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Two new crustose *Cladonia* species with strepsilin and other new lichens from the Serra de Maracaju, Mato Grosso do Sul, Brazil

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ABSTRACT
Five species of lichens are described as new from the Serra de Maracaju in Mato Grosso do Sul (Brazil): *Cladonia gumboskii* Aptroot, M.F. Souza & Spielmann, sp. nov. (also reported from five other states in Brazil), *C. zebrathallina* Aptroot & Spielmann, sp. nov., *Lecanora fluoroxylina* Aptroot & M.F.Souza, sp. nov. (also reported from Mato Grosso and Paraná), *L. lichexanthoxylina* Aptroot & M.F. Souza, sp. nov., and *Trypethelium muriforme* Aptroot & M.F.Souza, sp. nov.. A further 123 species are reported new to the area, of which ten are first records for Brazil and a further 41 are first records for the state.

KEY WORDS
Lecanora, Trypethelium, Cerrado, new species.

RÉSUMÉ
Deux nouvelles espèces de Cladonia *crustacés avec strepsiline et autres nouveaux lichens de la Serra de Maracaju, Mato Grosso do Sul, Brésil.*
Cinq espèces de lichens sont décrites comme nouvelles de la Serra de Maracaju dans le Mato Grosso do Sul (Brésil) : *Cladonia gumboskii* Aptroot, M.F. Souza & Spielmann, sp. nov. (également signalé dans cinq autres États du Brésil), *C. zebrathallina* Aptroot & Spielmann, sp. nov., *Lecanora fluoroxylina* Aptroot & M.F.Souza sp. nov. (également signalé dans le Mato Grosso et le Paraná), *L. lichexanthoxylina* Aptroot & M.F.Souza, sp. nov., et *Trypethelium muriforme* Aptroot & M.F.Souza, sp. nov. En outre, 123 espèces sont signalées comme nouvelles dans la région, dont dix sont des premières mentions pour le Brésil et 41 pour l'État.

MOTS CLÉS
Lecanora, Trypethelium, Cerrado, espèces nouvelles.

INTRODUCTION

The Serra de Maracaju is situated in Mato Grosso do Sul, at the margin of the pre-cambrian sandstone plateau that covers most of the state. Here, steep cliffs, created by the Aquidauana river and its tributaries, mark the transition to the Pantanal. Exposed parts of the cliffs are covered by lichens, predominantly *Xanthoparmelia* (Vain.) Hale. Trees and shrubs support additional species, and the wooden poles of fences posts are often full of lichens as well. Fleig & Riquelme (1991) reported 72 lichen species from the area, mostly corticolous macrolichens.

Cladonia P. Browne, the type genus of the Cladoniaceae Zenker, is a large genus of generally fruticose lichens. Most species are dimorphic, composed of a squamulose or crustose basal part and a vertically elongated and usually branched part called podetium. Observations of such crustose basal thalli are restricted to a small portion of the species assigned to subgenus *Cladina* Nyl., as most species occur on soil and such crusts are only developed on the rare cases when such species grow in a more stable substratum like decorticated wood. Brazil is the country with the world's richest *Cladonia* funga, in species number, number of endemic species and spread in characters (Ahti 2000; Gumboski & Eliasaro 2011; Gumboski *et al.* 2013). Recently, from mountains in Bahia, *Cladonia minisaxicola* Aptroot & M. Cáceres was described (Aptroot & Cáceres 2018), which is the only *Cladonia* species that remains crustose, without developing podetia. It only forms shortly stalked pycnidia. Until then, the most crustose species was *C. curta* Ahti & M.P. Marcelli (Ahti 2000), also described from Brazil and actually growing in Piraputanga (a district from Municipality of Aquidauana, Mato Grosso do Sul); see Table 1 below. It has a thick crustose thallus made up of agglutinated, long and much divided squamules. *Cladonia crustacea* Ahti (Ahti 2000) is, notwithstanding its name, not crustose at all. In the same paper about new lichens from Bahia (Aptroot & Cáceres 2018), *Cladonia lichexanthonica* Aptroot & M. Cáceres was described, which is the first known *Cladonia* with lichexanthone. This is a rather common cortical substance in some groups of tropical lichens, but a rare substance in temperate and arctic lichens, and unknown from many taxonomic groups.

Strepsilin is a chemical substance that is unique to one single *Cladonia* species, *Cladonia strepsilis* (Ach.) Grognot (Ahti 2000). It is a rare substance in nature, furthermore only known from a few *Lepraria* species, including *Lepraria goughensis* Elix & Øvstedal (Elix *et al.* 2005), *L. larrainiana* Lendemer (Lendemer 2010), and *L. xerophila* Tønsberg (Elix & Tønsberg 2004). Its presence in a lichen is easily recognized by the unique C+ blue-green colour reaction, but it is also quite characteristic on a TLC plate.

To our surprise, we came across two undescribed crustose *Cladonia* species in Piraputanga, both of which contain strepsilin, and one of which also contains lichexanthone. We describe them below as new to science. One is now already known from five other Brazilian states, as it was often collected before but filed as unknown crust; it must be the most common still undescribed *Cladonia*.

On wooden fences and fence poles, there is often a lush vegetation of lichens present, mostly a mosaic of crustose species with the occasional foliose and fruticose species overgrowing them. Most of the species present on this substratum are also known from bark, but not all.

Among the species that seem to be characteristic for wooden fences are two species of *Lecanora* Ach. that we found in various places but that seem to be undescribed so far. *Lecanora* is in the current wide sense a large genus, the type genus of the Lecanoraceae Körb. There exists no monograph, and even most regional treatments are only partial.

The genus *Trypethelium* Spreng. is common and turns out to be quite rich in species in southern Brazil. It is the type genus of the Trypetheliaceae Eschw., and was monographed by Aptroot & Lücking (2016). Recently (Aptroot & Spielmann 2020), three new species were described from Mato Grosso do Sul alone. Here we add another one, the first species in this genus with muriform ascospores.

MATERIAL AND METHODS

During three trips in 2019 and 2020, specimens were collected by the authors, using Opinel knife or hammer and chisel, examined by 10× hand lens (Leuchtlupe with 365nm 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 or AK3ST stereomicroscope 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 or Motic with iPhone. Chemical spot reactions are abbreviated as K (5% KOH), C (commercial bleach), KC (K followed by C), P (paraphenylenediamine, Steiner's solution), and UV refers to fluorescence at 366 nm. Thin-layer chromatography (Orange *et al.* 2001) has been applied by A. Aptroot using solvent A.

RESULTS

The Serra de Maracaju was found to be quite rich in lichen species, much richer than the 72 species reported by Fleig & Riquelme (1991) suggested. 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). Several specimens seem to belong to undescribed species though. Here we describe several new species to science from the region. A further 123 species are reported new to the area (Table 1), of which ten are first records for Brazil and a further 41 are first records for the state.

