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Chapter 6
Lichenized *Ascomycota* from the Pantanal in Mato Grosso do Sul state, Brazil

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6.1 Introduction

The Pantanal is an area of savanna that is seasonally partly flooded, located in the upper Paraguay River depression, and which extends between the Central Brazilian Shield and the foothills of the Andes (Junk and Nunes da Cunha 2016). In Brazil, the Pantanal is included in the Cerrado domain, a large phytogeographic region with high vegetation heterogeneity (Bueno et al. 2018) and comprises many woody species (around 750) as well as a great number of herbaceous plants (around 1,150), including 250 aquatic and/or palustrine species (Junk et al. 2014).

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Lichens are a symbiotic association of at least two partners: a fungus (the mycobiont) and an alga and/or a cyanobacterium (the photobiont) that together results in a thallus with varying morphologies (Purvis 2000, Marcelli 2006). Lichens are good indicators of environmental changes (Giordani et al. 2002, Aptroot and van Herk 2006, Koch et al. 2013, Matos et al. 2019), so documenting their diversity is an important tool for monitoring and conservation efforts.

Gustav Malme visited the state of Mato Grosso do Sul during the First and the Second Regnellian Expedition, from 1892 to 1894 and from 1901 to 1902, respectively. It was during the first expedition that he paid close attention to lichens (Baptista 1996). Malme specifically visited the municipality of Corumbá, which belonged to Mato Grosso state at that time. He studied the major part of his collections (e.g. Malme 1897, 1902, 1923, 1924a, b, 1927), but many of his materials were also studied by other lichen taxonomists (e.g., Lynge 1914, 1924; Motyka 1936, 1938; Redinger 1933a, b, 1935, 1936, 1940). For a complete list of Malme publications and those based on his collections, see Marcelli (1998).

Unfortunately, no complete compilation of the findings based on Malme's collections is available, but Spielmann and Canêz (2012) presented a small list of new species discovered by him. Besides Malme, other researchers also contributed to the knowledge of lichen biodiversity in the state, e.g., Klaus Kalb, Marcelo Marcelli, Mariana Fleig, and Neli Honda (Spielmann and Canêz 2012).

Klaus Kalb had the opportunity to collect in Brazil; his findings, including those made in Mato Grosso do Sul, were mostly treated in his exsiccate series, *Lichens Neotropici* I to XIII (Kalb 1982a, b, c, d, 1983a, b, 1984, 1986, 1988, 1990, 1991, 2001a, b).

Fleig and Riquelme (1991) studied specimens from the municipality of Piraputanga and found 72 species, including 23 new records to the State. Osorio (1992) studied macrolichens from the municipality of Ponta Porã, reporting 42 taxa including 16 new records. On a smaller scale other lichenologists had access to Mato Grosso do Sul specimens, e.g., Lynge (1924), Redinger (1936, 1940), Marcelli (1993), Staiger (2002), and Kitaura et al. (2019). Despite these important contributions, it is not yet possible to reliably assess the diversity of lichenized fungi in the state because in part there is no compiled information. Furthermore, one has to be careful when searching the literature for taxa reported from this area because before 1977 Mato Grosso do Sul was a territorial part of the now neighboring Mato Grosso State.

Based on the above considerations, the objectives of the present work were to compile bibliographic data and to update and improve data available in several papers that reported lichens from the Pantanal. We also report new collections made by us in 2010 (Fig. 6.1), mainly from Morraria do Urucum, an area of hills situated along the Paraguay River. It is important to note that not all the collected material is described here. Further taxa that need more studies will be published elsewhere.

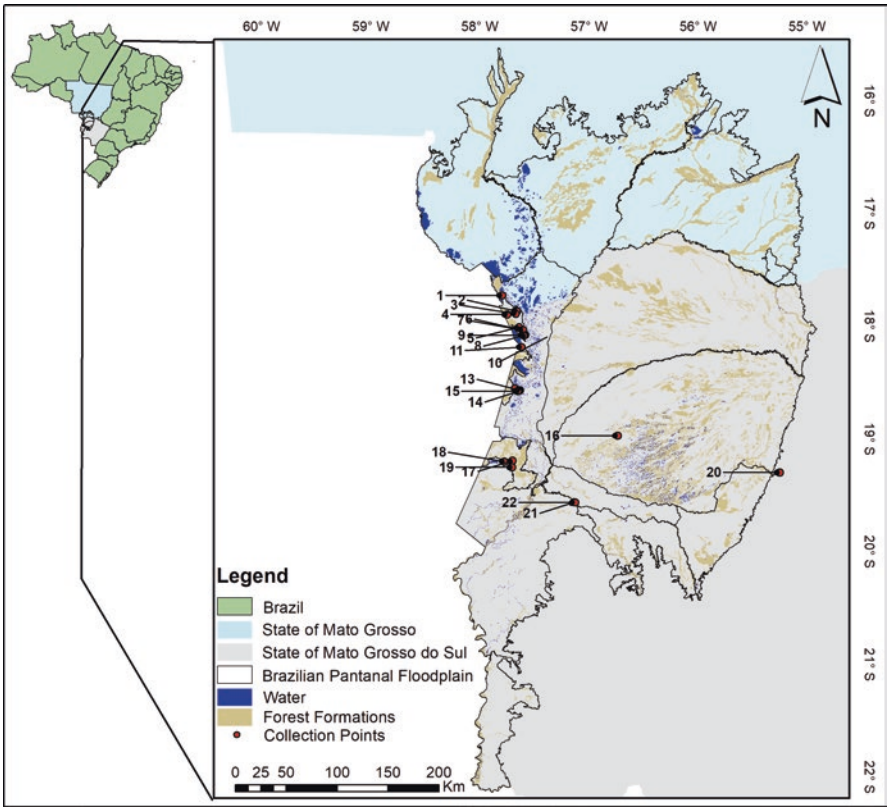

Fig. 6.1 Sample areas treated in this chapter. 1 = *RPPN Rumo ao Oeste, Ecotropica*; 2 = *RPPN Acurizal*; 3 = *Reserva Acurizal, Córrego Fundão*; 4 = *Fazenda Gaíva, Jaguaribe*; 5, 8, 9, and 10 = *RPPN Eliezer Batista, Novos Dourados*; 6 = *Baía do Taquaral*; 7 = *Morro do Amolar,* margin of *Baía do Taquara*; 11 = *Baía do Mandioré*; 12, 13, 14 and 15 = *Baía do Castelo*; 16 = *Fazenda Nhumirim, Salinado 8, Reserva*; 17 = *Morro do Urucum*; 18 = *Morro Tromba dos Macacos*; 19 = *Morro São Domingos – Mineração Corumbaense*; 20 = Margin of the road *MS-419*, between *Rio Negro* and *Rio Verde de Mato Grosso* municipalities; 21 = *Passo do Lontra, Base de Estudos do Pantanal – UFMS*; 22 = *Passo do Lontra, Base de Estudos do Pantanal – UFMS, Baía da Medalha*. All these points are in Corumbá municipality, except point 20 that is in Rio Negro municipality.

6.2 Taxa Previously Reported from the Pantanal

Based on published records, we previously found 129 reported names (97 species, 32 infraspecific taxa). After taxonomic and nomenclatural revision, we had 115 species and four infraspecies adding up to the compiled list 119 taxa of lichen fungi from the Pantanal in Mato Grosso do Sul state (Table 6.1). Most of these records are from the Corumbá region, including many species that were described based on specimens from the southern Pantanal region. *Arctomia leptospora* (Malme) Otálora & Wedin, *Biatora kalbii* (Brako) S. Y. Kondr., *Pertusaria platystoma* Malme, *Porina*

Table 6.1 List of taxa already reported in the literature relevant to Pantanal areas from Mato Grosso do Sul state, the basionym and the current name for each taxon, and references

Recorded name	Current name	References
Anomomorpha sordida Staiger	*Anomomorpha sordida* Staiger	Staiger (2002)
Anthracothecium duplicans (Nyl.) Müll. Arg.	*Pyrenula duplicans* (Nyl.) Aptroot	Malme (1929a) and Aptroot et al. (2008)
Anthracothecium leucostomum (Ach.) Malme	*Pyrenula leucostoma* Ach.	Malme (1929a)
Anthracothecium papilliferum (Nyl.) Müll. Arg.	*Pyrenula papillifera* (Nyl.) Aptroot	Malme (1929a) and Aptroot (2012)
Anthracothecium paraguayense Malme	*Pyrenula globifera* (Eschw.) Aptroot	Malme (1929a) and Aptroot et al. (2008)
Bacidia chorisiae Malme	*Bacidia russeola* (Kremp.) Zahlbr.	Malme (1935)
Bacidia medialis (Tuck.) Zahlbr.	*Bacidina medialis* (Tuck.) Kistenich, Timdal, Bendiksby & S. Ekman	Malme (1935) and Kistenich et al. (2018)
Bacidia russeola (Kremp.) Zahlbr.	*Bacidia russeola* (Kremp.) Zahlbr.	Malme (1935)
Bacidia russeola var. *lamprocheila* Malme	*Bacidia russeola* (Kremp.) Zahlbr.	Malme (1935)
Bacidia vulgata Malme	*Fellhanera vulgata* (Malme) Lücking comb. nov.	Malme (1935)
Buellia modesta (Kremp.) Müll. Arg.	*Cratiria americana* (Fée) Kalb & Marbach	Malme (1927) and Marbach (2000)
Buellia myriocarpa (DC.) Mudd	*Amandinea extenuata* (Müll. Arg.) Marbach	Malme (1927) and Marbach (2000)
Buellia subareolata Müll. Arg.	*Buellia subareolata* Müll. Arg.	Malme (1927)
Calicium hyperelloides Nyl.	*Calicium hyperelloides* Nyl.	Tibell (1996)
Calicium salicinum Persoon	*Calicium salicinum* Pers.	Tibell (1996)
Callopisma subvitellinum Müll. Arg.	*Caloplaca subvitellina* (Müll. Arg.) Zahlbr.	Malme (1926)
Catillaria americana Malme	*Catillaria americana* Malme	Malme (1923)
Coccocarpia pellita var. *isidiophylla*	*Coccocarpia palmicola* (Spreng.) Arv. & D.J. Galloway	Malme (1925) and Arvidsson and Galloway (1979)
Collema leptosporum Malme	*Arctomia leptospora* (Malme) Otálora & Wedin	Malme (1924a) and Otálora et al. (2014)
Collema paraguayense Malme	*Collema pustulatum* Ach.	Malme (1924a) and Degelius (1974)
Collema pycnocarpum f. *crassiusculum* Malme	*Enchylium conglomeratum* (Hoffm.) Otálora, P.M. Jørg. & Wedin	Malme (1924a) and Otálora et al. (2014)
Dermatocarpon australe Malme	*Dermatocarpon australe* Malme	Malme (1928)
Dimerella myriocarpa Malme	*Coenogonium pusillum* (Mont.) Lücking, Aptroot & Sipman	Malme (1934) and Rivas Plata et al. (2006)

(continued)

Table 6.1 (continued)

Recorded name	Current name	References
Dimerella subdiluta Malme	*Coenogonium subdilutum* (Malme) Lücking, Aptroot & Sipman	Malme (1934) and Rivas Plata et al. (2006)
Dirinaria aegialita (Afzel. ex Ach.) Moore	*Dirinaria aegialita* (Afzel. ex Ach.) B.J. Moore	Barbosa (2019)
Dirinaria africana (Müll.Arg.) D.D. Awasthi	*Dirinaria africana* (Müll.Arg.) D.D. Awasthi	Barbosa (2019)
Dirinaria confluens (Fr.) D.D. Awasthi	*Dirinaria confluens* (Fr.) D.D. Awasthi	Barbosa (2019)
Dirinaria consimilis (Stirt.) D.D. Awasthi	*Dirinaria consimilis* (Stirt.) D.D. Awasthi	Kalb et al. (2009)
Dirinaria papillulifera (Nyl.) D.D. Awasthi	*Dirinaria papillulifera* (Nyl.) D.D. Awasthi	Barbosa (2019)
Dirinaria picta (Sw.) Clem. & Shear	*Dirinaria picta* (Sw.) Clem. & Shear	Barbosa (2019)
Dirinaria pruinosa Kalb	*Dirinaria pruinosa* Kalb	Barbosa (2019)
Dirinaria purpurascens (Vain.) B.J. Moore	*Dirinaria purpurascens* (Vain.) B.J. Moore	Barbosa (2019)
Endocarpon adscendens Malme	*Endocarpon malmeanum* Zahlb.	Malme (1928) and Zahlbruckner (1931)
Glyphis cicatricosa Ach.	*Glyphis cicatricosa* Ach.	Staiger (2002)
Glyphis favulosa var. *intermedia* Müll. Arg.	*Glyphis cicatricosa* Ach.	Redinger (1933a)
Graphina bipartita f. *corumbensis* Redinger	*Graphis bipartita* (Müll. Arg.) Lücking	Redinger (1933b) and Lücking et al. (2008)
Graphina puiggarii var. *corumbensis* Redinger	*Graphis puiggarii* (Müll. Arg.) Lücking	Redinger (1933b) and Lücking et al. (2008)
Graphina virginea (Eschw.) Müll.Arg.	*Diorygma poitaei* (Fée) Kalb, Staiger & Elix	Redinger (1935) and Kalb et al. (2004)
Graphis assimilis Nyl.	*Graphis assimilis* Nyl.	Redinger (1935)
Graphis furfuracea Leight.	*Fissurina furfuracea* (Leight.) A.W. Archer	Kalb (1986) and Archer (2007)
Graphis hyphosa Staiger	*Graphis hyphosa* Staiger	Staiger (2002)
Graphis immersa Fink	*Graphis aurita* Eschw.	Redinger (1935)
Graphis lineola var. *comma* (Ach.) Redinger	*Allographa comma* (Ach.) Lücking & Kalb	Redinger (1935) and Lücking and Kalb (2018)
Graphis noumeana Müll. Arg.	*Allographa calcea* (Fée) Lücking & Kalb	Redinger (1935) and Lücking and Kalb (2018)
Gyalectina nana (Tuck.) Vězda	*Gyalecta nana* Tuck.	Kalb (1983a) and Lücking et al. (2019)
Haematomma puniceum var. *subinnatum* Malme	*Haematomma subinnatum* (Malme) Kalb & Staiger	Malme (1937) and Staiger and Kalb (1995)
Lecanactis insignior var. *fusca* (Müll.Arg.) Zahlbr.	*Cresponea leprieurii* (Mont.) Egea & Torrente	Malme (1926) and Egea and Torrente (1993)

(continued)

Table 6.1 (continued)

Recorded name	Current name	References
Lecanora granifera Ach.	*Malmidea granifera* (Ach.) Kalb, Rivas Plata & Lumbsch	Malme (1936a) and Kalb et al. (2011)
Lecanora intrusa Nyl.	*Rinodina intrusa* (Nyl.) Malme	Malme (1902)
Lecidea compaginata (Müll. Arg.) Zahlbr.	*Phyllopsora thaleriza* (Stirt.) Swinscow & Krog	Malme (1936a), Brako (1989), and Kistenich et al. (2019)
Lecidea gyalectoides Malme	*Malmidea gyalectoides* (Vain.) Kalb & Lücking	Malme (1936a) and Kalb et al. (2011)
Lecidea scyphulifera Ach.	*Glyphis scyphulifera* (Ach.) Staiger	Staiger (2002)
Leptogium brebissonii Mont.	*Leptogium brebissonii* Mont.	Malme (1924a)
Leptogium chloromelum (Sw.) Nyl.	*Leptogium chloromelum* (Sw.) Nyl.	Malme (1924a)
Leptogium cochleatum (Dicks.) Jørg. & James	*Leptogium cochleatum* (Dicks.) Jørg. & James	Kitaura et al. (2019)
Leptogium cyanescens (Rabenh.) Körb.	*Leptogium cyanescens* (Rabenh.) Körb.	Kitaura et al. (2019)
Leptogium diaphanum (Sw.) Mont.	*Leptogium diaphanum* (Sw.) Mont.	Kitaura et al. (2019)
Leptogium fusisporum (Tuck.) C.W. Dodge	*Leptogium fusisporum* (Tuck.) C.W. Dodge	Kitaura et al. (2019)
Leptogium phyllocarpum (Pers.) Nyl.	*Leptogium phyllocarpum* (Pers.) Nyl.	Malme (1924a)
Leptotrema wightiii (Tayl.) Müll. Arg.	*Sanguinotrema wightii* (Taylor) Lücking	Redinger (1936) and Lücking et al. (2015)
Melanotheca anomala (Ach.) Malme	*Pyrenula anomala* (Ach.) Vain.	Malme (1923) and Aptroot (2012)
Melanotheca arthonioides var. *lueheae* Malme	*Pyrenula anomala* (Ach.) Vain.	Malme (1924b) and Aptroot (2012)
Opegrapha alborimosa f. *brevicarpa* Redinger	*Opegrapha astraea* Tuck.	Redinger (1940) and Ertz (2009)
Opegrapha alborimosa var. *globulifica* Redinger	*Opegrapha astraea* Tuck.	Redinger (1940) and Ertz (2009)
Opegrapha alborimosa var. *reticulata* Redinger	*Opegrapha astraea* Tuck.	Redinger (1940) and Ertz (2009)
Opegrapha alborimosa var. *senescens* Redinger	*Opegrapha astraea* Tuck.	Redinger (1940) and Ertz (2009)
Opegrapha aperiens f. *crustosa* Redinger	*Opegrapha aperiens* f. *crustosa* Redinger	Redinger (1940)
Opegrapha aperiens Vain.	*Opegrapha aperiens* Vain.	Redinger (1940)
Opegrapha bonplandi var. *condrochracea* Redinger	*Zwackhia bonplandii* (Fée) Ertz	Redinger (1940) and Diederich et al. (2012)
Opegrapha chionoplaca Redinger	*Opegrapha chionoplaca* Redinger	Redinger (1940)

(continued)

Table 6.1 (continued)

Recorded name	Current name	References
Opegrapha corumbensis Redinger	*Opegrapha corumbensis* Redinger	Redinger (1940)
Opegrapha cylindrica Raddi	*Opegrapha cylindrica* Raddi	Kalb (1986)
Opegrapha lichenoides Pers.	*Opegrapha lichenoides* Pers.	Redinger (1940)
Opegrapha lichenoides var. *subchondrina* Redinger	*Opegrapha lichenoides* var. *subchondrina* Redinger	Redinger (1940)
Opegrapha multiseptata var. *brevicarpa* Redinger	*Opegrapha multiseptata* var. *brevicarpa* Redinger	Redinger (1940)
Opegrapha ochroplaca Redinger	*Opegrapha ochroplaca* Redinger	Redinger (1940)
Opegrapha prolificans Redinger	*Opegrapha prolificans* Redinger	Redinger (1940)
Opegrapha pulicaris f. *minuta* (Chevall.) H. Olivier.	*Alyxoria varia* (Ach.) Ertz & Tehler	Redinger (1940) and Ertz and Tehler (2011)
Parathelium crassiusculum Malme	*Pyrenula crassiuscula* (Malme) Aptroot	Malme (1923) and Aptroot (2012)
Parathelium dilutum Malme	*Pyrenula adacta* Fée	Malme (1923) and Aptroot (2012)
Parathelium fusisporum Malme	*Pyrenula fusispora* (Malme) Aptroot	Malme (1923) and Aptroot (2012)
Parathelium subferrugineum f. *expallescens* Malme	*Pyrenula circumfiniens* Vain.	Malme (1923) and Aptroot (2012)
Parathelium subferrugineum Malme	*Pyrenula subferruginea* (Malme) R.C. Harris	Malme (1923) and Aptroot (2012)
Parmelia argentina Kremp.	*Parmotrema argentinum* (Kremp.) Hale	Hale (1965)
Parmelia melanochaeta Kurok.	*Parmotrema melanochaetum* (Kurok.) O. Blanco, et al.	Hale and Kurokawa (1964)
Parmelia valenzueliana Mont.	*Ramonia valenzueliana* (Mont.) Stitzenb.	Malme (1934)
Patellaria domingensis Pers.	*Letrouitia domingensis* (Pers.) Haf. & Bellem.	Malme (1923)
Pertusaria platystoma Malme	*Pertusaria platystoma* Malme	Malme (1936b)
Phaeographina chapadana Redinger	*Pallidogramme chapadana* (Redinger) Staiger, Kalb & Lücking	Staiger (2002) and Lücking et al. (2008)
Phaeographis neotricosa f. *dissipata* Redinger	*Phaeographis neotricosa* Redinger	Redinger (1935)
Phyllopsora corallina var. *santensis* (Tuck.) Brako	*Phyllopsora santensis* (Tuck.) Swinscow & Krog	Brako (1991) and Swinscow and Krog (1981)
Phyllopsora kalbii Brako	*Biatora kalbii* (Brako) S. Y. Kondr.	Brako (1991) and Kondratyuk et al. (2019)
Physcia aegialita f. *coccinea* Lynge	*Dirinaria rhodocladonica* Kalb, Schumm & Elix	Lynge (1924) and Kalb et al. (2020)
Physcia alba var. *linearis* Lynge	*Physcia kalbii* Moberg	Lynge (1924) and Moberg (1990)

(continued)

Table 6.1 (continued)

Recorded name	Current name	References
Physcia alba var. *obsessa* (Mont.) Lynge	*Physcia integrata* Nyl.? See comment in Jungbluth (2010)	Lynge (1924)
Physcia integrata var. *sorediosa* Vain.	*Physcia sorediosa* (Vain.) Lynge	Lynge (1924)
Physcia melanocarpa Müll. Arg.	*Dirinaria melanocarpa* (Müll. Arg.) Dodge	Awasthi (1975)
Physcia syncolla f. *convexa* Lynge	*Hyperphyscia syncolla* (Tuck. ex Nyl.) Kalb	Lynge (1924) and Kalb (1983a)
Physcia syncolla Tuck.	*Hyperphyscia syncolla* (Tuck. ex Nyl.) Kalb	Lynge (1924) and Kalb (1983a)
Pleurothelium inclinatum Müll. Arg.	*Pyrenula ravenelii* (Tuck.) R.C. Harris	Malme (1924b) and Aptroot (2012)
Porina cryptostoma Malme	*Porina cryptostomoides* Lücking, Aptroot & Spielmann nom. nov.	Malme (1929b)
Porina melanops Malme	*Porina melanops* Malme	Malme (1929b)
Porina subcarpinea Malme	*Porina subcarpinea* Malme	Malme (1929b)
Pyrenastrum depauperatum Malme	*Pyrenula cryptothelia* (Müll. Arg.) Aptroot & Etayo	Malme (1924b) and Aptroot (2012)
Pyrenastrum fulvum Malme	*Pyrenula subgregantula* Müll. Arg.	Malme (1923) and Aptroot (2012)
Pyrenula emersa Malme	*Pyrenula quassiaecola* Fée	Malme (1929a) and Aptroot (2012)
Pyrenula fulvescens Malme	*Pyrenula quassiaecola* Fée	Malme (1929a) and Aptroot (2012)
Pyrenula plumbea Malme	*Pyrenula quassiaecola* Fée	Malme (1929a) and Aptroot (2012)
Pyxine cocoes var. *eschweileri* Tuck.	*Pyxine eschweileri* (Tuck.) Vain.	Malme (1897) and Vainio (1890)
Pyxine meissneri var. *convexula Malme*	*Pyxine petricola* var. *convexula* (Malme) Kalb	Malme (1897) and Kalb (1987)
Pyxine meissneri var. *genuina* Malme	*Pyxine petricola* Nyl.	Malme (1897)
Pyxine meissneri var. *physciaeformis* Malme	*Pyxine berteriana* (Feé) Imshaug	Malme (1897)
Rinodina conspersa Müll. Arg.	*Rinodina conspersa* Müll. Arg.	Malme (1902)
Toninia isidiata Malme	*Phyllopsora cinchonarum* (Fée) Timdal	Malme (1937) and Brako (1989)
Rinodina dispersa Malme	*Rinodina dispersa* Malme	Malme (1902)
Sarcographa actinobola (Nyl.) Müll. Arg. var. *latruncularia* Redinger	*Sarcographa labyrinthica* (Ach.) Müll. Arg.	Redinger (1933a)
Sarcographa actinobola (Nyl.) Müll. Arg. var. *perradiata* Redinger	*Sarcographa cinchonarum* Fée	Redinger (1933a)
Thelenella nitidula Malme	*Thelenella brasiliensis* (Müll. Arg.) Vain.	Malme (1928) and Mayrhofer (1987)

(continued)

Table 6.1 (continued)

Recorded name	Current name	References
Thelotrema cavatum Ach.	*Ocellularia cavata* (Ach.) Müll. Arg.	Redinger (1936)
Trachylia leucampyx Tuck.	*Heterocyphelium leucampyx* (Tuck.) Vain.	Tibell (1996)
Trypethelium eluteriae Spreng.	*Trypethelium eluteriae* Spreng.	Malme (1924b)
Trypethelium ochroleucum (Eschw.) Nyl.	*Astrothelium porosum* (Ach.) Aptroot & Lücking	Malme (1924b) and Aptroot and Lücking (2016)
Trypethelium ornatum Müll. Arg.	*Trypethelium ornatum* Müll. Arg.	Malme (1924b)
Tylophoron moderatum Nyl.	*Tylophoron moderatum* Nyl.	Tibell (1996)
Urceolaria compuncta Ach.	*Leucodecton occultum* (Eschw.) Frisch	Redinger (1936) and Frisch et al. (2006)
Ustalia junghuhnii Mont. & Bosch	*Diorygma junghuhnii* (Mont. & Bosch) Kalb, Staiger & Elix	Kalb et al. (2004)
Verrucaria brunneola Malme	*Verrucaria brunneola* Malme	Malme (1937)
Verrucaria myriocarpella Malme	*Verrucaria myriocarpella* Malme	Malme (1937)
Verrucaria tropica Ach.	*Nigrovothelium tropicum* (Ach.) Lücking, M.P. Nelsen & Aptroot	Malme (1924b) and Aptroot and Lücking (2016)

melanops Malme, *Pyrenula cryptothelia* (Müll. Arg.) Aptroot & Etayo, and *Rinodina dispersa* Malme are examples of species that had their types collected in Corumbá.

6.3 Species Diversity and Taxonomic Treatment

In this chapter, the taxonomic organization follows the idea of morphological groups that do not necessarily reflect natural taxa. In this way, all genera with crustose, microfoliose, or squamulose thallus are treated in the section "Microlichens," while those with cyanobacteria as photobionts are grouped in the "Cyanolichens" section. Families with a greater diversity, as *Caliciaceae*, *Physciaceae*, and *Parmeliaceae,* are treated separately.

We are providing short descriptions and comments to the 72 taxa of lichenized fungi that were recently collected and identified by us from Pantanal areas in the state of Mato Grosso do Sul. These taxa represent 30 genera and 18 families.

The most diverse was the group of microlichens with 22 taxa distributed in several families, being 18 new records to the Pantanal. Regarding the other groups, the increase in diversity of known *Parmeliaceae* species was of 16 new records, since only two species were previously cited in the literature to the Pantanal region. Foliose *Caliciaceae* and *Physciaceae* were represented by 21 taxa including 7 new records. The cyanolichens were represented here by 11 species including three new records to the study area.

As shown above (Table 6.1), 119 taxa were previously reported in the literature as occurring in the Pantanal. These previous data combined with the species reported by us sum up to a total of 165 taxa including four infraspecific taxa; thus, 46 new taxa were added to the list of lichen fungi known from the Pantanal. The previously reported taxa are not explicitly treated below, except the new combination *Fellhanera vulgata* and the new replacement name *Porina cryptostomoides*.

Opegrapha rissoensis Redinger is a new record for Brazil, *Agonimia* Zahlbr., *Crypthonia* Frisch & G. Thor, *Marcelaria* Aptroot, M.P. Nelsen & Parnmen and *Neoprotoparmelia* Garima Singh, Lumbsch & I. Schmitt are genera newly reported for Mato Grosso do Sul state (●), and 12 species are reported to occur in Mato Grosso do Sul for the first time (*). These include *Parmotrema confusum* Hale, reported before only from Mato Grosso state, *P. soredioaliphaticum* Estrabou & Adler, cited only for Rio Grande do Sul state, and *Peltula auriculata*, which was previously reported to Roraima state (Schultz and Aptroot 2008). The new reports to the Pantanal region are represented by (°).

The species list with their respective families is presented below.

List of Lichenized *Ascomycota* identified in newly collected material from the Pantanal and treated below:

Class *Arthoniomycetes*
Order *Arthoniales*
Family *Arthoniaceae*

● *Crypthonia albida* (Fée) Frisch & G. Thor

Family *Chrysothricaceae*

°*Chrysothrix xanthina* (Vain.) Kalb

Family *Lecanographaceae*

Alyxoria varia (Pers.) Ertz & Tehler

Family *Opegraphaceae*

Opegrapha astraea Tuck.
°*Opegrapha rissoensis* Redinger

Class *Dothideomycetes*
Order *Trypetheliales incertae sedis*
Family *Trypetheliaceae*

●*Marcelaria purpurina* (Nyl.) Aptroot, Nelsen & Parnmen

Class *Eurotiomycetes*
Order *Pyrenulales*
Family *Pyrenulaceae*

Pyrenula anomala (Ach.) Vain.
°*Pyrenula xanthoglobulifera* Aptroot, Lücking & M. Cáceres

Class *Lecanoromycetes*
Order *Arctomiales*
Family *Arctomiaceae*

Arctomia leptospora (Malme) Otálora & Wedin

Order *Caliciales*
Family *Caliciaceae*

**Amandinea submontana* Marbach
°*Buellia curatellae* Malme
°*Cratiria obscurior* (Stirt.) Marbach & Kalb
Dirinaria aegialita (Afzel. ex Ach.) B.J. Moore
Dirinaria africana (Müll. Arg.) D.D. Awasthi
Dirinaria confluens (Fr.) D.D. Awasthi
Dirinaria consimilis (Stirt.) D.D. Awasthi
Dirinaria papillulifera (Nyl.) D.D. Awasthi
Dirinaria picta (Sw.) Clem. & Shear
Dirinaria pruinosa Kalb
Dirinaria purpurascens (Vain.) B.J. Moore
Dirinaria rhodocladonica Kalb, Schumm & Elix
Pyxine berteriana (Fée) Imshaug
°*Pyxine coccifera* (Fée) Nyl.
°*Pyxine cocoës* (Sw.) Nyl.
Pyxine eschweileri (Tuck.) Vain.
Pyxine petricola Nyl.
°*Pyxine subcinerea* Stirt.

Family *Physciaceae*

**Hyperphyscia adglutinata* (Flörke) H. Mayhofer& Poelt
Hyperphyscia syncolla (Tuck. ex Nyl.) Kalb
°*Physcia aipolia* (Humb.) Fürnr.
°*Physcia convexa* Müll. Arg.
°*Physcia manuelii* Moberg
**Physcia tribacia* (Ach.) Nyl.

Order *Candelariales*
Family *Candelariaceae*

°*Candelaria concolor* (Dicks.) Stein.

Order *Lecanorales*
Family *Lecanoraceae*

**Lecanora achroa* Nyl.
**Lecanora concilianda* Vain.
**Lecanora helva* Stizenb.

Family *Parmeliaceae*

**Bulbothrix regnelliana* Jungbluth, Marcelli & Elix
°*Canoparmelia amazonica* (Nyl.) Elix & Hale
°*Canoparmelia caroliniana* (Nyl.) Elix & Hale
°*Crespoa carneopruinata* (Zahlbr.) Lendemer & Hodkinson
°*Crespoa crozalsiana* (B. de Lesd. ex Harm.) Lendemer & Hodkinson
°*Crespoa scrobicularis* (Kremp.) Benatti & Lendemer
°*Myelochroa lindmanii* (Lynge) Elix & Hale
•*Neoprotoparmelia multifera* (Nyl.) Garima Singh, Lumbsch & I. Schmitt
Parmotrema argentinum (Kremp.) Hale
**Parmotrema confusum* Hale
°*Parmotrema consors* (Nyl.) Krog & Swinscow
°*Parmotrema dilatatum* (Vain.) Hale
Parmotrema melanochaetum (Kurok.) Blanco et al.
°*Parmotrema mesotropum* (Müll. Arg.) Hale
°*Parmotrema mordenii* (Hale) Hale
°*Parmotrema praesorediosum* (Nyl.) Hale
**Parmotrema soredioaliphaticum* Estrabou & Adler
°*Parmotrema tinctorum* (Dèspr. ex Nyl.) Hale
°*Usnea subparvula* A. Gerlach & P. Clerc

Family *Ramalinaceae*

**Phyllopsora pyxinoides* (Nyl.) Kistenich, Timdal, Bendiksby & S. Ekman
**Phyllopsora chlorophaea* (Müll. Arg.) Zahlbr.

Family *Ramboldiaceae*

°*Ramboldia russula* (Ach.) Kalb, Lumbsch & Elix

Order *Peltigerales*
Family *Collemataceae*

°*Leptogium austroamericanum* (Malme) C.W. Dodge
Leptogium chloromelum (Sw.) Nyl.
Leptogium cochleatum (Dicks.) Jørg. & James
Leptogium cyanescens (Rabenh.) Körb.
Leptogium diaphanum (Sw.) Mont.
Leptogium fusisporum (Tuck.) C.W. Dodge
°*Leptogium isidiosellum* (Riddle) Sierk
°*Leptogium marginellum* (Sw.) Gray
Leptogium phyllocarpum (Pers.) Mont.

Order *Ostropales*

Family *Graphidaceae*

°*Dyplolabia afzelii* (Ach.) A. Massal.
Sanguinotrema wightii (Taylor) Lücking

Order *Verrucariales*
Family *Verrucariaceae*

•*Agonimia opuntiella* (Buschardt & Poelt) Vězda

Class *Lichinomycetes*
Order *Lichinales*
Family Peltulaceae

**Peltula auriculata* Büdel, Schultz & Gröger

6.4 Identification Keys

We included in the keys all species currently reported to the Pantanal, that is, the species reported in the literature and those sampled and treated by us. However, for the microlichens group, only species that we collected and studied are included. Since a representative number of species known from old records were not recollected, we did not include them considering they may have old, often hidden, or wrong identification, which can be also different from the current concept. It is important to highlight that *Graphidaceae*, one of the most representative families in the area, is being treated separately because we found new species that need more studies.

6.5 Identification Key to the Groups of Lichens Found in the Pantanal

1a. Cyanobacteria as primary photobiont	Cyanolichens (Key A)
2b. Chloroccocoid algae as primary photobiont	2
2a. Thallus crustose, microfoliose, or squamulose	Microlichens (Key B)
2b. Thallus foliose or fruticose	3
3a. Thallus foliose, lobes usually narrower than 0.4 mm, spores brown, and mostly bicellular, rarely 4-celled	foliose *Caliciaceae* and *Physciaceae* (Key C)
3b. Thallus foliose or fruticose, lobes usually wider than 0.4 mm, spores hyaline, and simple	*Parmeliaceae* (Key D)

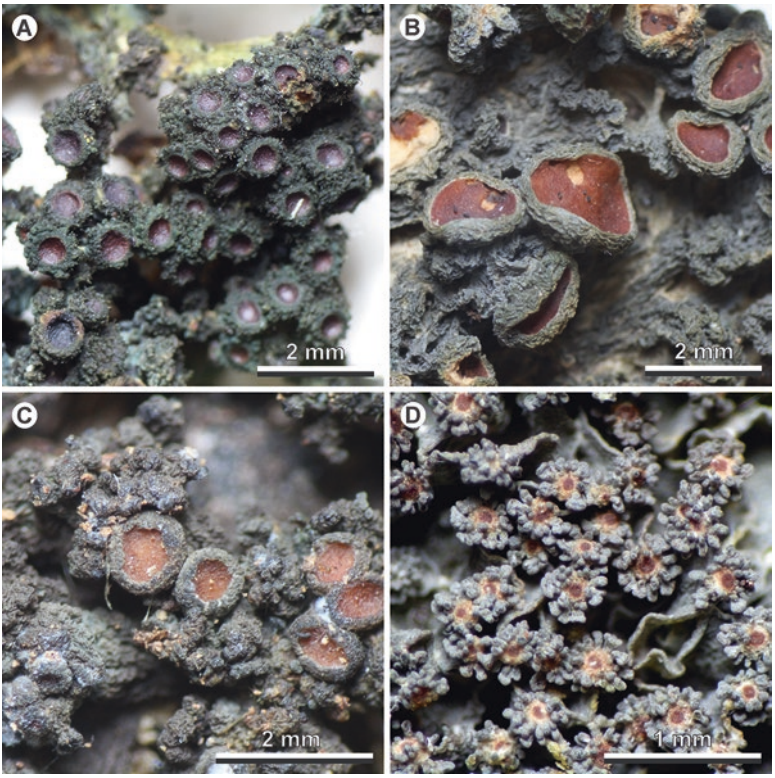

Fig. 6.2 Cyanolichens
(**a**) *Arctomia leptospora* (Malme) Otálora & Wedin. (**b**) *Leptogium chloromelum* (Sw.) Nyl. (**c**) *Leptogium fusisporum* (Tuck.) C.W. Dodge. (**d**) *Leptogium marginellum* (Sw.) Gray.

6.6 Key A – Cyanolichens

Identification Key to the Species of Cyanolichens Known from the Pantanal (Fig. 6.2)

1a. Thallus squamulose with ear-shaped	*Peltula auriculata*
1b. Thallus foliose	2
2a. Thallus with concentric ridges, attached on the substrate through rhizines that originate a hypothallus, and hereromerous	*Coccocarpia palmicola*
2b. Thallus without concentric ridges, attached on the substrate usually by hapterons, and homomerous	3
3a. Thallus with vegetative propagules (isidia and/or lobules)	4
3b. Thallus without vegetative propagules	11
4a. With lobules or lobuloid propagules	5
4b. With isidia or isidioid propagules	7

5a. Propagules present on the thallus and apothecia	*Leptogium diaphanum*
5b. Propagules restricted to the apothecia	6
6a. Apothecia marginal, up to 0.5 mm diam.	*Leptogium marginellum*
6b. Apothecia laminal, more than 1.0 mm diam.	*Leptogium phyllocarpum*
7a. Isidia usually granular, and ascospores transversely septate	8
7b. Isidia usually cylindrical, and ascospores muriform or submuriform	9
8a. Cortex with paraplectenchymatous cells	*Leptogium brebissonii*
8b. Cortex without paraplectenchymatous cells	*Arctomia leptospora*
9a. Thallus with smooth upper surface	*Leptogium cyanescens*
9b. Thallus with ridged or wrinkled upper surface	10
10a. Upper surface ridged, and lobes overlapping,	*Leptogium isidiosellum*
10b. Upper surface wrinkled, and lobes agglomerated	*Leptogium austroamericanum*
11a. Cortex with paraplectenchymatous cells	12
11b. Cortex without paraplectenchymatous cells	14
12a. Ascospores acicular, transversely septate	*Leptogium fusisporum*
12b. Ascospores fusiform, muriform to submuriform	13
13a. Upper surface with longitudinal to irregular ridges, and apothecia with thick paraplectenchymatous proper exciple	*Leptogium chloromelum*
13b. Upper surface distinctly striate, and apothecia with thick paraplectenchymatous thalline exciple	*Leptogium cochleatum*
14a. Apothecia immersed when young, with ascospores submuriform to muriform, 20–40 × 11–15 µm (Degelius 1974)	*Collema pustulatum*
14b. Apothecia sessile to stipitate, with ascospores transversely septate, (13–)15–24(–26) × 3.0–4.5 (–6.0) µm (Degelius 1954)	*Enchylium conglomeratum*

6.7 Key B – Microlichens

Identification Key to Some Epiphytic Species of Microlichens from the Pantanal (Figs. 6.3 and 6.4)

1a. Thallus sterile, without fruiting bodies	2
1b. Thallus fertile, with fruiting bodies	7
2a. Thallus yellow	3
2b. Thallus gray to whitish or green	4
3a. Thallus leprose/floccose/powdery	*Chrysothrix xanthina*
3b. Thallus microfoliose with soredia	*Candelaria concolor*
4a. Thallus squamulose, greenish	5
4b. Thallus byssoid, whitish to gray	6
5a. Squamules adnate, with tiny glassy hairs on the upper surface	*Agonimia opuntiella*
5b. Squamules ascending from a byssoid hypothallus	*Phyllopsora chlorophaea*
6a. Thallus forming distinct marginal lobules bordered by a black prothallus	*Phyllopsora pyxinoides*
6b. Thallus with entire margins and a pale prothallus	*Crypthonia albida*
7a. Ascomata closed or with narrow pore, rounded	8

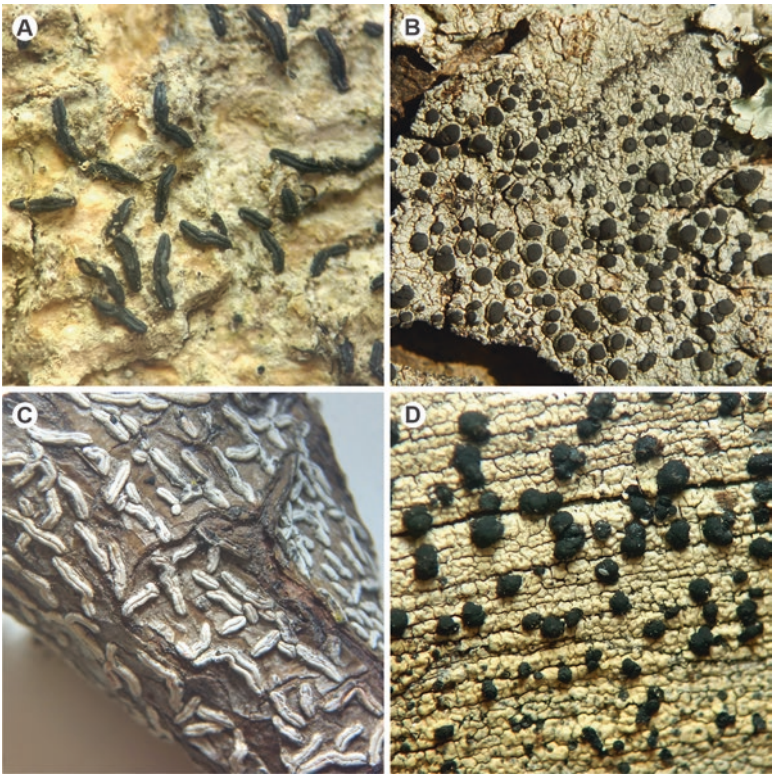

Fig. 6.3 Microlichens 01
(**a**) *Alyxoria varia* (Pers.) Ertz & Tehler. (**b**) *Cratiria obscurior* (Stirt.) Marbach & Kalb. (**c**) *Dyorigma afzelii* (Ach.) A. Massal. (**d**) *Buellia curatellae* (Malme) Marbach

7b. Ascomata with open disc or elongate to linear	11
8a. Ascomata apothecioid, immersed with narrow pore, and pale to brownish wall; thallus containing pockets of red crystals	*Sanguinotrema wightii*
8b. Ascomata perithecioid, with almost closed ostiole and black walls	9
9a. Ascomata and in part thallus covered by a layer of red, K+ purple pigment; ascospores hyaline	*Marcelaria purpurina*
9b. Ascomata not covered by pigment, black or thallus-covered; ascospores brown	10
10a. Ascomata fused into pseudostromatic groups, thallus UV-; ascospores 3-septate, small (17–20) µm	*Pyrenula anomala*
10b. Ascomata dispersed, thallus UV+ yellow (lichexanthone); ascospores muriform, large (more than 100 µm)	*Pyrenula xanthoglobulifera*
11a. Ascomata elongate to linear, often branched (lirellae)	12
11b. Ascomata round, with open disc (apothecia)	16

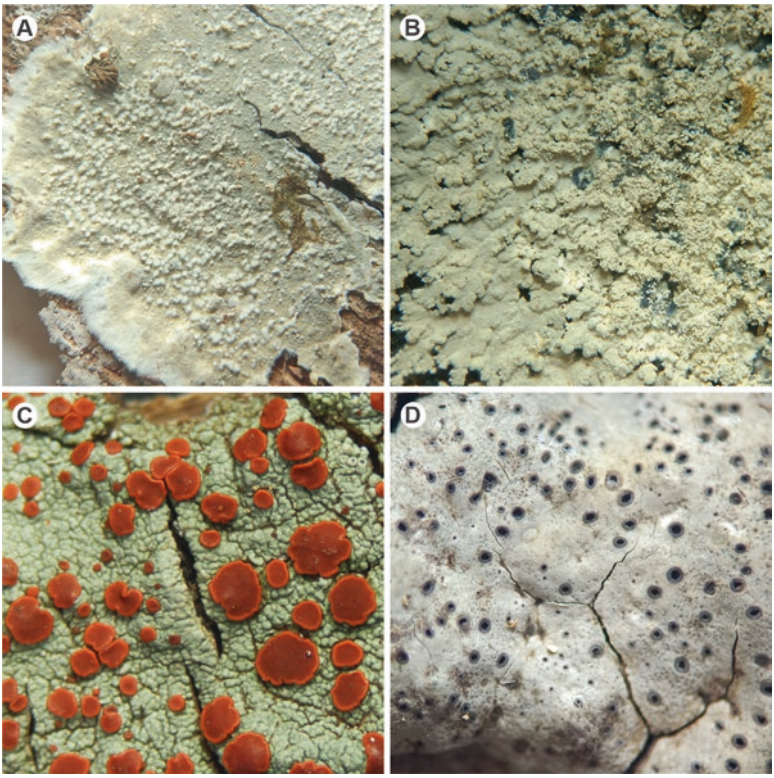

Fig. 6.4 Microlichens 02
(**a**) *Crypthonia albida* (Fée) Frisch & G. Thor. (**b**) *Phyllopsora pyxinoides* (Nyl.) Kistenich, Timdal, Bendiksby & S. Ekman. (**c**) *Ramboldia russula* (Ach.) Kalb. (**d**) *Sanguinotrema wightii* (Taylor) Lücking.

12a. Lirellae with disc exposed and black margins	*Alyxoria varia*
12b. Lirellae with disc concealed	13
13a. Lirellae with white coating which reacts C+ red	*Dyplolabia afzelii*
13b. Lirellae black or with pruina which is C-	14
14a. Lirellae with white pruina	*Opegrapha astraea*
14b. Lirellae epruinose, black	*Opegrapha rissoensis*
16a. Apothecia bright red, K+ purple	*Ramboldia russula*
16b. Apothecia not red	17
17a. Apothecia with pale to thallus-colored margin, containing algae (lecanorine), ascospores hyaline, one-celled (simple)	18
17b. Apothecia with brown-black margin not containing algae (lecideine), ascospores brown, 2-celled	21
18a. Ascospores around 50 per ascus	*Neoprotoparmelia multifera*
18b. Ascospores 8 per ascus	19
19a. Apothecial disc brown to reddish brown	*Lecanora concilianda*
19b. Apothecial disc beige to ochre	20

20a. Thallus greenish gray, containing atranorin and usnic acid	*Lecanora achroa*
20b. Thallus gray, containing atranorin but without usnic acid	*Lecanora helva*
21a. Thallus dark gray, irregular, K+ persistently yellow	*Amandinea submontana*
21b. Thallus pale gray, smooth, K+ yellow turning red after a few minutes	22
22a. Hymenium with numerous oil droplets	*Buellia curatellae*
22b. Hymenium without oil droplets	*Cratiria obscurior*

6.8 Key C – Foliose Caliciaceae and Physciaceae

Identification Key to the Foliose *Caliciaceae* and *Physciaceae* Species from the Pantanal (Fig. 6.5)

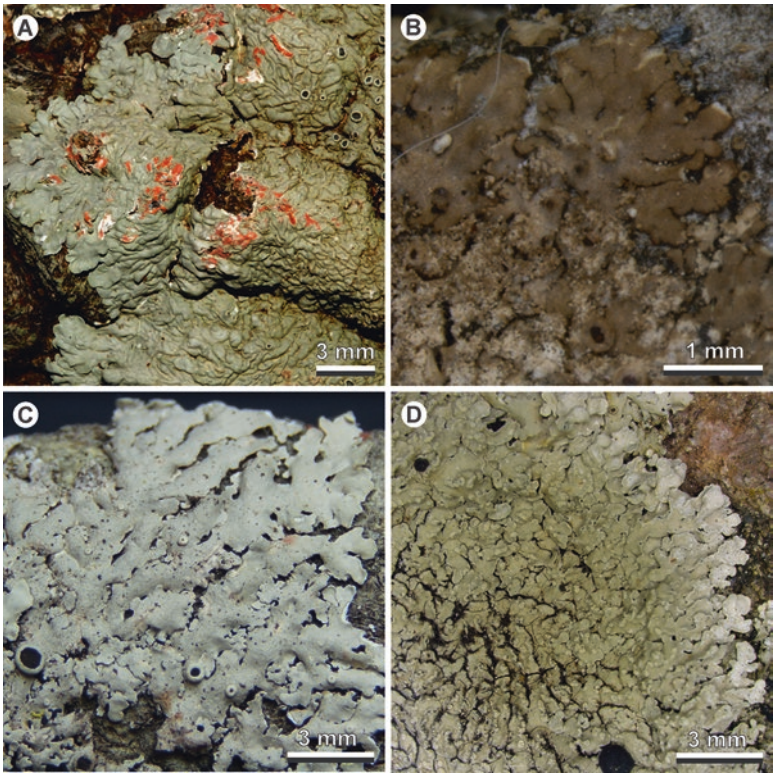

Fig. 6.5 Foliose Caliciaceae and Physciaceae
(**a**) *Dirinaria rhodocladonica* Kalb, Schumm & Elix. (**b**) *Hyperphyscia adglutinata* (Flörke) H. Mayrhofer & Poelt. (**c**) *Physcia aipolia* (Ehrh. ex Humb.) Fürnr. (**d**) *Pyxine cocoës* (Sw.) Nyl.

1a. Upper cortex UV+ yellow (lichexanthone present)	2
1b. Upper cortex UV- (lichexanthone absent)	6
2a. Soralia present	3
2b. Soralia absent	4
3a. Soralia marginal and crescent-shape; medulla yellow above	*Pyxine subcinerea*
3b. Soralia laminal and orbicular to irregular; medulla entirely white	*Pyxine cocoës*
4a. Medulla yellow above, K+ yellow to orange	*Pyxine berteriana*
4b. Medulla entirely white, K-	5
5a. Internal stipe reddish to brownish red, K+ reddish rose	*Pyxine petricola*
5b. Internal stipe white, K-	*Pyxine petricola* var. *convexula*
6a. Upper cortex K+ yellow (atranorin present)	7
6b. Upper cortex K- (atranorin absent)	16
7a. Rhizines present	8
7b. Rhizines absent	17
8a. Vegetative propagules present	9
8b. Vegetative propagules absent	13
9a. Phyllidia present; soralia and polysidiangia absent	*Physcia manuelii*
9b. Phyllidia absent; soralia or polysidiangia present	10
10a. Polysidiangia present; soralia absent	*Pyxine eschweileri*
10b. Polysidiangia absent; soralia present	11
11a. Soralia cinnabar-red	*Pyxine coccifera*
11b. Soralia white	12
12a. Soralia terminal at principal branches, labriform	*Physcia tribacia*
12b. Soralia marginal or at the tips of short lateral lacinulae, orbicular to capitate	*Physcia sorediosa*
13a. Maculae distinct and spotted	14
13b. Maculae absent	*Physcia kalbii*
14a. Lower surface black, except near the tips	*Physcia integrata*
14b. Lower surface pale to dark brown	15
15a. Saxicolous; lower surface with pinkish pigment	*Physcia convexa*
15b. Corticicolous; lower surface lacking pinkish pigment	14
16a. Soralia present; apothecia rare	*Hyperphyscia adglutinata*
16b. Soralia absent; apothecia frequent	*Hyperphyscia syncolla*
17a. Vegetative propagules present	18
17b. Vegetative propagules absent	22
18a. Isidia present; soralia and polysidiangia absent	*Dirinaria papillulifera*
18b. Isidia absent; soralia or polysidiangia present	19
19a. Soralia present; polysidiangia absent	*Dirinaria picta*
19b. Soralia absent; polysidiangia present	20
20a. Sekikaic acid present; divaricatic acid absent	*Dirinaria consimilis*
20b. Sekikaic acid absent; divaricatic acid present	21
21a. Apothecial disc with purple pruina	*Dirinaria pruinosa*
21b. Apothecial disc epruinose or with white pruina	*Dirinaria aegialita*
22a. Medulla with coccineus pigment	*Dirinaria rhodocladonica*
22b. Medulla totally white	23
23a. Saxicolous and strongly adnate to the substrate	*Dirinaria africana*
23b. Corticiclous and loosely adnate to the substrate	24
24a. Apothecial disc purplish pruinose	*Dirinaria purpurascens*
24b. Apothecial disc epruinose or whitish-pruinose	25
25a. Lower surface yellow	*Dirinaria melanocarpa*
25b. Lower surface black	*Dirinaria confluens*

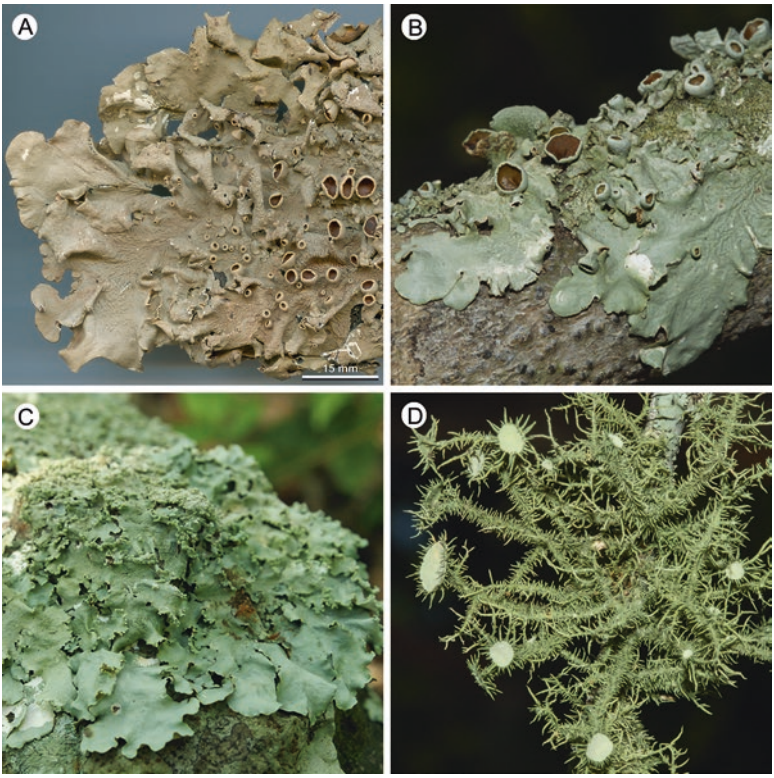

Fig. 6.6 Parmeliaceae
(**a**) *Parmotrema confusum* Hale. (**b**) *Parmotrema mesotropum* (Müll. Arg.) Hale. (**c**) *Parmotrema mordenii* (Hale) Hale. (**d**) *Usnea subparvula* A. Gerlach & P. Clerczz

6.9 Key D – Parmeliaceae

Identification Key to *Parmeliaceae* Species from the Pantanal (Fig. 6.6)

1a. Thallus fruticose, usneoid	*Usnea subparvula*
1b. Thallus foliose, parmelioid	2
2a. Lobes usually less than 5.0 mm wide, rhizines frequently present up to the margin	3
2b. Lobes usually more than 5.0 mm wide, rhizines frequently absent in a large marginal zone	8
3a. Thallus with marginal cilia	4
3b. Thallus without marginal cilia	15
4a. Marginal cilia bulbate, frequently without apices	*Bulbothrix regnelliana*
4b. Marginal cilia not bulbate	5
5a. Medulla yellow	*Myelochroa lindmanii*

5b. Medulla white	6
6a. Thallus with isidia or soredia	7
6b. Thallus without isidia or soredia	12
7a. Thallus isidiate	8
7b. Thallus sorediate	9
8a. Isidia ciliate; medulla K-, C+ rose (gyrophoric acid)	*Parmotrema melanochaetum*
8b. Isidia eciliate; medulla K+ red (lecanoric acid), C-	*Parmotrema tinctorum*
9a. Medulla K+ yellow or dirty yellow	10
9b. Medulla K-	11
10a. Thallus usually closely adnate to the substratum; medulla P+ slowly yellowish (atranorin)	*Parmotrema mordenii*
10b. Thallus usually loosely adnate to the substratum; medulla P+ orange (protocetraric acid)	*Parmotrema dilatatum*
11a. Soredia frequently on top of dactyls	*Parmotrema soredioaliphaticum*
11b. Soredia usually formed in crescent-shaped soralia	*Parmotrema praesorediosum*
12a. Lobes ciliate	13
12b. Lobes eciliate	14
13a. Cilia short, tapered and thick; medulla UV-	*Parmotrema consors*
13b. Cilia long, uniform and thin; medulla UV+ greenish (alectoronic acid)	*Parmotrema argentinum*
14a. Medulla K+ dirty yellow, P+ orange (protocetraric acid)	*Parmotrema confusum*
14b. Medulla K-, P- (fatty acids)	*Parmotrema mesotropum*
15a. Upper surface smooth to slightly foveolate	16
15b. Upper surface scrobiculate	17
16a. Lower surface black, medulla with protocetraric acid (K+ yellow, P+ orange)	*Canoparmelia amazonica*
16b. Lower surface brown, medulla without protocetraric acid (K-, P-)	*Canoparmelia caroliniana*
17a. Thallus sorediate	18
17b. Thallus not producing propagules	*Crespoa scrobicularis*
18a. Lobes up to 2.5 mm wide	*Crespoa carneopruinata*
18b. Lobes up to 4.0 mm wide	*Crespoa crozalsiana*

6.10 Comments on the Species Treated in This Chapter

Agonimia opuntiella (Buschardt & Poelt) Vězda, Lichenes Rariores Exsiccati 33 (nos. 321-330): 4, no. 330. 1997.

Agonimia opuntiella is characterized by the greenish gray to brownish microsquamulose thallus, squamules 0.5–1.5 mm, adnate, with tiny glassy hairs which are usually 17–21 × 5 µm, but a little longer in the Pantanal material (40–60 µm). Perithecia and pycnidia were not seen in our specimen. According to Smith et al. (2009), *A. opuntiella* differs from *A. tristicula* (Nyl.) Zahlbr. by the minute hairs along the thallus surface. See description in Aptroot (2011) and Smith et al. (2009).

Examined material: Corumbá municipality, beginning of the trail to Morro do Amolar, next to the margin of Baía do Taquaral, in a shaded place, on tree trunk,

18°02′48.90″S, 57°29′49.50″W, 89 m alt., 26.XI.2010, leg. A.A. Spielmann 8680 (CGMS).

Alyxoria varia (Pers.) Ertz & Tehler, Fungal Diversity 49(1): 53. 2011.

Fig. 6.3b

Alyxoria varia is characterized by its crustose thallus, with simple carbonized lirellae, not pruinose, with concealed disc, sometimes exposed. The ascospores are transversally septated, 6–7 cells, with two enlarged cells in the middle. The Pantanal material has ascospores of (27.5–)30–35(–37.5) × (–3.5)–5 µm, mostly within the interval cited by Ertz (2009). *A. varia* differs from *Opegrapha xerica* Torrente & Egea by shorter (14–20 µm) and less septate (4–6 cells) ascospores (Torrente and Egea 1992; Ertz 2009). See description in Ertz (2009) as *Opegrapha varia* Pers.

Examined material: Corumbá municipality, Fazenda Nhumirim, Pomar da sede-Pantanal, on goiabeira trunk [*Psidium guajava* L.], 18°59′01.8″S, 56°36′56.9″W, 90m alt., 26.X.1988, leg. V.J. Pott 684 (COR); idem, Sub-região Pantanal do Paraguai, Baía do Castelo, riparian forest in a rock outcrop, on tree trunk, 18°34′52.20″S, 57°31′36.50″W, 95m alt., 22.XI.2010, leg. T.H. Stefanello 28 (CGMS).

Amandinea submontana Marbach, Bibliotheca Lichenol. 74: 105. 2000.

Amandinea submontana is characterized by its crustose thallus, dark gray, with small black apothecia (around 0.2–0.4 mm), with clear hymenium, one-septate olive-brown ascospores, 12.5–15 × 5 µm and only atranorin in the thallus. According to Marbach (2000), this species resembles *A. leucomela* (Imshaug) P.F. May & Sheard, but differs mainly on the chemistry: *A. leucomela* has 6-O-methylarthotheline and lichexanthone, reacting UV+ on the thallus, while *A. submontana* has only atranorin (UV-). See description in Marbach (2000).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Castelo, riparian forest in a rock outcrop, on tree trunk, 18°34′52.20″S, 57°31′36.50″W, 95m alt., 22.XI.2010, leg. T.H. Stefanello 27 (CGMS).

Arctomia leptospora (Malme) Otálora & Wedin, Lichenologist 45: 293. 2013.

Fig. 6.2a

Arctomia leptospora is characterized by agglomerated branches that are covered by blackish granular isidia. The ascospores are transversely septate with (110–)125–175(–200) × 3–4(–5) µm (Malme 1924a). The thallus of *Arctomia leptospora* is greenish and homoiomerous, and cortices without paraplectenchymatous cells, as in *Collema*. The species was combined within *Arctomia* by Otálora & Wedin (2013), but previous molecular studies inferred that *A. leptospora* belongs to *Collemataceae* and further studies are necessary. See description in Malme (1924a).

Examined material: Corumbá municipality, Fazenda Nhumirim, Pomar da sede, on tree, 26. X.1988, leg. M.P. Marcelli 682 (COR); idem, Tromba dos Macacos, 02.XI.1993, leg. O. Yano s/n (COR).

Buellia curatellae Malme, Ark. Bot. 21A (no. 14): 18. 1927

Fig. 6.3d

Buellia curatellae is characterized by its usually cracked crustose thallus, pale gray, black, and small apothecia (0.4–0.6 mm), with inspersed hymenium, brown

one-septate ascospores, 13–20 × 5 µm in the Pantanal material. The thallus reacts K+ yellow turning red, due to the presence of norstictic acid. This species is similar to *Buellia rechingeri* Zahlbr. which, according to Marbach (2000), has a cartilaginous-squamulose thallus and smaller ascospores (12)15–17(–18) × (4–)5–6 µm. See description in Marbach (2000).

Examined material: Rio Negro municipality, margin of the road MS-419, between Rio Negro and Rio Verde de Mato Grosso, in an open area, on a wooden fence pole, 19°17′55.83″S, 55°06′1.04″W, 165 m alt., 3.X.2013, leg. A.A. Spielmann 11132 (CGMS).

Bulbothrix regnelliana Jungbluth, Marcelli & Elix, Mycotaxon 104: 58 (2008)

This species is characterized by the lack of propagules, absence of laminal bulbs, cilia more frequently without apices, brown lower surface, coronate apothecia, ellipsoid ascospores 10–12 × 6–7 µm and medulla K+ yellow → orange, C-, KC-, P+ yellow, UV-.

It could be confused with *B. subcoronata* (Müll. Arg.) Hale and *B. viatica* Spielmann & Marcelli since they share the medullary chemistry and lack propagules, for instance. However, they can be distinguished by the lower surface color, the ascospores size, and the laminal ciliary bulbs. See Benatti (2012) for detailed comments and further differentiation.

Bulbothrix regnelliana was previously reported to the states of São Paulo (Jungbluth et al. 2008), Minas Gerais, and Rio Grande do Sul (Benatti 2012), and this is the first record to Mato Grosso do Sul state.

TLC: atranorin and norstictic acid.

Examined material: Corumbá, Sub-região Pantanal do Paraguai, on the bank of Taquaral Bay, 18° 02′ 42,3″ S, 57° 30′ 15,2″ W, 83 m alt., on thin branch of *Licania* sp. at the edge of the bay, 26.XI.2010, leg. L.S. Canêz et al. 3620 (CGMS).

Candelaria concolor (Dicks.) Stein., Flora, Regensburg 62: 364. 1879.

Candelaria concolor is characterized by the microfoliose, yellow thallus, formed by laciniae less than 0.5 mm wide, with granular soredia on their apices. Apothecia in this species are reported as rare (Awasthi 2007; Westberg and Arup 2010), and the Pantanal material was also found without this reproductive structure, having only soredia. This species is similar to *C. fibrosa* (Fr.) Müll. Arg., which usually has broader lobes, lacks soredia, and has numerous apothecia (Almborn 1966). See description in Almborn (1966) and Awasthi (2007).

Examined material: Corumbá municipality, Fazenda Nhumirim, Bordo de Salina – forest, on tree trunk, 18°59′01.8″S, 56°36′56.9″W, 90m alt., 10.IX.1988, leg. V.J. Pott 622 (COR).

Canoparmelia amazonica (Nyl.) Elix & Hale, Mycotaxon 27: 277. 1986.

Canoparmelia amazonica is different from other species of the genus due to its smooth upper surface, black lower surface, for presenting mostly simple isidia with brown apices and by its medullary chemistry: K+ yellow, C-, KC+ evanescent rose violet, P+ orange, UV-.

This species resembles *C. caroliniana* that also has isidia; however, it can be easily recognized because of its medullary chemistry. *Canoparmelia caroliniana* produces perlatolic acid (K-, P-) instead of protocetraric acid (K+, P+). Complete

descriptions, additional data, and a helpful table about *Canoparmelia* species can be found in Jungluth (2006).

TLC: atranorin and protocetraric acid.

[0]Examined Material: Corumbá, Morraria do Urucum, on fallen brunch, 19°12′08,2″ S, 57°36′04,6″ W, 733 m alt., 03.IX.2010, leg. L.S. Canêz et al. 3348 (CGMS).

Canoparmelia caroliniana (Nyl.) Elix & Hale, Mycotaxon 27: 278. 1986.

Canoparmelia caroliniana presents smooth or slightly foveolate upper surface, isidiate, brown lower surface or with some black areas, concolour rhizines, and produces medullary perlatolic acid (KC+ evanescent pink) and cortical atranorin. For additional data, see Jungbluth (2006) and Spielmann & Marcelli (2008).

TLC: atranorin, perlatolic acid, traces of anziaic acid and triterpenes.

Examined Material: Brazil, Mato Grosso do Sul, Corumbá, Morraria do Urucum, on fallen brunch on trail, 19° 12′ 08,2″ S, 57° 36′ 04,6″W, 733 m alt., 03.IX.2010, leg. L.S. Canêz et al. 3286 (CGMS).

Chrysothrix xanthina (Vain.) Kalb, Biblioth. Lichenol. 78: 144. 2001.

Chrysothrix xanthina is characterized by the bright yellow leprose thallus, with no separate reproductive structures. This species is very similar to *C. candelaris* (L.) Laundon, but according to Kalb (2001b), *C. xanthina* only occurs in the tropics and has smaller thallus granules (20–50 µm in diameter) than the former (75–200 µm in diameter). Differences in chemistry were also found, with some rare exceptions, as *C. candelaris* has calycin as the main substance, while *C. xanthina* produces more concentrations of pinastric acid. See description in Laundon (1981), as *C. candelaris*, and in Kalb (2001b).

Examined material: Corumbá municipality, on the border of Fazenda Nhumirim and Campo Dora, on a wooden fence pole, 18°59′01.8″S, 56°36′56.9″W, 90m alt., 11.IX.1988, leg. V.J. Pott 641 (COR); idem, Fazenda Nhumirim, Pomar da sede, on mangueira trunk [*Mangifera indica* L.], 18°59′01.8″S, 56°36′56.9″W, 90m alt., leg. V.J. Pott 690 (COR); Rio Negro municipality, margin of the road MS-419, between Rio Negro and Rio Verde de Mato Grosso, edge of Cerrado, 19°17′55.83″S, 55°06′1.04″W, 165m alt., 3.X.2013, leg. A.P. de Souza 42 (CGMS).

Cratiria obscurior (Stirton) Marbach & Kalb, Biblioth. Lichenol. 74: 186. 2000. Fig. 6.3b

Cratiria obscurior is characterized by the pale gray crustose thallus, the black lecideine apothecia, with clear hymenium, brown two-celled ascospores, 12.5–17.5 × 5 µm, excipulum K+ yellow-red forming red crystals, and thallus K+ red (norstictic acid). According to Marbach (2000), this species is very similar to *C. lauricassiae* (Fée) Marbach, which differs by its four-celled ascospores. Also similar to *C. obscurior* are *C. amphorea* (Eckfeldt) Marbach and *C. saltensis* (H. Magn.) Marbach, which differ by having inspersed hymenia. See description in Marbach (2000).

Examined material: Corumbá municipality, margin of Baía do Taquaral, riparian forest, on twig of *Licania* sp., 18°02′42.30″S, 57°30′15.20″W, 83m alt., 26.XI.2010, leg. L.S. Canêz 3605 (CGMS).

Crespoa carneopruinata (Zahlbr.) Lendemer & Hodkinson, North American Fungi 7(2): 2012.

This species is characterized by the scrobiculate upper surface, presence of orbicular and laminal soralia, lobes up to 2.5 mm, black lower surface, medulla K+ yellow, C-, KC-, P+ orange (stictic acid complex).

Crespoa carneopruinata was first reported to Mato Grosso do Sul state by Fleig & Riquelme (1991, as *Canoparmelia carneopruinata*, but here it is cited to the Pantanal for the first time. Additional data can be found in Jungbluth (2006).

Examined Material: Corumbá, Morraria do Urucum, on cortex, 19° 12′ 08,2″ S, 57° 36′ 04,6″W, 733 m alt., 03.IX.2010, leg. L.S. Canêz, A.A. Spielmann, A.P. Lorenz-Lemke & W.S. Fava 3251 (CGMS).

Crespoa crozalsiana (B. de Lesd. ex Harm.) Lendemer & Hodkinson, North American Fungi 7(2): 2012.

This species is characterized by the sublacinulate to lobate thallus, strong scrobiculate upper surface, orbicular soralia, laminal, atranorin as cortical constituents and stictic acid complex in the medulla (K+ yellow, C-, KC-, P+ orange).

Crespoa crozalsiana and *C. carneopruinata* are similar and it seems that the two differ only by the width of the lobes, that are up to 2.5 mm in *C. carneopruinata* and slightly wider in *C. crozalsiana* that are up to 4.0 mm. These two species could be synonyms, but a more thourough investigation is necessary. For additional information, see Jungbluth (2006) and Spielmann & Marcelli (2008).

TLC: atranorin, stictic, constictic (stictic complex).

Examined material: Corumbá, Morraria do Urucum, on cortex, 19° 12′ 08,2″ S, 57° 36′ 04,6″W, 733 m alt., 03.IX.2010, leg. L.S. Canêz et al. (CGMS).

Crespoa scrobicularis (Kremp.) Benatti & Lendemer, Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn 25: 10. 1873.

This species is characterized by a very scrobiculate upper surface, narrow laciniae, propagules absent (only apothecia), and for presenting substances of the stictic acid complex.

Crespoa scrobicularis was reported to Brazil (as *Canoparmelia*) for several authors in different states (Ribeiro 1998, Eliasaro 2001, Jungbluth 2006, Spielmann 2006). Despite this, here in Mato Grosso do Sul state, *C. scrobicularis* was cited only to Ponta Porã in Osorio (1973) and it was found in Pantanal almost fifty years later.

TLC: atranorin and substances from stictic complex.

Examined material: Corumbá, Morraria do Urucum, on fallen branch, 19° 12′ 08,2″ S, 57° 36′ 04,6″W, 733 m alt., 03.IX.2010, leg. L.S. Canêz et al. 3300, 3249, 3278 *p. parte* (CGMS).

Dirinaria aegialita (Afz. ex Ach.) B.J. Moore, The Bryologist 71: 248. 1968.

Dirinaria aegialita is characterized by the foliose thallus, slightly plicate; laciniae discrete to slightly confluent, palmatifid to irregularly branched, apices not flabellate and rounded; laminal polysidiangia with apical granular soredia; apothecia sessile to constricted at the base; disc plane to slightly convex, black, epruinose, or rarely whitish pruinose; ascospores *Dirinaria*-type, 2-celled, 13–17(–19) × 5–7(–8) µm (Awasthi 1975), but apothecia was not found in the studied material. The

chemical constituents are atranorin and divaricatic acid. The other species with polysidiangia are *D. consimilis* and *D. pruinosa*, but the first has sekikaic acid and the last has purplish-pruinose apothecial disc. See description in Awasthi (1975).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, beginning of the trail to Morro do Amolar à margem da Baía do Taquaral, on rock, 18°02′48.90″S, 57°29′49.50″W, 89 m alt., 26.XI.2010, leg. L.S. Canêz 3636; 18°02′42.30″S, 57°30′15.20″W, 83m alt., leg. C.O. Dourado 77 (CGMS).

Dirinaria africana (Müll. Arg.) D.D. Awasthi, Biblioth. Lichenol. 2: 40. 1975.

Dirinaria africana is characterized by the foliose thallus strongly adnate, slightly plicate; laciniae confluent, subdichotomously branched, slightly flabellate, rounded apices, and dark-brown margins; vegetative propagules absent; apothecia immersed; disc plane, black, epruinose; ascospores *Dirinaria*-type, 12–18 × (5–)6–8 µm. The chemical constituents are atranorin and divaricatic acid. In Swinscow & Krog (1978) *D. africana* was treated as a synonym of *D. confluens*, but due to the characteristics presented by Awasthi (1975), it was considered a valid species. This is the first record of *D. africana* for the American continent. See description in Awasthi (1975).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, RPPN Eliezer Batista (Novos Dourados), topo do morro, on rock, 18°05′33.40″S, 57°29′31.40″W, 208m alt., 24.XI.2010, leg. L.S. Canêz 3566b, 3569 (CGMS); início da trilha, on rock, 18°05′40.20″S, 57°29′15.50″W, 95m alt., 24.XI.2010, leg. A.A. Spielmann 8741 (CGMS).

Dirinaria confluens (Fr.) D.D. Awasthi, Biblioth. Lichenol. 2: 28. 1975.

Dirinaria confluens is characterized by the foliose thallus loosely adnate, strongly plicate and verrucose in the central part; laciniae confluent, dichotomously to subdichotomously branched, flabellate, rounded apices; vegetative propagules absent; apothecia sessile to constricted at the base; disc plane to slightly convex, black, epruinose; ascospores *Dirinaria*-type, (14–)16–24 × (6–)8–10 µm. The chemical constituents are atranorin and divaricatic acid. A closely related species is *D. pruinosa,* which has purplish-pruinose apothecial disc. See description in Awasthi (1975).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, RPPN Eliezer Batista (Novos Dourados), on bark, 18°05′40.20″S, 57°29′15.50″W, 95m alt., 24.XI.2010, leg. C.S. Robles 45 (CGMS); idem, 58; 18°01′09.20″S, 57°32′03.80″W, 95m alt., leg. L.S. Canêz 3556 (CGMS); RPPN Acurizal, próximo à sede da ECOTROPICA, on bark 17°52′38.20″S, 57°33′12.00″W, 27.XI.2010, leg. T.S. Amaral 159 (CGMS).

Dirinaria consimilis (Stirt.) D.D. Awasthi, in Awasthi & Agarwal, J. Indian Bot. Soc. 49: 135. 1970.

Dirinaria consimilis is characterized by the foliose thallus, smooth to slightly plicate; laciniae discrete to slightly confluent, palmatifid to irregularly branched, apices not flabellate and rounded; laminal polysidiangia with apical granular soredia; apothecia sessile to constricted at the base; disc plane to slightly convex, black, epruinose, or rarely whitish pruinose; ascospores *Dirinaria*-type, 14–23 × 6–8 µm. The chemical constituents are atranorin and sekikaic acid. For comparisons with

closely related species, see comments under *D. aegialita*. See description in Awasthi (1975).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai início da trilha para o Morro do Amolar à margem da Baía do Taquaral, on rock, 18°02′48.90″S, 57°29′49.50″W, 89m alt., 26.XI.2010, leg. C.O. Dourado 57 (CGMS); idem, 18°02′42.30″S, 57°30′15.20″W, 83m alt., 26.XI.2010, leg. L.S. Canêz 3626 (CGMS).

Dirinaria papillulifera (Nyl.) D.D. Awasthi, The Bryologist 67: 369. 1964.

Dirinaria papillulifera is characterized by the foliose thallus, slightly plicate to strongly plicate; laciniae discrete to slightly confluent, subdichotomously branched, flabellate, rounded apices; laminal to submarginal isidia present; apothecia sessile to constricted at the base; disc plane to slightly convex, black, epruinose; ascospores *Dirinaria*-type, 12–16 × 5.5–8 µm. The chemical constituents are atranorin and divaricatic acid. This is the only species with true isidia in *Dirinaria*. This is the first record of this species for the state of Mato Grosso do Sul. See description in Awasthi (1975).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Mandioré, on bark, 18°11′50.70″S, 57°30′39.70″W, 90m alt., 23.XI.2010, leg. A.A. Spielmann 8710, 8723 (CGMS); L.S. Canêz 3518, 3525, 3532, 3534 (CGMS); Baía do Castelo on bark, 18°35′17.30″S, 57°32′10.80″W, 86m alt., 22.XI.2010, leg. T.H. Stefanello 10 (CGMS).

Dirinaria picta (Sw.) Clem. & Shear, The Genera of Fugi. 323. 1931.

Dirinaria picta is characterized by the foliose thallus, not plicate; laciniae discrete, palmatifid to irregularly branched, apices not flabellate and rounded; laminal and hemispheric soralia, farinose soredia; apothecia sessile to constricted at the base; disc plane to slightly convex, black, epruinose; ascospores *Dirinaria*-type, (12–)14–17(–21) × 5–7(–9) µm. The chemical constituents are atranorin and divaricatic acid. *Dirinaria applanata* is the most closely related species, but the thallus of this species is strongly plicate and it has flabellate laciniae. This is the first record of this species for the state of Mato Grosso do Sul. See description in Awasthi (1975).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Mandioré, on bark, 18°11′50.70″S, 57°30′39.70″W, 90m alt., 23.XI.2010, leg. T.H.D. Leandro 30, 31, 33, 35, 40, 41, 42, 68 (CGMS), L.S. Canêz 3515, 3520, 3527, 3529 3538 (CGMS); Baía do Taquaral, on bark, 18°02′42.30″S, 57°30′15.20″W, 83m alt., 26.XI.2010, leg. C.O. Dourado 99, 103 (CGMS); L.S. Canêz 3611 (CGMS); Baía do Castelo, on bark, 18°35′17.30″S, 57°32′10.80″W, 86m alt., 22.XI.2010, leg. L.S. Canêz 3499 (CGMS); leg. T.H. Stefanello 9 (CGMS).

Dirinaria pruinosa Kalb, Biblioth. Lichenol. 78: 147. 2001.

Dirinaria pruinosa is characterized by the foliose thallus, not plicate to slightly plicate; laciniae discrete to slightly confluent, palmatifid to irregularly branched, apices not flabellate and rounded; laminal to marginal polysidiangia with apical granular soredia; apothecia sessile to constricted at the base; disc plane to slightly convex, black, purplish-pruinose; ascospores *Dirinaria*-type, (14–)20–25 × (6–)7–8 µm. The chemical constituents are atranorin and divaricatic acid. For comparisons

with closely related species, see *D. aegialita* comment. This is the first record of this species for the state of Mato Grosso do Sul. See description in Kalb (2001b).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, RPPN Elizer Batista (Novos Dourados), início da trilha, on bark, 18°01′09.20″S, 57°32′03.80″W, 95m alt., 24.XI.2010, leg. L.S. Canêz 3554 (CGMS); Baía do Taquaral, início da trilha para o Morro do Amolar, próximo a margem da baía, 18°02′48.90″S, 57°29′49.50″W, 89m alt., 26.XI.2010, leg. L.S. Canêz 3637 (CGMS).

Dirinaria purpurascens (Vain.) B.J. Moore, The Bryologist 71: 251. 1968.

Dirinaria purpurascens is characterized by the foliose thallus loosely adnate to the substrate, slightly plicate; laciniae discrete to slightly confluent, palmatifid to irregularly branched, apices flabellate, truncate; vegetative propagules absent; apothecia sessile to constricted at the base; disc plane to slightly convex, black, purplish-pruinose; ascospores *Dirinaria*-type, (11–)14–18 × 5–7 µm. The chemical constituents are atranorin and divaricatic acid. For comparisons with closely related species, see *D. confluens* comment. This is the first record of this species for the state of Mato Grosso do Sul. See description in Awasthi (1975).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Mandioré, on bark, 18°11′50.70″S, 57°30′39.70″W, 90m alt., 23.XI.2010, leg. L.S. Canêz 3526, 3528 (CGMS); Nhecolandia, Baía do Jacaré, Fazenda Nhumirim, on bark, 10.IX.1988, leg. V.J. Pott 638, 639, 685 (COR); Morro São Domingos, on bark, 25.XI.1995, leg. E.F. da Rocha s/n (COR).

Dirinaria rhodocladonica Kalb, Schumm & Elix, Australasian Liquenology 86: 8. 2020

Fig. 6.5a

Dirinaria rhodocladonica is characterized by the foliose thallus, strongly plicate and verrucose in the central part; medulla white with coccineous pigment in the upper region; laciniae confluent, dichotomously to subdichotomously branched, flabellate, rounded to retuse apices; vegetative propagules not present; apothecia sessile to constricted at the base; disc plane to slightly convex, black, epruinose; ascospores *Dirinaria*-type, (12–)15–19 × 6–7 µm. The chemical constituents are atranorin and divaricatic acid. The main difference between *D. rhodocladonica* and *D. confluens* is the presence of a coccineous pigment in the medulla of the first species. See description in Awasthi (1975).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, RPPN Eliezer Batista (Novos Dourados), on bark, 18°05′40.20″S, 57°29′15.50″W, 95m alt., 24.XI.2010, leg. C.S. Robles 42 (CGMS); Rio Negro municipality, margem da Estrada MS-419, entre Rio Negro e Rio Verde do Mato Grosso, 19°17′55.83″S, 55°06′1.04″W, 165m alt., 3.X.2013, leg. A.A. Spielmann 11131, 11133 (CGMS).

Dyplolabia afzelii (Ach.) A. Massal., Neagenea Lich.: 6. 1854.

Fig. 6.3c

Dyplolabia afzelii is characterized by the brown to olive brown crustose thallus, mostly simple lirellae, (0.35–)0.75–1.75(–2.25) mm, with thick white coating C+ red (presence of lecanoric acid), laterally carbonized excipulum, clear hymenium, paraphyses branched and anastomosing, hyaline ascospores, 3-septate, 16–20 × 7.5

µm, with negative iodine reaction. Similar to *D. afzelii*, *D. ochrocheila* (Vain.) Rivas Plata & Lücking differs by its very long lirellae (10–30 mm) with a yellowish white cover and smaller ascospores (14–17 × 5–7 µm). The other three known species of this genus, *D. dalywaiana* Rivas Plata, Bawingan & Lücking, *D. oryzoides* (Leight.) Kalb & Staiger and *D. chumphonensis* J. Kalb & K. Kalb have submuriform to muriform ascospores (Kalb et al. 2016). See description in Staiger (2002).

Examined material: Corumbá municipality, Fazenda Nhumirim, Pomar da sede, on cajueiro trunk [*Anacardium occidentale* L.], 18°59′01.8″S, 56°36′56.9″W, 26.X.1988, leg. V.J. Pott 688 (COR).

Fellhanera vulgata (Malme) Lücking **comb. nov.**

MycoBank MB 835680

Bas.: *Bacidia vulgata* Malme, Ark. Bot. 27A(5): 10. 1935.

Tax. syn.: *Bacidia vulgata* f. *saxicola* Malme, Ark. Bot. 27A(5): 11. 1935.

This corticolous (and saxicolous) species has been related to the genus *Fellhanera*, but the combination has apparently never been validly published. *Fellhanera vulgata* is similar to the foliicolous *F. rhaphidophylli* (Rehm) Vězda and *F. paradoxa* (Vězda) Vězda. From the first it differs by the larger apothecia with distinct margins and from the second by the smaller, regularly 3-septate ascospores.

Examined material: Matto Grosso: Santa Anna da Chapada, 2 March 1894, Malme 2472 (S, holotype).

Crypthonia albida (Fée) Frisch & G. Thor, Mycol. Progress 9: 290. 2010.

Fig. 6.4a

Crypthonia albida is characterized by its crustose loose attached light green thallus, with pale prothallus, numerous felty-like white pseudoisidia, and the presence of psoromic acid as the major substance (thallus C-, K-, UV-, P+ strong yellow). According to Aptroot et al. (2009), psoromic acid is rare in *Arthoniales*, occurring for instance also in *Ancistrosporella psoromica* Komposch, Aptroot & Hafellner. In Arthoniaceae, besides *C. albida*, only three species of the related and similar genus *Herpothallon* have this substance: *H. australasicum* (Elix) Elix & G. Thor, *H. echinatum* Aptroot, Lücking & Will-Wolf and *H. globosum* G. Thor. The first differs from *C. albida* by the scattered red pigment in the prothallus and its substrate (foliicolous or lignicolous); *H. echinatum* has firmly attached thallus and cylindrical, compact pseudoisidia, whereas *H. globosum* has a red prothallus and red, globose pseudoisidia. See description in Aptroot et al. (2009) and Frisch & Thor (2010).

Examined material: Corumbá municipality, Morro São Domingos – