
New lichen species and records from the Serra da Bodoquena, Mato Grosso do Sul, Brazil, the westernmost Atlantic rain forest

André Aptroot^{1,2} & Adriano Spielmann¹

¹ Laboratório de Botânica / Liquenologia, Instituto de Biociências, Universidade Federal de Mato Grosso do Sul, Avenida Costa e Silva s/n, Bairro Universitário, CEP 79070-900, Campo Grande, Mato Grosso do Sul, Brazil.

²Corresponding author's e-mail: andreaptroot@gmail.com

Abstract: Eleven species of lichens are described as new from the Serra do Bodoquena in Mato Grosso do Sul (Brazil): *Alyxoria cyanea*, *Astrothelium ochraceum*, *Chiodecton xanthonosorediatum*, *Gyalecta perithecioidea*, *Gyalecta uniseptata*, *Pyrenula rubroacutispora*, *Ramonia xylophila*, *Synarthonia xanthosarcographoides*, *Trypethelium aureornatum*, *Trypethelium endoflavum*, and *Trypethelium xanthostiolornatum*. Around 400 further species are reported, of which 27 are first records for Brazil and 265 are first records for the state.

Introduction

Brazil is the country with the world's richest lichen flora. Recent lichen exploration in Brazil focused on macrolichens. Microlichens were systematically investigated in the Amazon region (e.g. Cáceres & Aptroot 2017) and in the north-eastern states (e.g. Cáceres 2007, Cáceres et al. 2017). As part of a continuous effort to explore lichenologically relatively unknown regions, we investigated the microlichens in a tropical south-western inland region, viz. the area around the Parque Nacional da Serra da Bodoquena in the state of Mato Grosso do Sul, close to the borders with Paraguay and Bolivia. This range of hills sticks is the only larger forested area still in existence in this state. No microlichens were previously reported from the area. This area is close to the venue of IAL9, the nearby town of Bonito, and partly belongs to this municipality.

The natural vegetation of the Serra da Bodoquena is Atlantic rain forest, a biome that stretches all along the coast from north-eastern to south-eastern Brazil. In fact, it is the most western patch of Atlantic rain forest in existence, and as such unique. The bedrock is partly siliceous, partly limestone. Sheltered and exposed outcrops of both rock types are present and were sampled.

Material and methods

During two weeks in October/November 2018, over 1100 specimens were collected by the authors during the yearly botanical excursion from UFMS, 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% I₂) 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.

Results

The area was quite rich in lichen species. Somewhat to our surprise, many of the species were first records for the state; we expected to find mostly species that were already recorded by Malme, who collected in a nearby area of the state (Corumbá municipality). Among the species are several that were so far only known from the Amazon and/or the Atlantic rain forest or Caatinga in north-western Brazil, showing that many recently described species are more widespread than originally known. Several specimens seem to belong to undescribed species though. Here we describe 12 new species to science from the region. Around 400 further species are reported (Table 1), of which 27 are first records for Brazil and 265 are first records for the state.

New species

Alyxoria cyanea Aptroot, sp. nov.

Fig. 1

MYCOBANK MB 836327

Saxicolous *Alyxoria* with epihymenium a vivid blue green, with ascospores 5–7-septate, 23–27 × 5–6 µm, with 1.5 µm wide gelatinous sheath.

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Bonito, Saci, near Córrego Taquaral, Fazenda Marambaia, alt. 500 m, 21°06'S, 56°38'W, on shaded limestone in Atlantic rain forest, 31 October 2018, A.Aptroot 77192 (holotype: CGMS; isotype: ABL); Same details, 77201 (paratype: CGMS).

Description. Thallus crustose, continuous, not corticate, dull, pale greenish brown, up to 0.1 mm thick, not surrounded by a prothallus. Photobiont trentepohlioid. Ascomata sessile, solitary, superficial on the thallus, linear in outline, 0.4–0.7 mm wide, up to 3 mm long, c. 0.2 mm high, disc purplish brown-black, margin raised above the disc, concolourous, c. 0.05 mm wide. Excipulum brown. Epihymenium a vivid blue green. Hamathecium not inspersed, weakly amyloid, paraphysoids 1–1.5 µm wide, anastomosing. Ascospores 8/ascus, hyaline, 5–7-septate, clavate, 23–27 × 5–6 µm, surrounded by a 1.5 µm wide gelatinous sheath. Pycnidia not observed.

Chemistry. Thallus and apothecia UV–, C–, P–, K–. TLC: nil.

Etymology. Named after the blue pigment.

Ecology and distribution. On sheltered limestone in Atlantic rain forest; only known from Brazil.



Fig.1. *Alyxoria cyanea*, isotype. Habitus. Note that the prothallus belongs to the other lichen species present. Width of picture 13 mm.

Discussion. The genus *Alyxoria* encompasses species that were until recently classified as *Opegrapha* with mostly wide open discs. Vivid blue green colours are very rare in lichenized ascomycetes, and known from the epihymenium of a few groups, notably *Lecidea* and *Porpidia*. No other species in the Arthoniales have been reported with this colour. The new species is somewhat similar in other characters to *Opegrapha corumbensis* Redinger (Redinger 1940), with which it grows together, and which is likely also be attributable to the genus *Alyxoria*. A formal transfer of the latter species awaits sequencing of toptype material.

Astrothelium ochraceum Aptroot, sp. nov.

Fig. 2

MYCOBANK MB 836328

Corticolous *Astrothelium* with thallus ochraceous, UV-negative, ascomata solitary, ostioles apical, hamathecium not interspersed, and ascospores 3-septate, $21\text{--}23 \times 6\text{--}7 \mu\text{m}$.

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Morraria do Sul, Fazenda Sol de maio, alt. 525 m, $20^{\circ}35'33''\text{S}$, $56^{\circ}51'40''\text{W}$, on bark of *Aspidosperma cuspa* in pasture near Atlantic rain forest, 5 November 2018, A.Aptroot 77647 (holotype: CGMS; isotype: ABL).

Description. Thallus dull, deep ochraceous, not surrounded by a prothallus. Ascomata globose to pyriform, 0.2–0.4 mm diam., mostly immersed in the thallus, not in pseudostromata. Ostioles apical, single, black. Hamathecium not inspersed. Ascospores 8/ascus, hyaline, 3-septate, $21\text{--}23 \times 6\text{--}7 \mu\text{m}$, long-ellipsoid, lumina diamond-shaped, not surrounded by a gelatinous sheath. Pycnidia not observed.

Chemistry. Thallus UV–, C–, P–, K–. TLC: nil.

Etymology. Named for the deep ochraceous colour of the thallus.

Ecology and distribution. On tree bark in Atlantic rain forest; only known from Brazil.



Fig.2. *Astrothelium ochraceum*, isotype. Habitus. Width of picture 19 mm.