TABLE 1. — Lichen species encountered by the authors in 2019 and 2020 in the Serra de Maracaju, Mato Grosso do Sul, Brazil, with status of report and Aptroot collection number.

Name	new record	Aptroot no.	Date	Substratum	Locality	Alt.	Lat./Long.
Astrothelium aeneoides Aptroot		81442	27.VI.2020	bark	2 km SW of Piraputanga	175 m	20°29'18"S, 55°33'17"W
Astrothelium cinnamomeum (Eschw.) Müll. Arg.	new to MS	81446	27.VI.2020	bark	2 km SW of Piraputanga	175 m	20°29'18"S, 55°33'17"W
Astrothelium inspersaeneum Aptroot & M. Cáceres	new to MS	80714	28.XI.2019	tree bark	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Astrothelium neoinspersum Aptroot	new to MS	80874	14.III.2020	tree bark	Piraputanga, Chacará São Gabriel	160 m	20°29'04"S, 55°31'58"W
Astrothelium nitidiusculum (Nyl.) Aptroot & Lücking		80735	8.XII.2019	tree bark	Rochedo, 7 km NE	300 m	19°55'S, 54°50'W
Bathelium madreporiforme (Eschw.) Trevis.		81362	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 5°38'47"W
Bathelium mastoideum Afzel. ex. Ach.		80729	8.XII.2019	tree bark	Rochedo, 7 km NE	300 m	19°55'S, 54°50'W
Buellia mamillana (Tuck.) W.A. Weber		80540	26.XI.2019	exposed sandstone rock	Vila Piraputanga	190 m	20°29'S, 55°29'W
Buellia stellulata (Tayl.) Br. & Rostr.		80541	26.XI.2019	exposed sandstone rock	Vila Piraputanga	190 m	20°29'S, 55°29'W
Bulbothrix regnelliana Jungbluth, Marcelli & Elix	new to MS	80723	28.XI.2019	tree bark	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Caloplaca baueri (Müll. Arg.) Zahlbr.	new to MS	80724a	28.XI.2019	exposed conglomerate rock	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Caloplaca brachyloba (Müll. Arg.) Zahlbr.	new to MS	80513	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Caloplaca brasiliensis (Müll. Arg.) Zahlbr.	new to MS	80884a	15.III.2020	exposed siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Caloplaca cupulifera (Vain.) Zahlbr.		80489	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Caloplaca diplacia (Ach.) Riddle	new to MS	80705	28.XI.2019	exposed conglomerate rock	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Caloplaca erythrantha (Tuck.) Zahlbr.		81365	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Caloplaca subvitellina (Müll. Arg.) Zahlbr.		81391	27.VI.2020	shaded sandstone	Camisão	150 m	20°28'52"S, 55°38'47"W
Chrysothrix xanthina (Vain.) Kalb		80523	26.XI.2019	wood	Vila Piraputanga	250 m	20°29'S, 55°29'W
Cladonia subradiata (Vain.) Sandstede		80539	26.XI.2019	exposed sandstone rock	Vila Piraputanga	190 m	20°29'S, 55°29'W
Clandestinotrema minutum Aptroot	new to Brazil	80915	15.III.2020	tree bark	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Coccocarpia pellita (Ach.) Müll. Arg.	new to MS	80519	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Coenogonium moniliforme Tuck.	new to MS	81376	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Coenogonium subdentatum (Vězda & G. Thor) Rivas Plata, Lücking, Umaña & Chaves		81345	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Constrictolumina planorbis (Ach.) Lücking, M.P. Nelsen & Aptroot		81436	27.VI.2020	bark	2 km SW of Piraputanga	175 m	20°29'18"S, 55°33'17"W
Cratiria obscurior (Stirt.) Marbach & Kalb		81371	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Dendrographa austrosorediata Aptroot & Gumboski		80887	15.III.2020	overhanging siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Dictyomeridium proponens (Nyl.) Aptroot, M.P. Nelsen & Lücking		81427	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Diorygma confluens (Fée) Kalb, Staiger & Elix	new to MS	80502	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Diorygma poitaei (Fée) Kalb, Staiger & Elix		81415	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W

Table 1. — Continuation.

Name	new record	Aptroot no.	Date	Substratum	Locality	Alt.	Lat./Long.
Diploschistes hypoleucus (Vain.) Zahlbr.	new to MS	80488	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Dirinaria picta (Sw.) Clem. & Shear		81352	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Dirinaria purpurascens (Vain.) B.J. Moore		80501	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Endocarpon pallidulum (Nyl.) Nyl.	new to MS	80482	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Enterographa subquassiicola M. Cáceres & Lücking	new to MS	81375	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Fellhanera bouteillei (Desm.) Vězda		80745	8.XII.2019	tile	Rochedo, 7 km NE	300 m	19°55'S, 54°50'W
Fissurina pseudostromatica Lücking & Rivas Plata		81357	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Flakea papillata O.E. Erikss.		80880	14.III.2020	tree bark	Piraputanga, Chacará São Gabriel	160 m	20°29'04"S, 55°31'58"W
Gassicurtia coccinea Fée	new to MS	81401 pp	27.VI.2020	wood	Camisão	150 m	20°28'52"S, 55°38'47"W
Glyphis scyphulifera (Ach.) Staiger		81368	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Graphis caesiocarpa Redinger	new to MS	81353	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Graphis hyphosa Staiger		80707	28.XI.2019	tree bark	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Graphis pinicola Zahlbr.	new to MS	81341	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Graphis pyrrhocheiloides Zahlbr.	new to MS	81339	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Graphis submarginata Lücking		81340	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Graphis tenuirima (Shirley) A.W. Archer	new to MS	80487	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Haematomma flexuosum Hillm.		81401 pp	27.VI.2020	wood	Camisão	150 m	20°28'52"S, 55°38'47"W
Hyperphyscia viridissima (Müll. Arg.) Scutari		81418	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Hypotrachyna novella (Vain.) Hale	new to MS	80907	15.III.2020	tree bark	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Karoowia saxeti (Stizenb.) Hale	new to MS	80883	15.III.2020	exposed siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Lecanora brasiliana Zahlbr.	new to MS	80884	15.III.2020	exposed siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Lecanora cerradoensis Guderley	new to MS	80702	28.XI.2019	exposed conglomerate rock	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Lecanora helva Stizenb.		81360	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Lecanora hypofusca Aptroot & M. Cáceres	new to MS	80895	15.III.2020	exposed siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Lecanora kalbiana Lumbsch	new to MS	80699	28.XI.2019	exposed conglomerate rock	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Lecanora lichexanthona Guderley		80526	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Lecanora pseudistera Nyl.		80510	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Lecanora subimmergens Vain.	new to MS	80742	8.XII.2019	tile	Rochedo, 7 km NE	300 m	19°55'S, 54°50'W
Lecanora subimmersa (Fée) Vain.		80546	26.XI.2019	exposed sandstone rock	Vila Piraputanga	190 m	20°29'S, 55°29'W
Lecanora tropica Zahlbr.		81373	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Lecidella enteroleucella (Nyl.) Hertel	new to Brazil	81463	9.VIII.2020	sandstone along river	Rochedo, along Rio Aquidauana	240 m	19°57'11"S, 54°53'44"W
Lepraria sipmaniana (Kümmerl. & Leuckert) Kukwa	new to MS	80516	26.XI.2019	overhanging sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Leptogium coralloideum (Meyen & Flotow) Vain.		81431	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W

Table 1. — Continuation.

Name	new record	Aptroot no.	Date	Substratum	Locality	Alt.	Lat./Long.
Leptogium isidiosellum (Riddle) Sierk		81430	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Leucodecton desquamescens (Vain.) Lücking	new to Brazil	80509	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Malmidea flavopustulosa (M. Cáceres & Lücking) M. Cáceres & Kalb		81414	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Myriostigma xanthonicum Aptroot & M. Cáceres	new to MS	80485	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Neoprotoparmelia multifera (Nyl.) Garima Singh, Lumbsch & I. Schmitt		81401 pp	27.VI.2020	wood	Camisão	150 m	20°28'52"S, 55°38'47"W
Nigrovothelium inspersotropicum Aptroot & Diederich		81332	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Parallopsora leucophyllina (Nyl.) Kistenich, Timdal, Bendiksby & S. Ekman	new to MS	81404	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Parmotrema crinitum (Ach.) M. Choisy		81440	27.VI.2020	bark	2 km SW of Piraputanga	175 m	20°29'18"S, 55°33'17"W
Parmotrema masonii Ferraro	new to MS	80486	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Parmotrema subcaperatum (Kurokawa) Hale		80511	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Parmotrema subtinctorium (Zahlbr.) Hale	new to MS	81410	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Peltula clavata (Kremp.) Wetm.		81487	9.VIII.2020	sandstone along river	Rochedo, along Rio Aquidauana	240 m	19°57'11"S, 54°53'44"W
Peltula euploca (Ach.) Poelt ex Ozenda & Clauzade		81478	9.VIII.2020	sandstone along river	Rochedo, along Rio Aquidauana	240 m	19°57'11"S, 54°53'44"W
Peltula lingulata (Vain.) Swinscow & Krog	new to MS	80533	26.XI.2019	exposed sandstone rock	Vila Piraputanga	190 m	20°29'S, 55°29'W
Peltula obscurans (Nyl.) Gyeln.		80493	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Peltula omphaliza (Nyl.) Wetmore	new to Brazil	80515	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Pertusaria flavens Nyl.		81346	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Phaeographis dendritica (Ach.) Müll. Arg.		81355	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Phyllopsora cinchonarum (Fée) Timdal		80703	28.XI.2019	tree bark	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Phyllopsora corallina (Eschw.) Müll. Arg.		81402	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Phyllopsora nigrocincta Timdal	new to MS	81397	27.VI.2020	shaded sandstone	Camisão	150 m	20°28'52"S, 55°38'47"W
Phyllopsora pyrrhomelaena (Tuck.) Swinscow & Krog		81372	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Phyllopsora pyxinoides (Nyl.) Kistenich, Timdal, Bendiksby & S. Ekman		81435	27.VI.2020	bark	2 km SW of Piraputanga	175 m	20°29'18"S, 55°33'17"W
Phyllopsora santensis (Tuck.) Swinscow & Krog		81426	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Physcia aipolia (Ehrenb. ex Humb.) Fürnrohr		81417	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Physcia alba (Fée) Müll. Arg.		81343	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Placidiopsis hypothallina Aptroot	new to MS	80894	15.III.2020	exposed siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Platygramme caesiopruinosa (Fée) Fée		81335	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Porina chlorotica (Ach.) Müll. Arg.		81392	27.VI.2020	shaded sandstone	Camisão	150 m	20°28'52"S, 55°38'47"W
Porina nigrofusca Müll. Arg.		81380	27.VI.2020	sheltered siliceous rock	Camisão	150 m	20°28'52"S, 55°38'47"W
Pseudopyrenula superans Müll. Arg.	new to Brazil	80900	15.III.2020	exposed siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W

TABLE 1. — Continuation.

Name	new record	Aptroot no.	Date	Substratum	Locality	Alt.	Lat./Long.
Pyrenula anomala (Ach.) A. Massal.		81467	9.VIII.2020	bark	Rochedo, along Rio Aquidauana	240 m	19°57'11"S, 54°53'44"W
Pyrenula bahiana Malme	new to MS	81465	9.VIII.2020	bark	Rochedo, along Rio Aquidauana	240 m	19°57'11"S, 54°53'44"W
Pyrenula dissimulans (Müll. Arg.) R.C. Harris	new to MS	81364	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Pyrenula mamillana (Ach.) Trevis.		81425	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Pyrenula quassiicola (Fée) Fée		81381	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Pyrenula subducta (Nyl.) Müll. Arg.		81428	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Pyrenula thelomorpha Tuck.	new to MS	80713	28.XI.2019	tree bark	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Pyxine eschweileri (Tuck.) Vain.		81455	27.VI.2020	bark	2 km SW of Piraputanga	175 m	20°29'18"S, 55°33'17"W
Ramonia intermedia Kalb	new to MS	81486pp	9.VIII.2020	sandstone along river	Rochedo, along Rio Aquidauana	240 m	19°57'11"S, 54°53'44"W
Rinodina lepida (Nyl.) Vain.	new to MS	80903	15.III.2020	exposed siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Rinodina oxydata (A. Massal.) A. Massal.		80722	28.XI.2019	exposed conglomerate rock	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Scoliciosporum camptosporum (Vain.) Aptroot		80892	15.III.2020	exposed siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Sculptolumina japonica (Tuck.) Marbach		80916	15.III.2020	tree bark	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Septotrapelia triseptata (Hepp) Aptroot	new to Brazil	81457	27.VI.2020	shaded sandstone	2 km SW of Piraputanga	175 m	20°29'18"S, 55°33'17"W
Septotrapelia usnica (Sipman) Lendemer & Bungartz	new to Brazil	80483	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Stigmatochroma metaleptodes (Nyl.) Marbach		81367	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Thelenella luridella (Nyl.) Mayrh.	new to MS	80532	26.XI.2019	exposed sandstone rock	Vila Piraputanga	190 m	20°29'S, 55°29'W
Toninia submexicana B. de Lesd.	new to Brazil	Spielmann s.n.	26.IX.014	exposed conglomerate rock	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Trypethelium aureornatum Aptroot		80877	14.III.2020	tree bark	Piraputanga, Chacará São Gabriel	160 m	20°29'04"S, 55°31'58"W
Trypethelium foveolatum Müll. Arg.	new to MS	80709	28.XI.2019	tree bark	Dois Irmãos do Buriti, Palmeiras	225 m	20°30'S, 55°21'W
Trypethelium platystomum Mont.		81337	27.VI.2020	bark	Camisão	150 m	20°28'52"S, 55°38'47"W
Trypethelium subeluteriae Makhija & Patw.		81449	27.VI.2020	bark	2 km SW of Piraputanga	175 m	20°29'18"S, 55°33'17"W
Tylophoron moderatum Nyl.		80896	15.III.2020	overhanging siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Verrucaria aquatilis Mudd	new to Brazil	81481	9.VIII.2020	sandstone along river	Rochedo, along Rio Aquidauana	240 m	19°57'11"S, 54°53'44"W
Verrucaria elaeina Borrer		81377	27.VI.2020	shaded sandstone	Camisão	150 m	20°28'52"S, 55°38'47"W
Verrucaria macrostoma DC.	new to Brazil	81469	9.VIII.2020	sandstone along river	Rochedo, along Rio Aquidauana	240 m	19°57'11"S, 54°53'44"W
Verrucaria nigrescens Pers.		80902	15.III.2020	exposed siliceous rock	Camisão, Mirador de Paxixi	600 m	20°23'09"S, 55°36'59"W
Xanthoparmelia mexicana (Gyeln.) Hale		80544	26.XI.2019	exposed sandstone rock	Vila Piraputanga	190 m	20°29'S, 55°29'W
Xanthoparmelia microspora (Müll. Arg.) Hale	new to MS	80499	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W
Xanthoparmelia neopropaguloides Hale		80497	26.XI.2019	exposed sandstone rock	Vila Piraputanga	250 m	20°29'S, 55°29'W

