March 2019, A.Aptroot 78134 (holotype: CGMS; isotype: ABL).

Description. Thallus dull, ochraceous grey, with whitish punctiform pseudocyphellae, consisting of pockets of calcium oxalate crystals, surrounded by a thin black prothallus line. Ascumata not observed. Pycnidia globose to pyriform, 0.3–0.6 mm diam., black, low hemispherical, mostly

covered by a thin thallus layer, not in pseudostromata. Wall carbonized in upperhalf, up to 80  $\mu\text{m}$  thick. Ostioles apical, single, black. Conidia hyaline, 1-septate,  $7.5\text{--}10.5 \times 4.5\text{--}6.5 \mu\text{m}$ , ellipsoid to broad ellipsoid, septum thickened, both poles with a c.  $6\text{--}9 \times 1\text{--}1.5 \mu\text{m}$  gelatinous appendage.

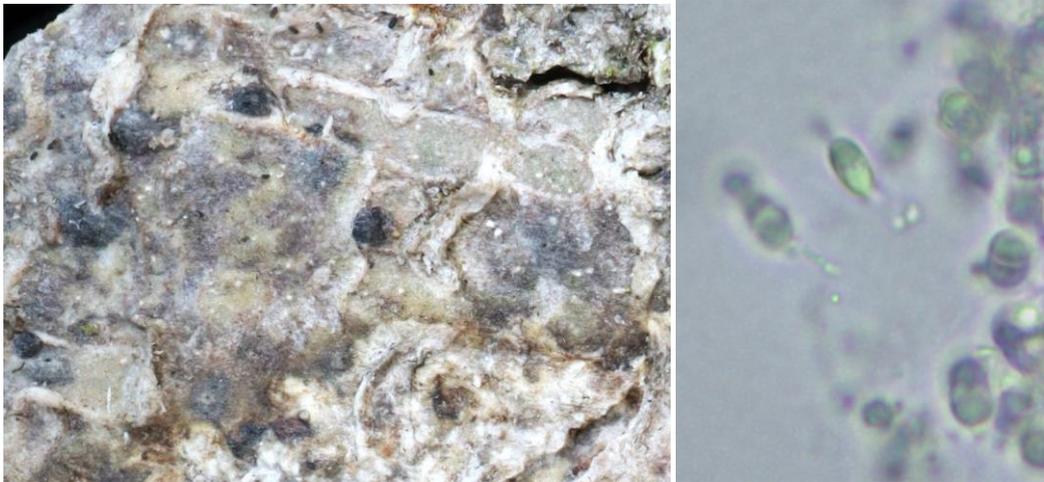


Fig. 3. *Strigula pyrenuloides* isotype. Left, habitus; right, conidia. Width of pictures: Left 6 mm, right 50  $\mu\text{m}$ .

Chemistry. Thallus UV–, C–, P–, K–. No TLC performed.

Etymology. Named for the superficial resemblance to a *Pyrenula*.

Ecology and distribution. On trees in the Pantanal; only known from Brazil.

Discussion. The 1-septate conidia with long gelatinous appendages are characteristic for the genus *Strigula* in the sense before the recent splitting (Jiang et al. 2020). The generic name *Discosiella* was even given to specimens of *Strigula* with only pycnidia. Several species of *Strigula* have been described before of which (at least originally) only pycnidia are present, e.g. *S. muriconidiata* Aptroot, L.I. Ferraro & M. Cáceres (Aptroot et al. 2014), which incidently was found in the same locality as the new species and which we here report as new to Brazil (specimen Aptroot 78221, CGMS). The new species differs from all by the relatively small conidia and especially by the black pycnidia which are thallus-covered in a *Pyrenula*-like thallus with pseudocypbellae.

*Thelopsis spinulosa* Aptroot, sp. nov.

**Fig. 4**

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Corticolous *Thelopsis* with ascospores 32/ascus, 1-septate,  $11\text{--}13 \times 4\text{--}4.5 \mu\text{m}$ , ellipsoid, with copious hyaline spines of c.  $3\text{--}4.5 \times 0.5 \mu\text{m}$ .

TYPE: BRAZIL. MATO GROSSO DO SUL: Pantanal 83 km SE of Corumbá, around Base de UFMS, alt. 90 m,  $19^{\circ}34'S$ ,  $57^{\circ}01'05''W$ , on bark of roadside tree, 3 March 2019, A.Aptroot 78199 (holotype: CGMS; isotype: ABL); same details, 78238; Jateí, Parque Estadual das Várzeas do Rio Ivinhema, on tree, 28 September 2019, A.Aptroot 80268 (paratypes: CGMS).