Discussion. This species would key out as follows in the world key by Aptroot & Lücking (2016): key 1, couplet 27. The species is unmistakable by deep ochraceous colour of the thallus.

Chiodecton xanthonosorediatum Aptroot, sp. nov.

Fig. 3

MYCOBANK MB 836329

Corticolous *Chiodecton* with thallus and soredia with lichexanthone and algae *Trentepohlia*, up to 10 μm diam.

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Bonito, Fazenda La Harmonia, alt. 460 m, 21°15'S, 56°43'W, on tree bark in Atlantic rain forest, 1 November 2018, A.Aptroot 77264 (holotype: CGMS; isotype: ABL).

Description. Thallus crustose, granular, uneven, not corticate, dull, pale greenish white, up to 0.2 mm thick, surrounded by a thin black prothallus. Photobiont trentepohlioid, up to 10 µm diam. Soralia low hemispherical, rounded, rather regular, later confluent, up to 2.5 mm diam. but mostly much smaller. Soredia farinose, covering all of the soralia. Ascomata and pycnidia not observed.

Chemistry. Thallus and soredia UV+ yellow, C–, P–, K–. TLC: lichexanthone.

Etymology. Named after the cortical secondary compound lichexanthone and the soredia.

Ecology and distribution. On tree bark in Atlantic rain forest; only known from Brazil.



Fig.3. *Chiodecton xanthonosorediatm*, isotype. Habitus. Width of picture 13 mm.

Discussion. In the currently accepted restricted sense of Thor (1990), the genus *Chiodecton* is a predominantly tropical group of crustose Roccellaceae comprising 26 species (Thor 1990, Harada 1990, Henssen & Thor 1998, Thor 2007, Lumbsch et al. 2011, Cáceres et al. 2014, Jagadeesh Ram 2014, 2015, 2016, Cáceres & Aptroot 2017). The only species so far known to contain lichexanthone is *C. lichexanthonicum* Aptroot & M.Cáceres (Cáceres & Aptroot 2017), described from Manaus. The current new species is more similar to *C. complexum* Aptroot & M.Cáceres

(Cáceres et al. 2014), with which it shares the structure of the soralia, but from which it differs markedly in the presence of lichexanthone.

Gyalecta perithecioidea Aptroot, sp. nov.

Fig. 4

MYCOBANK MB 836330

Saxicolous *Gyalecta* with thallus with trentepohlioid algae, ascomata perithecioid, paraphyses with yellow oil, ascospores muriform, 8/ascus, 22–27 × 15–16 µm.

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Jardim, Fazenda Santa Fé, alt. 500 m, 21°30'S, 56°45'W, on sheltered limestone in Atlantic rain forest, 2 November 2018, A.Aptroot 77459 (holotype: CGMS; isotype: ABL).

Description. Thallus crustose, saxicolous, dull, pale pinkish green to pale orange, without prothallus. Photobiont trentepohlioid. Ascomata perithecia, in cavities in the thallus and erumpent from the substratum, globose, pale ochraceous to pale orange, 0.3–0.4 mm diam. Wall pale, without paraphyses. Hamathecium of unbranched paraphyses filled with yellow oil. Ostiole orangish, darker than ascoma wall. Ascospores hyaline, 8/ascus, densely irregularly muriform with only median septum horizontal, 22–27 × 15–16 µm, ellipsoid. Pycnidia not observed.

Chemistry. Thallus not tested chemically.

Etymology. Named after the perithecia which is an exception in this genus.

Ecology and Distribution. On sheltered limestone in Atlantic rain forest; only known from Brazil.

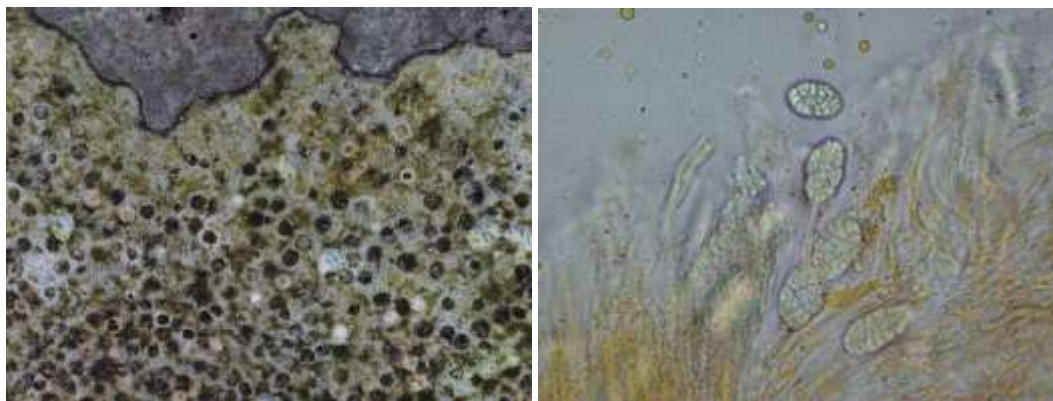


Fig.4. *Gyalecta perithecioidea*, isotype. Left: Habitus. Note that the dark purple prothallus belongs to *Lithothelium cubanum*. Right: Hamathecium with yellow pigment and muriform ascospores. Width of pictures: Left 16 mm, right 200 µm.

Discussion. This genus was traditionally restricted to a handful temperate species with cup-shaped apothecia. The concept of the genus has recently been widened to include also tropical species, species with more than 8 ascospores per ascus and species with perithecia (Lücking et al. 2019). This solved out initial problem as to which genus to assign this characteristic species: The

combination of perithecioid ascomata and muriform ascospores suggests *Topelia*, but it was noted that the species very much resembles a saxicolous *Gyalecta*, and the paraphyses with yellow oil inside are a very rare character, otherwise only known from *Gyalecta* species.

Gyalecta uniseptata Aptroot, sp. nov.

Fig. 5

MYCOBANK MB 836331

Saxicolous *Gyalecta* with thallus with trentepohlioid algae of 12-19 μm , paraphyses 1.5 μm wide, with yellow oil, no periphysoids, ascospores 1-septate, 12-16/ascus, 9.5-10 \times 4.5-5 μm .

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Jardim, Fazenda Santa Fé, alt. 500 m, 21°30'S, 56°45'W, on sheltered limestone in Atlantic rain forest, 2 November 2018, A.Aptroot 77453 (holotype: CGMS; isotype: ABL).

Description. Thallus crustose, saxicolous, dull, pale pinkish to pale ochraceous, without prothallus. Photobiont trentepohlioid, 12-19 μm diam. Ascomata apothecia, sessile, round, yellowish orange, 0.2–0.4 mm diam. Margin pale ochraceous, dentate, without periphyses. Hamathecium of unbranched paraphyses filled with yellow oil, c. 1.5 μm wide, tips swollen to c. 2.5 μm wide. Ascospores hyaline, 12-16/ascus, symmetrically 1-septate, 9.5-10 \times 4.5-5 μm , ellipsoid. Pycnidia not observed.