Family Cladoniaceae Zenker
Genus *Cladonia* P.Browne

Cladonia gumboskii
Aptroot, M.F. Souza & Spielmann, sp. nov.
(Fig. 1)

Mycobank. — MB 83946.

Diagnosis. — Saxicolous *Cladonia* with microsquamulose much incised thallus containing lichexanthone and strepsilin, thin, paraplectenchymatous upper cortex, and sessile, almost black, strongly concave pycnidia.

Type. — **Brazil**. Santa Catarina, São Bento do Sul, APA Rio Vermelho, on siliceous rock near river, 1.IV.2019, *A.Aptroot 78841* (holo-, CGMS; iso-, ABL).

Additional material studied. — **Brazil**. Mato Grosso do Sul: Aquidauana, Vila Piraputanga, alt. 250 m, 20°29'S, 55°29'W, on exposed sandstone rock, 26.XI.2019, *A.Aptroot 80481*; same details, *80505*; Mato Grosso: Cuiaba, Chapada dos Guimarães, on sandstone, 12-18.IX.2020, *A.Aptroot & M.F. Souza 81722*; São Paulo: Piquete, on rock, I.2007, *L.Canêz 2458*; Rio Grande do Sul: Canguçu, Florida, on soil, 16.VII.2019, *A.Aptroot 79345*; Piratini, Cerro do Ubaldo, 17.VII.2019, *A.Aptroot 79484* (para-, CGMS); Paraná: Curitiba. *S.Eliasaro s.n.* (para-, JOI).

Etymology. — Named after Emerson Gumboski, specialist of Brazilian *Cladonia* and the first to recognize that this was a remarkable species.

Ecology and distribution. — On exposed siliceous rock; only known from Brazil.

Description
Thallus crustose, mineral grey, consisting of scattered to dense, *c.* 0.2-0.4 mm diam., mostly appressed squamules, corticate. Squamules flat, crenate, contiguous or somewhat overlapping, sometimes ascending at the tips, sometimes mozaic-forming. Thallus 140-210 µm thick, upper cortex hyaline, 1-2 cells thick, *c.* 5-8 µm, paraplectenchymatous. Ascomata not observed. Pycnidia common, usually centrally in the thalli, almost black, sessile on the thallus, *c.* 0.2 mm diam., strongly concave. Conidia not seen.Chemistry. Thallus UV+ bright yellow, C+ blue green, P-, K-. TLC: lichexanthone and strepsilin.

Discussion
The species is similar to *Cladonia minisaxicola*, but differs markedly by the chemistry, which can already be tested in the field (C+ blue green, UV+ yellow). Although it is known already from five states in Brazil, it was never found fertile, which is not unusual in *Cladonia.*

Cladonia zebrathallina Aptroot & Spielmann, sp. nov.
(Fig. 2)

Mycobank. — MB 83947.

Diagnosis. — Terricolous *Cladonia* with squamulose thallus containing fumarprotocetraric acid and strepsilin, lobate, with black apothecia and black, globose pycnidia with filiform, curved to sigmoid conidia of 20-35 × 0.5 µm.

Type. — **Brazil**. Mato Grosso do Sul, Aquidauana, Vila Piraputanga, alt. 250 m, 20°29'S, 55°29'W, on exposed sand, 26.XI.2019, *A.Aptroot 80479* (holo-, CGMS; iso-, ABL).

Additional material studied. — **Brazil**. Mato Grosso do Sul: Aquidauana, Vila Piraputanga, alt. 250 m, 20°29'S, 55°29'W, on exposed sand, 26.XI.2019, *A.Aptroot 80508*; same locality, 26.IX.2014, *A.A.Spielmann s.n.* (para-, CGMS).

Chemistry. — Thallus UV-, C+ blue green, P+ red, K-. TLC: fumarprotocetraric acid and strepsilin.

Etymology. — Named after the surface pattern that reminds somewhat of a zebra, and the thallus.

Description
Thallus squamulose, greenish grey, consisting of short, *c.* 0.7-1.4 mm diam., mostly ascending squamules, corticate. Squamules flat to convex, crenate, strongly overlapping in several layers in a 2-3 mm thick crust, surface with a dense network of paler greyish pseudocyphellae, the main ones of them aligned in the length direction of the lobes. Lower surface black. Thallus squamules *c.* 100-200 µm thick, upper cortex hyaline, 1-2 cells thick, *c.* 5-10 µm, paraplectenchymatous. Apothecia common, black, lobate, convex, flat to 0.8-1.4 mm diam., sessile and not higher than the lobes, without differentiated margin. Epihymenium brown, *c.* 10 µm thick. Hymenium *c.* 100 µm high. Ascospores not observed. Pycnidia common, marginal, globose, black, 0.1-0.2 mm. Pycnidial wall *c.* 35 µm thick, carbonized in the upper half. Conidia hyaline, filiform, curved to sigmoid, 20-35 × 0.5 µm.

Discussion
The species has a unique morphology by the sessile apothecia, and a unique chemistry, which can already be tested in the field (C+ blue green, P+ red).

Family Lecanoraceae Körb.
Genus *Lecanora* Ach.

Lecanora fluoroxylina
Aptroot & M.F. Souza, sp. nov.
(Fig. 3)

MycoBank. — MB 83948.

Diagnosis. — Lignicolous *Lecanora* with extensive thallus of usnic acid colour, apothecia with granularly sorediate margins that are higher than the disk.

Type. — **Brazil**. Mato Grosso do Sul, Aquidauana, Camisão, alt. 150 m, 20°28'52"S, 55°36'47"W, on wooden fence post, 27.VI.2020, *A.Aptroot & M.F. Souza 81401* (holo-, CGMS;iso-, ABL).

Additional material studied. — **Brazil**. Mato Grosso do Sul: Miranda, Salobra, on wooden fence post, 26.VI.2020, *A.Aptroot & M.F. Souza 81310a*; Campo Grande, UCDB campus, on wooden fence post, 13.III.2020, *A.Aptroot & M.F. Souza 80858*; Mato Grosso: Cuiaba, Chapada dos Guimarães, on wood, 12-18.IX.2020, *M.F. Souza & A.Aptroot 104*; Paraná: Antonina, Cacatu, on wood of fence, 17.X.2020, *M.F. Souza & A.Aptroot 268* (para-, CGMS).

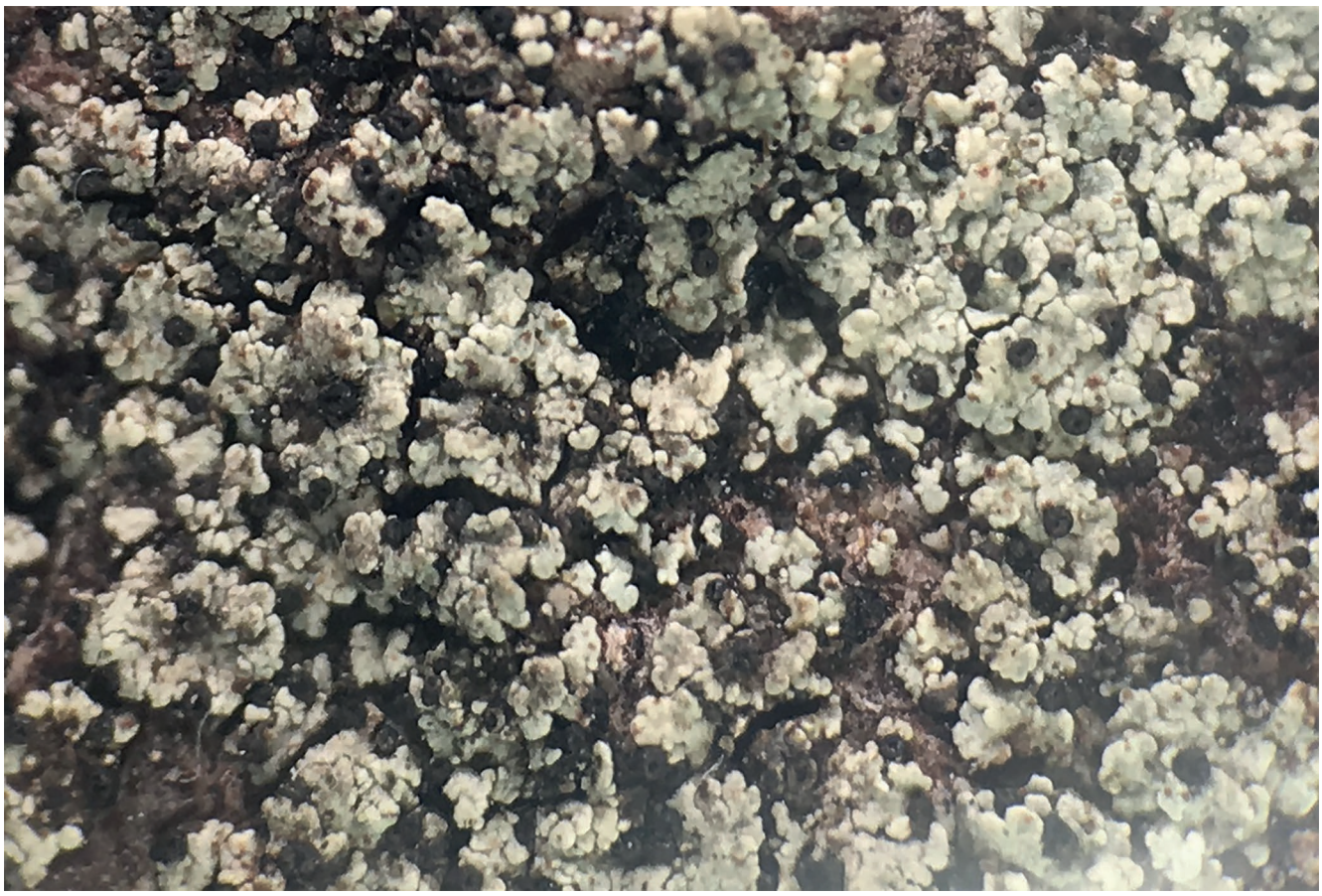

Fig. 1. — *Cladonia gumboskii* sp. nov., holotype, habitus. Width of picture: 9 mm.

Chemistry. — Thallus and apothecia UV-, C-, P+ yellow-orange, K+ yellow, KC+ yellow. TLC: usnic acid and zeorin.

Etymology. — Named after the colour that resembles the fluorescence of lichexanthone, and the occurrence on wood.

Ecology and distribution. — On wooden poles and fences; so far only known from two states in Brazil, but expected to occur in bordering states and countries.

Description

Thallus crustose, lignicolous, greyish green (usnic acid colour), smooth to granular, sorediate, without prothallus or rarely surrounded by thin black line. Soralia pale greenish, initially punctiform, later usually a bit higher than the thallus but soon confluent and covering most of the thallus, of thallus colour or colour a bit more saturated. Soredia granular, 25-45 µm. Apothecia often present, sessile, round to usually angular, 0.2-0.7 mm diam., up to 0.3 mm high. Margin of thallus colour, granular sorediate, higher than the disk, *c*. 0.1 mm wide. Disk flat to somewhat convex, pale ochraceous, with greenish (usnic acid) pruina. Epihymenium a dense mass of small usnic acid crystals that extend downward in streaks into the hymenium. Hypothecium hyaline. Excipulum only with small usnic acid crystals. Ascospores and pycnidia not observed.

Discussion

This is a locally very abundant, conspicuous species, visible and identifiable from the road. Although many species of *Lecanora* have been described, and many have been reported from Brazil, there seems not to be a clear fit with any described species. The observed chemistry is known from several other *Lecanora* species, including some sorediate ones; the organization of the apothecia confirms that the new species belongs to the genus *Lecanora* in the current wide sense. The new species is characterized by the extended thalli of usnic acid colour and the often abundant apothecia with granularly sorediate margins that are higher than the disk. No ascospores were found in many apothecia examined; the species clearly disperses by soredia.

Lecanora lichexanthoxylina
Aptroot & M.F. Souza, sp. nov.
(Fig. 4)

MycoBank. — MB 83949.

Diagnosis. — Lignicolous *Lecanora* with abundant apothecia with crenulate thalline margin and specially with the presence of lichexanthone.

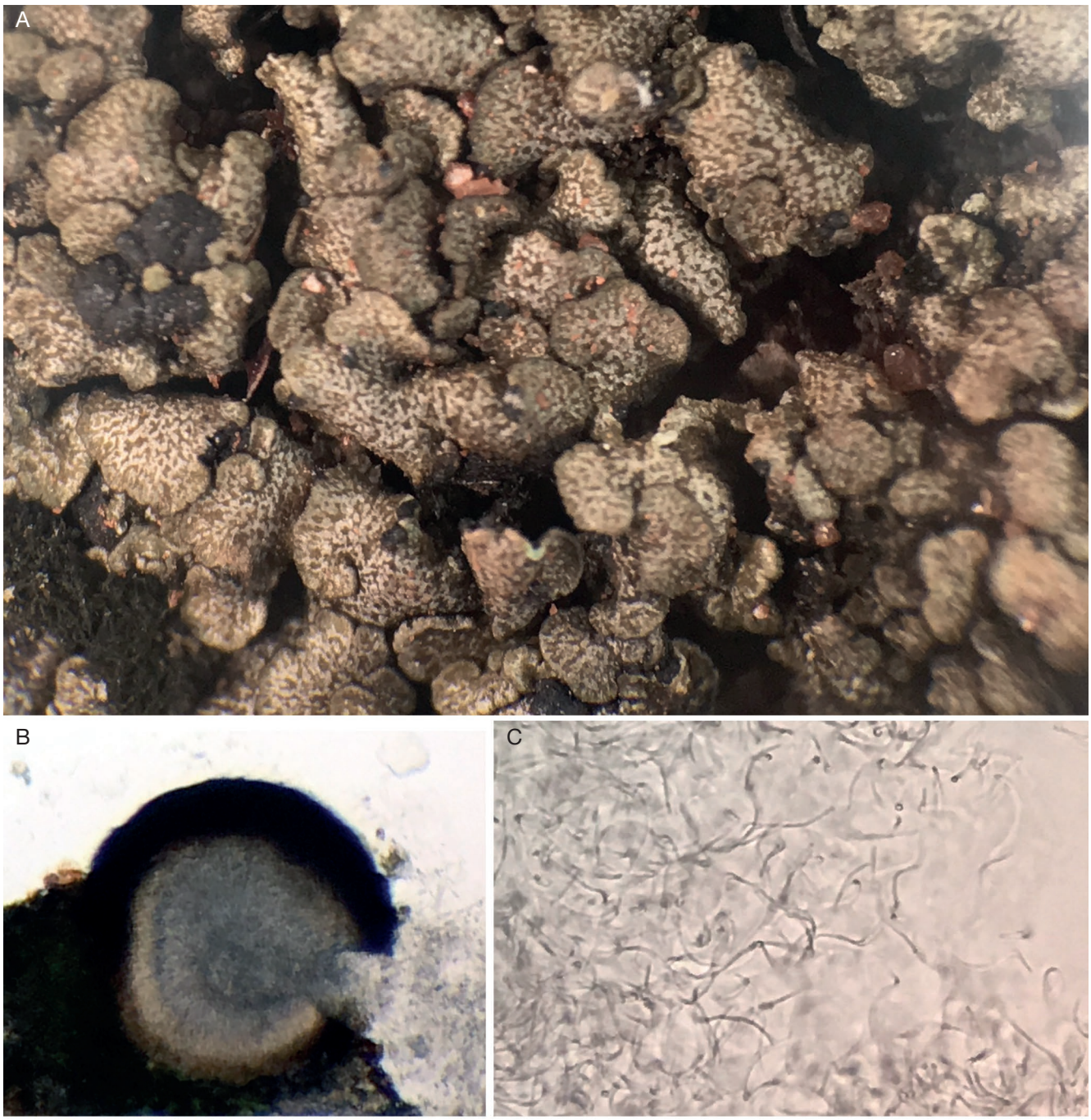

Fig. 2. — *Cladonia zebrathallina* Aptroot & Spielmann, sp. nov., holotype: **A**, habitus; **B**, pycnidium; **C**, conidia. Width of pictures: A, 10 mm, B, 250 µm, C, 120 µm.

Type. — **Brazil**. Mato Grosso do Sul, Miranda, Salobra, alt. 120 m, 20°10'19"S, 56°30'26"W, on wooden fence post, 26.VI.2020, *A.Aptroot & M.F. Souza 81310* (holo-, CGMS; iso-, ABL).

Additional material examined. — **Brazil**. Mato Grosso do Sul: Campo Grande, UCDB campus, on wooden fence post, 13.III.2020, *A.Aptroot & M.F. Souza 80870*; Naviraí, Fazenda Três Irmãos, on wooden fence post, 28.IX.2019, *A.Aptroot 80311* (para-, CGMS).

Chemistry. — Thallus and apothecia UV+ yellow, C-, P-, K-. TLC: lichexanthone.

Etymology. — Named after the lichexanthone content and the occurrence on wood.

Ecology and Distribution. — On wooden poles and fences; so far only known from one state in Brazil, but expected to occur in other states and countries.

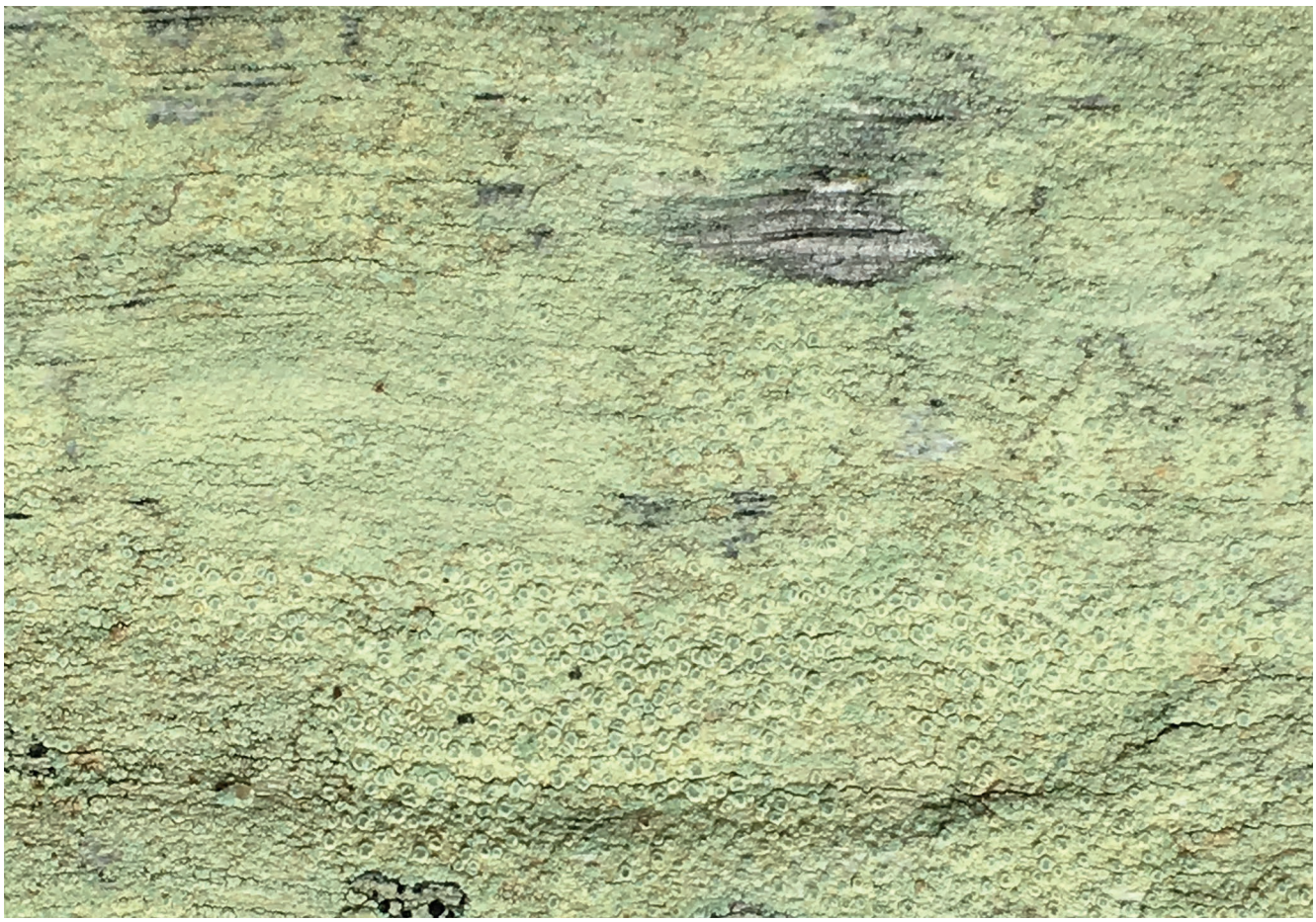

Fig. 3. — *Lecanora fluoroxylina* Aptroot & M.F. Souza, sp. nov., isotype, habitus. Width of picture: 30 mm.

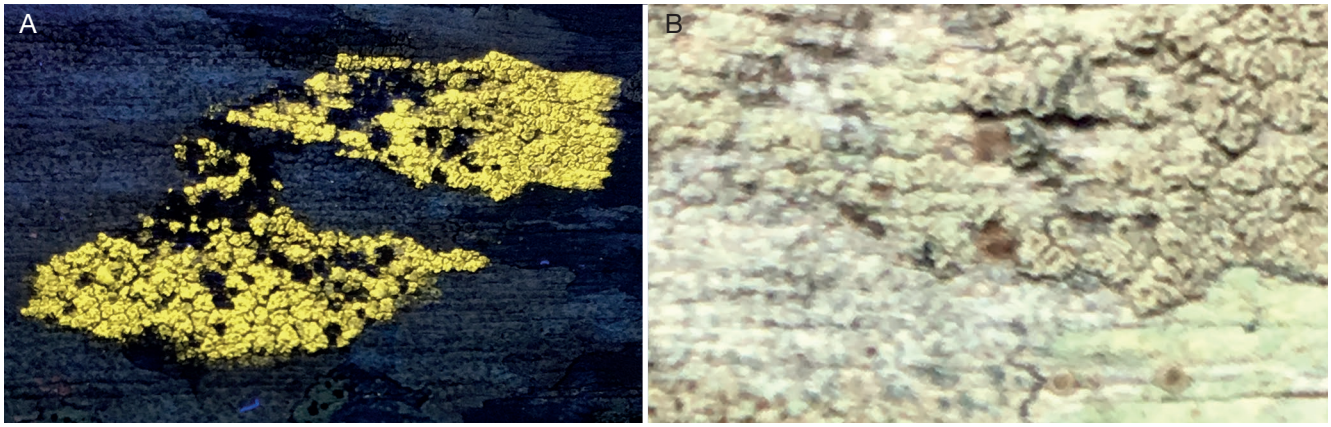

Fig. 4. — *Lecanora lichexanthoxylina* Aptroot & M.F. Souza, sp. nov., holotype: **A**, habitus with UV; **B**, habitus. Width of pictures: A, 30 mm; B, 10 mm.

Description

Thallus crustose, lignicolous, greyish white, smooth, mostly obscured by apothecia, without prothallus. Apothecia obscuring most of the thallus, sessile, irregularly angular while crowded, 0.3-0.6 mm diam. Margin of thallus colour, bulbose, crenate to coronate, higher than the disk, *c.* 0.1 mm wide. Disk pale ochraceous, without pruina. Epihymenium pale brown, without crystals. Hypothecium hyaline. Excipulum with large

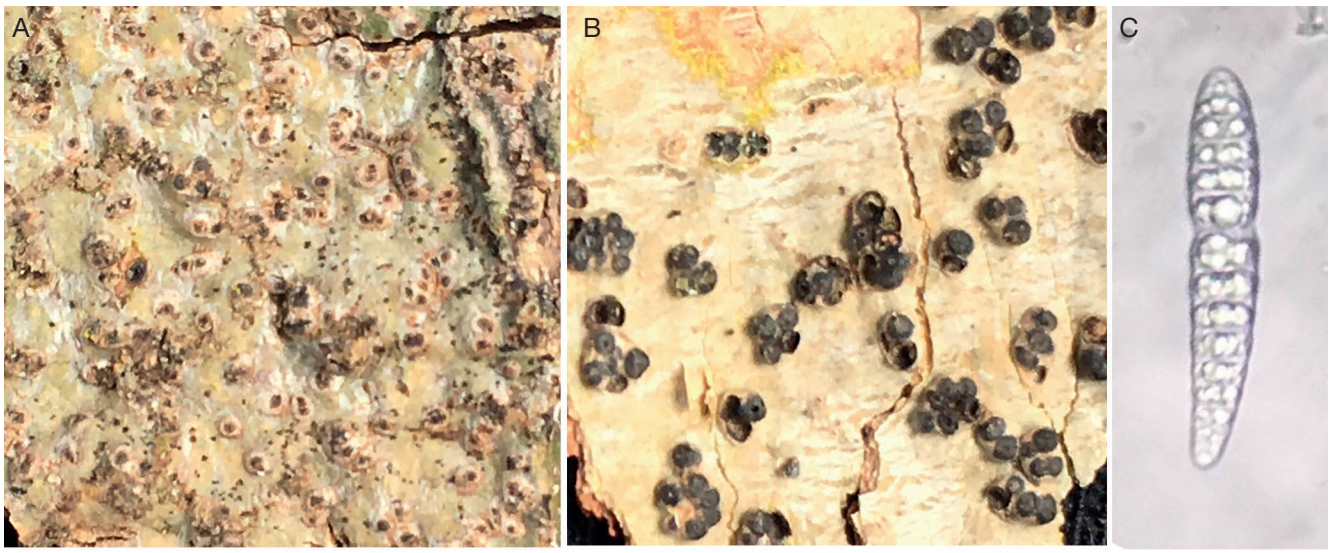

Fig 5. — *Trypethelium muriforme* Aptroot & M.F. Souza, sp. nov.: **A**, holotype, habitus; **B**, Aptroot & Souza 81453, habitus; **C**, holotype, ascospore. Width of pictures: A, B, 15 mm; C, 90 µm.

calcium oxalate crystals. Ascospores 8/ascus, 9-11 × 5-6 µm. Pycnidia not observed.

Discussion

We did not find a clear fit with any ohe many species described in *Lecanora*. The new species is characterized by the crenulate thalline margin of the apothecia and specially by the presence of lichexanthone. No species with lichexanthone is known that comes close. The species is not abundant but we have observed it in more places than where we collected it, because it often grows on the hardest wooden poles, from where it can not always be collected.

Family Trypetheliaceae Zenker
Genus *Trypethelium* Spreng.

Trypethelium muriforme
Aptroot & M.F. Souza, sp. nov
(Fig. 5)

MycoBank. — MB 83950.

Diagnosis. — Corticolous *Trypethelium* with thallus UV+ yellow and pseudostroma UV-negative, ascospores muriform, 50-70 × 10-13 µm.

Type. — **Brazil**. Mato Grosso do Sul, Aquidauana, 2 km SW of Piraputanga, alt. 175 m, 20°29"S, 55°33'17"W, on bark, 27.XI.2019, *A.Aptroot & M.F. Souza 81448* (holo-, CGMS; iso-, ABL).

Additional material studied. — **Brazil**. Mato Grosso do Sul: Aquidauana, 2 km SW of Piraputanga, alt. 175 m, 20°29'S, 55°33'17"W, on bark, 27.XI.2019, *A.Aptroot & M.F. Souza 81453* (para-, CGMS).

Chemistry. — Thallus UV+ yellow, K-; pseudostromata UV-. TLC: lichexanthone.

Etymology. — Named after the muriform ascospores.

Ecology and distribution. — On tree bark in cerrado forest; only known from Brazil.

Description

Thallus dull, pale olivaceous greenish, with pale whitish patches, not surrounded by a prothallus. Ascomata globose to pyriform, 0.4-0.6 mm diam., single or immersed in pseudostromata, in groups of 2-6. Pseudostroma conspicuous, erumpent to prominent and then constricted, outline roundish to lobate, top convex, sides curved, *c.* 0.5-2.5 mm diam., initially whitish, later black because the wall becomes exposed, without pigment. Ostioles apical, single, brown to black, 0.2-0.4 mm diam. Hamathecium not inspersed. Ascospores 8/ascus, hyaline, muriform, 9-13 × 1-3-septate, 50-70 × 10-13 µm, fusiform, asymmetrical with the central primary septum well above the middle, markedly constricted at the primary septum with irregularly rounded to ellipsoid lumina of rather different size, not surrounded by a gelatinous sheath. Pycnidia not observed.

Discussion

This is the first species in the genus with muriform ascospores; it would key out in the world key by Aptroot & Lücking (2016) at couplet 3: Haemathecium clear; no pigments; ascospores muriform.

Acknowledgements

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REFERENCES

Ahti T. 2000. — Cladoniaceae. *Flora Neotropica* 78: 1-362.

Aptroot A. & Cáceres M. E. S. 2018. — New lichen species from Chapada Diamantina, Bahia, Brazil. *The Bryologist* 121: 67-79. https://doi.org/10.1639/0007-2745-121.1.067

Aptroot A. & Lücking R. 2016. — A revisionary synopsis of the Trypetheliaceae. (Ascomycota: Trypetheliales). *Lichenologist* 48: 763-982. https://doi.org/10.1017/S0024282916000487

Aptroot A. & Spielmann A. A. 2020. — New lichen species and records from the Serra da Bodoquena, Mato Grosso do Sul, Brazil, the westernmost Atlantic rain forest. *Archive for Lichenology* 17: 1-25.

Elix J. A. & Tønsberg T. 2004. — Notes on the chemistry of some lichens, including four species of *Lepraria*. *Graphis scripta* 16: 43-45.

Elix J. A., Øvstedal D. G. & Gremmen N. J. M. 2005. — A new *Lepraria* species from Gough Island, South Atlantic Ocean. *Mycotaxon* 93: 273-275.

Fleig M. & Riquelme I. 1991. — Liquens de Piraputanga, Mato Grosso do Sul, Brasil. *Acta botanica brasilica* 5: 3-12. https://doi.org/10.1590/S0102-33061991000100001

Gumboski E. L. & Eliasaro S. 2011. — *Cladonia litoralis* (Cladoniaceae), a new species from Southern Brazil. *The Bryologist* 114: 665-667. https://doi.org/10.1639/0007-2745-114.4.665

Gumboski E. L., Beilke F. & Eliasaro S. 2013. — *Cladonia dunensis* sp. nov. from southern Brazil, with notes on the genus in beach dune environments. *Mycotaxon* 124: 333-340. https://doi.org/10.5248/124.333

Lendemer J. C. 2010. — *Lepraria larrainiana* (Stereocaulaceae, Lichenized Ascomycetes), a new species from Central Chile. *Guyana Botanica* 67: 238-241. https://doi.org/10.4067/S0717-66432010000200010

Orange A., James P. W. & White F. J. 2001. — *Microchemical Methods for the Identification of Lichens*. London: British Lichen Society.

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