Description. Thallus dull, pale ochraceous grey, continuous but rough, c. 0.1 mm thick, not surrounded by a prothallus. Algae trentepohlioid, copious, green. Ascomata hemispherical, dark brown, sessile, 0.2–0.3 mm diam., up to 1.5 mm high. Ostioles apical, single, black. Hamathecium not inspersed. Ascospores 32/ascus, hyaline, 1-septate,  $11\text{--}13 \times 4\text{--}4.5 \mu\text{m}$ , ellipsoid, with copious hyaline spines of c.  $3\text{--}4.5 \times 0.5 \mu\text{m}$ . Pycnidia not observed.

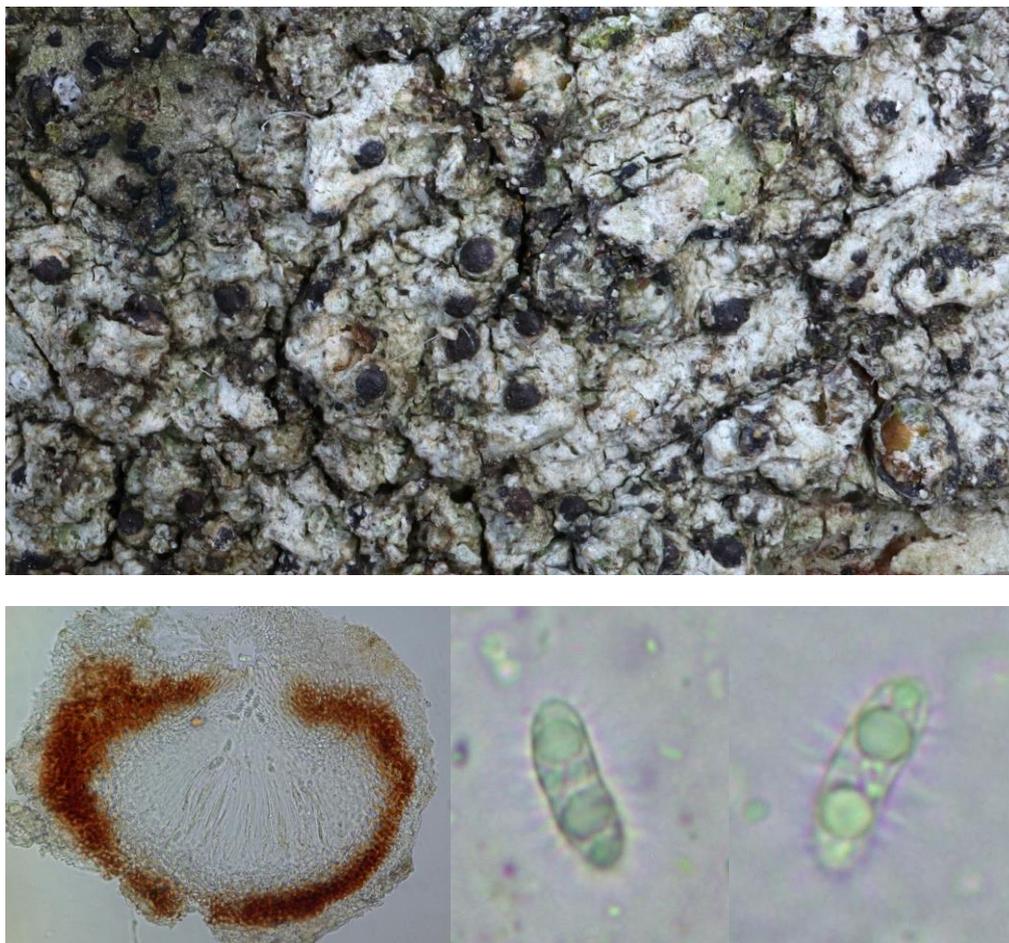


Fig. 4. *Thelopsis spinulosa*, isotype. Above, habitus; left under, section through ascoma; middle and right under, ascospores. Width of pictures: Habitus 6 mm, ascoma 0.3 mm, ascospores 15  $\mu\text{m}$ .

Chemistry. Thallus UV–, C–, P–, K–. No TLC performed.

Etymology. Named for the spines on the ascospores.

Ecology and distribution. On tree bark in Pantanal and Varzea forest; only known from Brazil.

Discussion. This genus *Thelopsis* is a small group with 15 known species (Aptroot et al. 2014b). This new species was found in two localities c. 450 km apart, and in both localities on several different trees. It is characterized by the unique long spines on the ascospores. There is always a small chance that eternal ornaments of spores are confused with germ tubes or that they are an

optical structure within a gelatinous matrix, but these spines are of real spine shape, more or less equal in size and present in several populations.

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