Chemistry. Thallus not tested chemically.

Etymology. Named after the 1-septate ascospores.

Ecology and Distribution. On sheltered limestone in Atlantic rain forest; only known from Brazil.

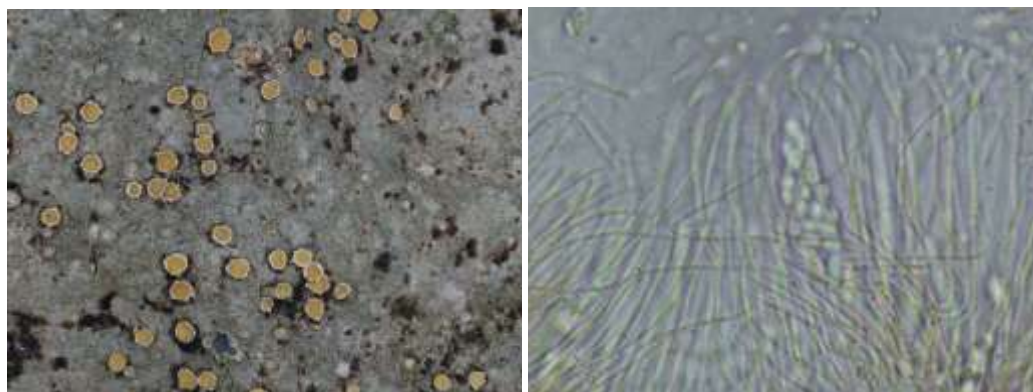


Fig. 5. *Gyalecta uniseptata*, isotype. Left: Habitus. Right: Hamathecium with multispore asci with 1-septate ascospores. Width of pictures: Left 16 mm, right 150 μm .

Discussion. This genus was traditionally restricted to a handful temperate species with cup-shaped apothecia. The concept of the genus has recently been widened to include also tropical species, species with more than 8 ascospores per ascus and species with perithecia (Lücking et al. 2019). This solved out initial problem as to which genus to assign this characteristic species: The many

spores per ascus suggested *Cryptolechia*, but the paraphyses with yellow oil inside are a very rare character, otherwise only known from *Gyalecta* species.

Pyrenula rubroacutispora Aptroot, sp. nov.

Fig. 6

MYCOBANK MB 836332

Corticolous *Pyrenula* with thallus carmine red, K+ violet, hamathecium not inspersed, ascospores 3-septate, $21\text{--}24 \times 9\text{--}11 \mu\text{m}$, with diamond-shaped lumina, ends rather pointed.

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Fazenda Monte Negro, alt. 530 m, $20^{\circ}54'25''\text{S}$, $56^{\circ}48'04''\text{W}$, on tree bark in Atlantic rain forest, 8 November 2018, A.Aptroot 77903 (holotype: CGMS; isotype: ABL).

Description. Thallus dull, carmine red, not surrounded by a prothallus. Ascomata low conical, 0.2–0.4 mm diam., low conical, black but largely thallus-covered. Ostioles apical, black. Hamathecium not inspersed. Ascospores 8/ascus, brown, 3-septate, $21\text{--}24 \times 9\text{--}11 \mu\text{m}$, with diamond-shaped lumina, ends rather pointed. Pycnidia not observed.

Chemistry. Thallus UV–, C–, P–, K+ violet. TLC: An unidentified anthraquinone.

Etymology. Named for the red thallus and the resemblance of the ascospores to *P. acutispora* Kalb & Hafellner.

Ecology and distribution. On tree bark in Atlantic rain forest; only known from Brazil.



Fig. 6. *Pyrenula rubroacutispora*, isotype. Left: Habitus. Right: Hamathecium with ascospores. Width of pictures: Left 10 mm, right 50 μm .

Discussion. *Pyrenula* species with carmine red thallus are so far only known from Brazil: *P. cinnabarina* Aptroot, E.L.Lima & M.Cáceres (Aptroot et al. 2015a) and *P. reginae* E.L.Lima, Aptroot & M.Cáceres (Lima et al. 2013). They differ by the smaller ascospores of 12–15 µm long and *P. reginae* also by the inspersed hamathecium. Both have been described since the publication of the world key to *Pyrenula* species (Aptroot 2012). Several other *Pyrenula* species with red thallus colours are known from Brazil, but they have a thallus of a different red colour (often reddish brown) and other key characters.

Ramonia xylophila Aptroot, sp. nov.

Fig. 7

MYCOBANK MB 836333

Lignicolous *Ramonia* with abundant periphyses, ascospores c. 500/ascus, globose, hyaline, old brown, 3–3.5 µm.

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Jardim, Fazenda Santa Fé, alt. 500 m, 21°30'S, 56°45'W, on wood in Atlantic rain forest, 2 November 2018, A.Aptroot 77449 (holotype: CGMS; isotype: ABL).

Description. Thallus crustose, lignicolous, greenish, slightly uneven, without prothallus. Photobiont trentepohlioid. Ascomata apothecia, sessile, round, 0.2–0.3 mm diam.; disc red brown; margin dark brown, smooth.Periphyses abundant. Paraphyses branched. Ascospores hyaline, old becoming brown, c. 500/ascus, simple, 3–3.5 µm diam., globose. Pycnidia not observed.

Chemistry. Thallus too small to test chemically.

Etymology. Named after the lignicolous habit.

Ecology and Distribution. On wood in Atlantic rain forest; only known from Brazil.



Fig. 7. *Ramonia xylophila*, isotype. Left: Habitus. Middle: Section through apothecium. Right: Hamathecium with multisporous asci with ascospores. Width of pictures: Left 2 mm, middle 0.4 mm, right 100 µm.

Discussion. This genus so far contains 26 species (Aptroot et al. 2015b). It would key out in the world key to the species (Aptroot et al. 2015b) close to *R. micrococca* Vězda, from which it chiefly differs by the larger ascospores.

Synarthonia xanthosarcographoides Aptroot, sp. nov.

Fig. 8

MYCOBANK MB 836334

Corticolous *Synarthonia* similar to *S. sarcographoides* but thallus UV-negative, pseudostromata with lichexanthone and UV+ yellow, hypothecium and epithecium brown, ascospores brown, regularly muriform, $20\text{--}22 \times 8\text{--}9 \mu\text{m}$.

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Bonito, Fazenda Marambaia, alt. 650 m, $20^{\circ}58'S$, $56^{\circ}42'W$, on tree bark in pasture close to Atlantic rain forest, 30 October 2018, A.Aptroot 77138 (holotype: CGMS; isotype: ABL).

Description. Thallus crustose, corticolous, mineral grey, dull, without prothallus. Photobiont trentepohlioid. Ascomata apothecia, punctiform to inkspot-like, eventually confluent, 0.2–0.4 mm diam., in raised whitish pseudostromata; disc bluish grey, dull; margin whitish. Hymenium hyaline, not inspersed, c. $75 \mu\text{m}$ high; epihymenium brown; hypothecium brown. Ascospores dark brown, 8 per ascus, regularly muriform, $7 \times 0\text{--}2$ -septate, $20\text{--}22 \times 8\text{--}9 \mu\text{m}$, surrounded by $2 \mu\text{m}$ wide gelatinous sheath. Pycnidia not observed.

Chemistry. Thallus UV–, C–, P–, K–; pseudostromata UV+ yellow. TLC: lichexanthone.

Etymology. Named after the yellow reaction to UV and the similarity to *Sarcographa*.

Ecology and Distribution. On tree bark in Atlantic rain forest; only known from Brazil.

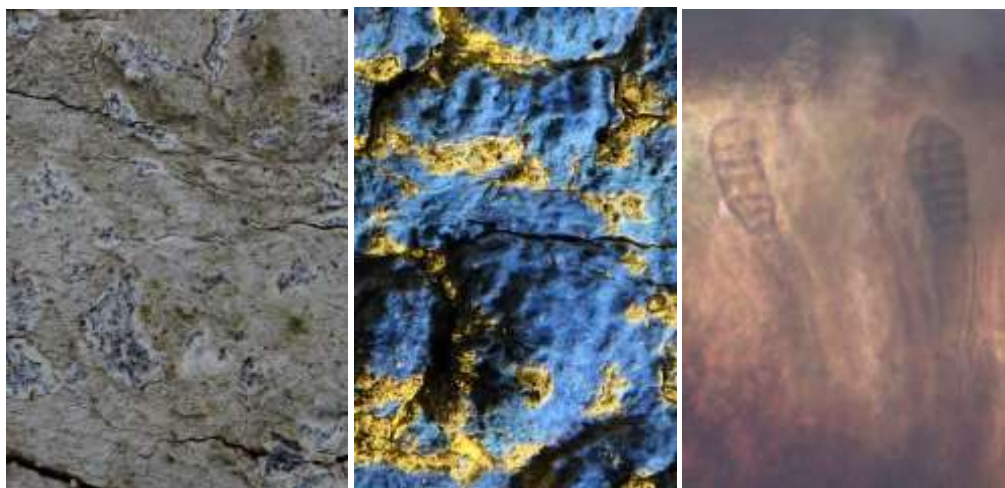


Fig. 8. *Synarthonia xanthosarcographoides*, isotype. Left: Habitus. Middle: Habitus with UV. Right: Hamathecium with brown muriform ascospores. Width of pictures: Left and middle 7 mm, right $60 \mu\text{m}$.

Discussion. This genus comprises so far only 20 species (Van den Broeck et al. 2018). The new species is very similar to *S. sarcographoides* Aptroot, A.A.Menezes, E.L.Lima & M.Cáceres (Menezes et al. 2013), but differs by the presence of lichexanthone in the pseudostromata and the consistently dark brown ascospores. These two species are somewhat isolated within the genus and may turn out to belong to a separate genus.

Trypethelium aureornatum Aptroot, sp. nov.

Fig. 9

MYCOBANK MB 836335

Corticolous *Trypethelium* with thallus UV-negative, pseudostromata with lichexanthone and UV+ yellow, with yellow, KOH+ red pigment inside, hamathecium interspersed; ascospores $73\text{--}77 \times 10\text{--}12 \mu\text{m}$.

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Bonito, Fazenda Marambaia, alt. 650 m, $20^{\circ}58'S$, $56^{\circ}42'W$, on tree bark in pasture close to Atlantic rain forest, 30 October 2018, A.Aptroot 77100 (holotype: CGMS; isotype: ABL); Bonito, Parque Nacional da Serra da Bodoquena, Rio Perdido, alt. 510 m, $21^{\circ}07'S$, $56^{\circ}43'W$, on tree bark in Atlantic rain forest, 3 November 2018, A.Aptroot 77487 (paratype: CGMS).

Description. Thallus dull, mineral grey, not surrounded by a prothallus. Ascomata globose to pyriform, 0.4–0.6 mm diam., immersed in pseudostromata, in groups of 2–6. Pseudostroma conspicuous, prominent, constricted, outline roundish, top flat, sides curved, c. 1–2 mm diam., black but pale ochraceous on the surface, internally with yellow pigment. Ostioles apical, single, brown. Hamathecium densely interspersed with oil globules. Ascospores 8/ascus, hyaline, 9-septate, $73\text{--}77 \times 10\text{--}12 \mu\text{m}$, long-ellipsoid, with ellipsoid lumina, not surrounded by a gelatinous sheath. Pycnidia not observed.

Chemistry. Thallus UV–, C–, K–, KC–, P–, pseudostroma UV+ yellow outside, K+ red inside. TLC: lichexanthone and an anthraquinone.



Fig. 9. *Trypethelium aureornatum*, isotype. Left: Habitus. Right: Habitus with UV. Width of pictures: 25 mm.

Etymology. Named after the yellow UV-reaction of the pseudostromata and the similarity to *T. ornatum*.

Ecology and distribution. On tree bark in primary rain forest; only known from Brazil.

Discussion. This species would key out in the world key by Aptroot & Lücking (2016) already at couplet 1: Thallus UV-negative, pseudostromata UV+ yellow.

Trypethelium endoflavum Aptroot, sp. nov.

Fig. 10

MYCOBANK MB 836336

Corticolous *Trypethelium* with thallus with lichexanthone and UV+ yellow, pseudostromata UV-negative, with yellow, KOH+ yellow pigment inside, hamathecium not inspersed; ascospores 13-septate, $53\text{--}57 \times 11\text{--}13 \mu\text{m}$.

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Morraria do Sul, Fazenda Sol de maio, alt. 525 m, $20^{\circ}35'33''\text{S}$, $56^{\circ}51'40''\text{W}$, on bark of *Zanthoxylon rigidum* in pasture near Atlantic rain forest, 5 November 2018, A.Aptroot 77651 (holotype: CGMS; isotype: ABL).

Description. Thallus dull, ochraceous grey, not surrounded by a prothallus. Ascomata globose to pyriform, 0.3–0.4 mm diam., immersed in pseudostromata, in groups of 2–5. Pseudostroma erumpent, low to sessile, outline roundish, c. 1–2 mm diam., whitish, internally with yellow pigment. Ostioles apical, single or superficially confluent, black. Hamathecium not inspersed. Ascospores 8/ascus, hyaline, 13-septate, $53\text{--}57 \times 11\text{--}13 \mu\text{m}$, long-ellipsoid, with ellipsoid lumina, not surrounded by a gelatinous sheath. Pycnidia not observed.

Chemistry. Thallus UV+ yellow, C–, K–, KC–, P–, pseudostroma UV– outside, K+ yellow inside. TLC: lichexanthone and an anthraquinone.

Etymology. Named after the yellow internal pigment.

Ecology and distribution. On tree bark in primary rain forest; only known from Brazil.



Fig. 10. *Trypethelium endoflavum*, isotype. Left: Habitus. Right: Habitus with UV. Width of pictures: 15 mm.

Discussion. This species would key out in the world key by Aptroot & Lücking (2016) at couplet 3: Thallus pseudostromata UV-negative, ascospores under $60 \mu\text{m}$ long. It is most similar to *T.*

tolimenense Lücking, Moncada & M. Gut., which differs by the also UV-positive pseudostromata and ascospores over 70 µm long.

Trypethelium xanthostiolornatum Aptroot, sp. nov.

Fig. 11

MYCOBANK MB 836337

Corticolous *Trypethelium* with thallus and pseudostroma UV-negative, ostioles UV+ yellow and with lichexanthone, hamathecium interspersed, ascospores 11(-13)-septate, 75–85 × 15–18 µm.

TYPE: BRAZIL. MATO GROSSO DO SUL: Serra da Bodoquena, Bonito, Fazenda La Harmonia, alt. 460 m, 21°15'S, 56°43'W, on tree bark in Atlantic rain forest, 1 November 2018, A.Aptroot 77279 (holotype: CGMS; isotype: ABL); Serra da Bodoquena, Bonito, Fazenda La Harmonia, alt. 460 m, 21°15'S, 56°43'W, on tree bark in Atlantic rain forest, 1 November 2018, A.Aptroot 77279, 77290 (paratypes: CGMS); Serra da Bodoquena, Fazenda Monte Negro, alt. 530 m, 20°54'25"S, 56°48'04"W, on tree bark in Atlantic rain forest, 8 November 2018, A.Aptroot 77877, 77925, 77936 (paratypes: CGMS).

Description. Thallus dull, greenish with pale whitish patches, not surrounded by a prothallus. Ascomata globose to pyriform, 0.4–0.6 mm diam., immersed in pseudostromata, in groups of 3–8. Pseudostroma conspicuous, prominent, constricted, outline roundish, top flat, sides curved, c. 1–2 mm diam., brown but pale ochraceous on the surface, internally with orange pigment. Ostioles apical, single, brown. Hamathecium densely interspersed with oil globules. Ascospores 8/ascus, hyaline, 11(-13)-septate, 75–85 × 15–18 µm, long-ellipsoid, with ellipsoid lumina, not surrounded by a gelatinous sheath. Pycnidia not observed.

Chemistry. Thallus and pseudostromata UV–, C–, K–, KC–, P–, ostioles UV+ yellow outside, pseudostroma K+ red inside. TLC: lichexanthone and an anthraquinone.

Etymology. Named after the yellow UV-reaction of the ostiole and the similarity to *T. ornatum*.

Ecology and distribution. On tree bark in primary rain forest; only known from Brazil.

Discussion. This species would key out in the world key by Aptroot & Lücking (2016) already at couplet 1: Thallus and pseudostromata UV-negative, but ostioles UV+ yellow. It is one of the most common undescribed species in the region, and a conspicuous element of the lichen flora.



Fig. 11. *Trypethelium xanthostiolornatum*, isotype. Habitus with UV. Width of picture 9 mm.

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Table 1. Lichen species encountered, with status of report and Aptroot collection number

<i>Acanthothesia corcovadensis</i>	MS first report	77019
<i>Acarospora lavicola</i>	MS first report	77989
<i>Actinoplaca strigulacea</i>	MS first report	77596
<i>Agonimia opuntella</i>	MS first report	77158
<i>Agonimia tenuiloba</i>	MS first report	77126
<i>Amandinea efflorescens</i>	MS first report	77063
<i>Amandinea extenuata</i>		77082
<i>Amandinea submontana</i>	MS first report	77028
<i>Anisomeridium albisedum</i>	MS first report	77738
<i>Anisomeridium distans</i>	new to Brazil	77470
<i>Anisomeridium subprostans</i>	MS first report	77489
<i>Arthonia parantillarum</i>	MS first report	77852
<i>Aspidothelium fugiens</i>	MS first report	77096
<i>Aspidothelium geminiparum</i>	MS first report	77265
<i>Asterothyrium anomalum</i>	MS first report	77598
<i>Asterothyrium argenteum</i>	MS first report	77602
<i>Asterothyrium decipiens</i>	MS first report	77252
<i>Asterothyrium microsporum</i>	MS first report	77243
<i>Astrothelium aenascens</i>	MS first report	77642
<i>Astrothelium aeneum</i>		77004
<i>Astrothelium kunzei</i>	MS first report	77654
<i>Astrothelium megaspermum</i>	MS first report	77299
<i>Astrothelium megeustomum</i>	MS first report	77484
<i>Astrothelium phlyctaena</i>	MS first report	77629
<i>Astrothelium quasidermatodes</i>	MS first report	77522
<i>Astrothelium rufescens</i>	MS first report	77660
<i>Astrothelium scoria</i>	MS first report	77135
<i>Aulaxina intermedia</i>	MS first report	77683
<i>Bacidia arceutina</i>	MS first report	78021
<i>Bacidia heterochroa</i>	MS first report	77970
<i>Bacidia termitophila</i>	MS first report	77664
<i>Bacidina apiahica</i>	MS first report	77236
<i>Bacidina medialis</i>		77078
<i>Bacidina neotropica</i>	MS first report	77694
<i>Bacidina pseudohyphosphorifera</i>	new to Brazil	77804
<i>Bapalmuia confusa</i>	MS first report	77084

<i>Bathelium madreporiforme</i>	MS first report	77906
<i>Bathelium mastoideum</i>	MS first report	77012
<i>Bathelium pruinolucens</i>	MS first report	77116
<i>Bathelium pruinosum</i>	new to Brazil	77013
<i>Bogoriella captiosa</i>	MS first report	77391
<i>Bogoriella confluens</i>	MS first report	78047
<i>Bogoriella fumosula</i>	MS first report	78042
<i>Bogoriella megaspora</i>	MS first report	77511
<i>Bogoriella miculiformis</i>	MS first report	77907
<i>Bogoriella punctata</i>	MS first report	77919
<i>Botryolepraria neotropica</i>	MS first report	77115
<i>Buellia griseovirens</i>	MS first report	77799
<i>Buellia halonia</i>	MS first report	77974
<i>Buellia mamillana</i>	MS first report	77976
<i>Buellia stellulata</i>	MS first report	77767
<i>Buellia subtabacina</i>	MS first report	77771
<i>Buellia xanthinula</i>		77787
<i>Bulbothrix coronata</i>		77020
<i>Bulbothrix fungicola</i>		78048
<i>Bulbothrix isidiza</i>		77081
<i>Bulbothrix pseudocoronata</i>	MS first report	78033
<i>Byssoloma chlorinum</i>	MS first report	77237
<i>Byssoloma leucoblepharum</i>		77240
<i>Byssoloma subpolychroum</i>	MS first report	77716
<i>Calenia monospora</i>	MS first report	77239
<i>Calicium salicinum</i>		77797
<i>Calopadia foliicola</i>	MS first report	77371
<i>Calopadia fusca</i>	MS first report	77254
<i>Calopadia puiggarii</i>	MS first report	77739
<i>Calopadia subcaerulescens</i>	MS first report	77662
<i>Caloplaca atroflava</i>	new to Brazil	77766
<i>Caloplaca bassiae</i>	MS first report	77509
<i>Caloplaca cinnabarina</i>		77789
<i>Caloplaca crocina</i>		77501
<i>Caloplaca cupulifera</i>	MS first report	77825
<i>Caloplaca erythrantha</i>	MS first report	77398
<i>Caloplaca flavorubescens</i>	MS first report	78022
<i>Caloplaca flavovirescens</i>	MS first report	77193
<i>Caloplaca granularis</i>		77793

<i>Caloplaca subsoluta</i>		77762
<i>Caloplaca subvitellina</i>		77763
<i>Candelaria concolor</i>		77011
<i>Canoparmelia carneopruinata</i>		77007
<i>Canoparmelia caroliniana</i>		77038
<i>Canoparmelia cryptochlorophaea</i>		77065
<i>Canoparmelia scrobicularis</i>		77006
<i>Canoparmelia texana</i>		77179
<i>Catinaria atropurpurea</i>	MS first report	77486
<i>Chapsa discoidea</i>	MS first report	77018
<i>Chapsa thalotrema</i>	MS first report	77550
<i>Chrysothrix xanthina</i>		77904
<i>Coccocarpia erythroxyli</i>		77475
<i>Coccocarpia palmicola</i>		77969
<i>Coenogonium chloroticum</i>	MS first report	77208
<i>Coenogonium dilucidum</i>	MS first report	77373
<i>Coenogonium fallaciosum</i>	MS first report	77361
<i>Coenogonium luteum</i>	MS first report	77418
<i>Coenogonium pyrophthalmum</i>	MS first report	77665
<i>Coenogonium roumeguerianum</i>		78010
<i>Coenogonium strigosum</i>	MS first report	77099
<i>Coenogonium subdentatum</i>	MS first report	77122
<i>Coenogonium subdilutum</i>		77407
<i>Coenogonium subluteum</i>	MS first report	77593
<i>Coenogonium subzonatum</i>	MS first report	77358
<i>Collema cristatum</i>	new to Brazil	77462
<i>Collema furfuraceum</i>	MS first report	77734
<i>Collema glaucophthalmum</i> var. <i>implicatum</i>	MS first report	77442
<i>Collema leptaleum</i>	MS first report	77070
<i>Collema leptosporum</i>		78016
<i>Collema tenax</i>	MS first report	77807
<i>Coniocarpon cinnabarinum</i>	MS first report	77267
<i>Constrictolumina cinchonae</i>	MS first report	77045
<i>Constrictolumina majuscula</i>	new to Brazil	77014
<i>Constrictolumina planorbis</i>	MS first report	77046
<i>Cratiria lauricassiae</i>	MS first report	77033
<i>Cratiria melanochlora</i>	MS first report	77049
<i>Cratiria obscurior</i>		77563

<i>Cratiria saltensis</i>		77488
<i>Cresponea leprieurii</i>		77176
<i>Cryptolechia geoioides</i>	MS first report	77884
<i>Cryptolechia nana</i>		77144
<i>Cryptolechia saxatilis</i>	new to Brazil	77850
<i>Cryptothecia effusa</i>	MS first report	77271
<i>Cryptothecia rhizophora</i>	MS first report	77292
<i>Cryptothecia striata</i>	MS first report	77061
<i>Dictyomeridium amylosporum</i>	MS first report	77283
<i>Diorygma antillarum</i>	MS first report	77873
<i>Diorygma poitaei</i>		77148
<i>Diorygma reniforme</i>	MS first report	77399
<i>Dirinaria aegialita</i>		77965
<i>Dirinaria confluens</i> var. <i>coccinea</i>		77794
<i>Dirinaria melanocarpa</i>		77026
<i>Dirinaria picta</i>		77042
<i>Echinoplaca bispora</i>	MS first report	77964
<i>Echinoplaca leucotrichoides</i>	MS first report	77595
<i>Echinoplaca pellicula</i>	MS first report	77365
<i>Echinoplaca verrucifera</i>	MS first report	77608
<i>Endocarpon pallidulum</i>		77191
<i>Eremothecella calamicola</i>	MS first report	77571
<i>Fellhanera bouteillei</i>	MS first report	77253
<i>Fellhanera microdiscus</i>	MS first report	77524
<i>Fellhanera rhapsidophylli</i>	MS first report	77260
<i>Fellhanera subfuscata</i>	MS first report	77256
<i>Fissurina pseudostromatica</i>	MS first report	77056
<i>Flakea papillata</i>	MS first report	77110
<i>Gassicurtia subpulcella</i>	MS first report	77140
<i>Glyphis cicatricosa</i>		77060
<i>Glyphis scyphulifera</i>		78030
<i>Glyphis substriatula</i>		78026
<i>Graphis acharii</i>	MS first report	77912
<i>Graphis angustata</i>	MS first report	77343
<i>Graphis aurita</i>		77112
<i>Graphis erythrocardia</i>	MS first report	77091
<i>Graphis furcata</i>	MS first report	77704
<i>Graphis glaucescens</i>	MS first report	77386
<i>Graphis handelii</i>	MS first report	77211

<i>Graphis hyphosa</i>		77865
<i>Graphis ingarum</i>	MS first report	77574
<i>Graphis librata</i>	MS first report	77625
<i>Graphis parilis</i>	MS first report	77263
<i>Graphis platycarpa</i>	MS first report	77955
<i>Graphis striatula</i>	MS first report	77569
<i>Graphis subcontorta</i>	new to Brazil	77111
<i>Graphis submarginata</i>	MS first report	77440
<i>Graphis subradiata</i>	new to Brazil	77356
<i>Graphis subtenella</i>	MS first report	77103
<i>Graphis symplecta</i>		77898
<i>Graphis vestitoides</i>	MS first report	77225
<i>Gyalectidium filicinum</i>	MS first report	77244
<i>Gyalideopsis applanata</i>	MS first report	77727
<i>Gyalideopsis confluens</i>	MS first report	77855
<i>Gyalideopsis kalbii</i>	MS first report	77064
<i>Gyalideopsis lambinonii</i>	MS first report	77139
<i>Gyalideopsis vulgaris</i>	MS first report	77232
<i>Haematomma flexuosum</i>		77024
<i>Haematomma matogrossense</i>	MS first report	77796
<i>Haematomma persoonii</i>	MS first report	78019
<i>Haematomma subinnatum</i>		77661
<i>Heppia despreauxii</i>	MS first report	77805
<i>Herpothallon roseocinctum</i>	MS first report	77696
<i>Heterocyphelium leucampyx</i>		77899
<i>Heterodermia diademata</i>		77032
<i>Heterodermia flabellata</i>	MS first report	77031
<i>Heterodermia microphylla</i>		77962
<i>Heterodermia speciosa</i>		77075
<i>Heterodermia tremulans</i>	MS first report	77381
<i>Hyperphyscia adglutinata</i>	MS first report	77397
<i>Hyperphyscia granulata</i>		77400
<i>Hyperphyscia minor</i>	MS first report	77195
<i>Hyperphyscia mobergii</i>	MS first report	77403
<i>Hyperphyscia syncolla</i>		77051
<i>Hyperphyscia viridissima</i>	MS first report	77387
<i>Hypotrachyna polydactyla</i>	MS first report	77039
<i>Hypotrachyna pustulifera</i>		77090

<i>Hypotrachyna silvatica</i>	MS first report	77113
<i>Julella sublactea</i>	MS first report	77402
<i>Lecanactis elaeocarpa</i>	MS first report	77444
<i>Lecanora achroa</i>	MS first report	77053
<i>Lecanora argentata</i>	MS first report	77059
<i>Lecanora caesiorubella</i>		77029
<i>Lecanora helva</i>	MS first report	77799a
<i>Lecanora leprosa</i>	MS first report	77002
<i>Lecanora pseudistera</i>	MS first report	77765
<i>Lecanora subalbellina</i>	MS first report	78008
<i>Lecanora subcrenulata</i>		77040
<i>Lecanora subimmersa</i>	MS first report	77987
<i>Lecanora thysanophora</i>	MS first report	77896
<i>Lecanora tropica</i>		77087
<i>Lecidella carpathica</i>	new to Brazil	77977
<i>Leptogium coralloideum</i>		77149
<i>Leptogium corticola</i>	MS first report	77278
<i>Leptogium cyanesens</i>	MS first report	77416
<i>Leptogium isidiosellum</i>		77481
<i>Leptogium marginellum</i>		77172
<i>Leptogium millegranum</i>	MS first report	77207
<i>Leptogium phyllocarpum</i>		77261
<i>Letrouitia domingensis</i>		77216
<i>Letrouitia flavocrocea</i>	MS first report	77423
<i>Leucodecton glaucescens</i>	MS first report	77181
<i>Lithothelium cubanum</i>	new to Brazil	77315
<i>Lithothelium grossum</i>	new to Brazil	77286
<i>Lithothelium obtectum</i>	MS first report	77162
<i>Lithothelium paraguayense</i>	new to Brazil	77859
<i>Lyromma confusum</i>	MS first report	77234a
<i>Lyromma palmae</i>	MS first report	77590
<i>Macroconstrictolumina megalateralis</i>		77751
<i>Malmidea fellhaneroides</i>	new to Brazil	77107
<i>Malmidea flavopustulosa</i>	MS first report	77101
<i>Malmidea furfurosa</i>	MS first report	77504
<i>Malmidea fuscella</i>	MS first report	77291
<i>Malmidea granifera</i>		77213
<i>Malmidea leptoloma</i>	MS first report	77219
<i>Malmidea piperis</i>	MS first report	77214

<i>Malmidea psychotrichoides</i>	MS first report	77339
<i>Malmidea rhodopsis</i>	MS first report	77288
<i>Malmidea vinosa</i>	MS first report	77106
<i>Mazosia melanophthalma</i>	MS first report	77583
<i>Mazosia rotula</i>	MS first report	77585
<i>Melanotrema platystomum</i>	MS first report	77151
<i>Metamelanea caesiella</i>	new to Brazil	77832
<i>Microtheliopsis uleana</i>	MS first report	77375
<i>Mycoporum compositum</i>	MS first report	77021
<i>Myelochroa immiscens</i>	new to Brazil	77479
<i>Myriostigma miniatum</i>	MS first report	77156
<i>Myriotrema myrioporum</i>	MS first report	77178
<i>Neoprotoparmelia brasiliisidiata</i>	MS first report	77184
<i>Neoprotoparmelia capitata</i>	MS first report	77750
<i>Neoprotoparmelia multifera</i>	MS first report	77023
<i>Nigrovothelium inspersotropicum</i>	MS first report	77068
<i>Ocellularia auberianoides</i>		77185
<i>Ocellularia landronii</i>	MS first report	77557
<i>Ocellularia papillata</i>	MS first report	77902
<i>Ocellularia pluripora</i>	MS first report	77857
<i>Opegrapha aperiens</i>		77319
<i>Opegrapha astraea</i>		77083
<i>Opegrapha corumbensis</i>		77458
<i>Opegrapha cylindrica</i>		77559
<i>Parmotrema cetratum</i>		77483
<i>Parmotrema consors</i>		77392
<i>Parmotrema crinitum</i>	MS first report	77886
<i>Parmotrema cristiferum</i>	MS first report	77034
<i>Parmotrema flavomedullosum</i>		77092
<i>Parmotrema melanochaetum</i>		77429
<i>Parmotrema mesotropum</i>		77037
<i>Parmotrema praesorediosum</i>		77043
<i>Parmotrema tinctorum</i>		78038
<i>Paulia gibbosa</i>	new to Brazil	77813
<i>Paulia stipitata</i>	new to Brazil	77818
<i>Peltula euploca</i>		77835
<i>Peltula obscurans</i>	MS first report	77676
<i>Pertusaria carneola</i>	MS first report	78044

<i>Pertusaria dehiscens</i>	MS first report	78009
<i>Pertusaria flavens</i>	MS first report	77073
<i>Pertusaria quassiae</i>	MS first report	77889
<i>Pertusaria tetralthalamia</i>	MS first report	77067
<i>Pertusaria tropica</i>	MS first report	77079
<i>Phaeographis brasiliensis</i>	MS first report	77345
<i>Phaeographis caesiodisca</i>	MS first report	77030
<i>Phaeographis dendritica</i>	MS first report	77301
<i>Phaeographis intricans</i>	MS first report	77080
<i>Phaeographis leiogrammodes</i>		77022
<i>Phlyctis brasiliensis</i>	MS first report	77102
<i>Phyllopsora buettneri</i>	MS first report	77123
<i>Phyllopsora cinchonarum</i>		77076
<i>Phyllopsora pyrromelaena</i>	MS first report	77128
<i>Phyllopsora pyxinoides</i>	MS first report	77316
<i>Physcia aipolia</i>		77048
<i>Physcia alba</i>	MS first report	77384
<i>Physcia atrostriata</i>	MS first report	77916
<i>Physcia convexa</i>		77777
<i>Physcia crispa</i>		77385
<i>Physcia kalbii</i>		77735
<i>Physcia pachyphylla</i>		77516
<i>Physcia phaeocarpa</i>	MS first report	77268
<i>Physcia poncinsii</i>		77411
<i>Physcia rolfii</i>		78000
<i>Physcia sinuosa</i>	MS first report	77071
<i>Physcidia striata</i>	MS first report	77928
<i>Piccolia conspersa</i>	MS first report	77281
<i>Platygramme caesiopruinosa</i>	MS first report	77302
<i>Porina alba</i>	MS first report	77584
<i>Porina chlorotica</i>	MS first report	77190
<i>Porina conspersa</i>	MS first report	77145
<i>Porina cryptostoma</i>	MS first report	77212
<i>Porina cubana</i>	first corticolous	77756
<i>Porina curtula</i>	MS first report	77871
<i>Porina distans</i>	MS first report	77275
<i>Porina epiphylla</i>	MS first report	77701
<i>Porina fulvella</i>	MS first report	77364
<i>Porina leptalea</i>	MS first report	77336

<i>Porina lucida</i>	MS first report	77238
<i>Porina mastoidea</i>	MS first report	77312
<i>Porina melanops</i>	MS first report	77468
<i>Porina nigrofusca</i>	MS first report	77129
<i>Porina nitidula</i>	MS first report	77234
<i>Porina nucula</i>	MS first report	77121
<i>Porina rubentior</i>	MS first report	77233
<i>Porina rufula</i>	MS first report	77377
<i>Porina vezdae</i>	first corticolous	77335
<i>Pseudochapsa phlyctidioides</i>	MS first report	77015
<i>Pseudoparmelia hypomiltha</i>		77519
<i>Psoroglaena cubensis</i>	MS first report	77404
<i>Punctelia missouriensis</i>		77482
<i>Pyrenula acutispora</i>	MS first report	77161
<i>Pyrenula anomala</i>		77120
<i>Pyrenula aspistea</i>	MS first report	77417
<i>Pyrenula circumfiniens</i>		77555
<i>Pyrenula cryptothelia</i>		77757
<i>Pyrenula cubana</i>	MS first report	77147
<i>Pyrenula globifera</i>	MS first report	77108
<i>Pyrenula infraleucotrypa</i>	MS first report	77431
<i>Pyrenula mamillana</i>	MS first report	77553
<i>Pyrenula pyrenuloides</i>	MS first report	77055
<i>Pyrenula quassiicola</i>		77150
<i>Pyrenula rubromamillana</i>	MS first report	77165
<i>Pyrenula septicollaris</i>	MS first report	77218
<i>Pyrenula subducta</i>	MS first report	77748
<i>Pyrenula subgregantula</i>		77554
<i>Pyrenula xanthoglobulifera</i>	MS first report	77496
<i>Pyxine berteriana</i>		77035
<i>Pyxine daedalea</i>		77036
<i>Pyxine eschweileri</i>		77095
<i>Pyxine exoalbida</i>	MS first report	77480
<i>Pyxine mantequeirensis</i>		77133
<i>Pyxine pyxinoides</i>	MS first report	77972
<i>Ramalina celastri</i>		78039
<i>Ramboldia russula</i>		77870
<i>Ramonia kandleri</i>		77069

<i>Ramonia microspora</i>	MS first report	77577
<i>Relicina abstrusa</i>		77009
<i>Rinodina guianensis</i>	MS first report	77010
<i>Rinodina maculans</i>	MS first report	77086
<i>Rinodina oxydata</i>	MS first report	77761
<i>Rinodina teichophila</i>	new to Brazil	77773
<i>Sanguinotrema wightii</i>		77105
<i>Sarcographa fenicis</i>	MS first report	77746
<i>Scoliciosporum camptosporum</i>	MS first report	77785
<i>Sculptolumina japonica</i>		77991
<i>Stigmatochroma kryptoviolascens</i>		77097
<i>Stigmatochroma metaleptodes</i>	MS first report	77027
<i>Stirtonia lucida</i>	MS first report	77305
<i>Stirtonia viridis</i>	new to Brazil	77226
<i>Strigula affinis</i>	new to Brazil	77561
<i>Strigula amphora</i>	MS first report	77159
<i>Strigula antillarum</i>	MS first report	77679
<i>Strigula bermudana</i>	new to Brazil	77200
<i>Strigula concreta</i>	MS first report	77709
<i>Strigula nemathora</i>	MS first report	77250
<i>Strigula nitidula</i>	MS first report	77246
<i>Strigula phaea</i>	MS first report	77205
<i>Strigula phyllogena</i>	MS first report	77362
<i>Strigula smaragdula</i>	MS first report	77241
<i>Strigula taylorii</i>	new to Brazil	77493
<i>Synalissa matogrossensis</i>	MS first report	77824
<i>Synarthothelium cerebriforme</i>	MS first report	77215
<i>Tephromela atra</i>	MS first report	77088
<i>Thalloloma cinnabarinum</i>	MS first report	77347
<i>Thelenella brasiliensis</i>		77802
<i>Thelidium minutulum</i>	new to Brazil	77544
<i>Thyrea confusa</i>	new to Brazil	77823
<i>Toninia mesoidea</i>	new to Brazil	77543
<i>Trapeliopsis flexuosa</i>	MS first report	77800
<i>Traponora asterella</i>	MS first report	77001
<i>Traponora fusca</i>	new to Brazil	77342
<i>Tricharia carnea</i>	MS first report	77231
<i>Trichothelium alboatrum</i>	MS first report	77711
<i>Trypethelium eluteriae</i>		77016

<i>Trypethelium luteolucidum</i>	MS first report	77639
<i>Trypethelium platystomum</i>	MS first report	77134
<i>Trypethelium subeluteriae</i>	MS first report	77003
<i>Tylophoron hibernicum</i>	MS first report	77180
<i>Tylophoron moderatum</i>		77005
<i>Usnea subelegans</i>		77743
<i>Verrucaria elaeina</i>	MS first report	77422
<i>Verrucaria elaeomelaena</i>	MS first report	77844
<i>Verrucaria nigrescens</i>	MS first report	77539
<i>Xanthoparmelia catarinae</i>	MS first report	77779
<i>Xanthoparmelia mexicana</i>	MS first report	77772
<i>Xanthoparmelia mougeotina</i>	MS first report	77790
<i>Xanthoparmelia neopropagulooides</i>	MS first report	77780
<i>Yoshimuriella subdissecta</i>	MS first report	77124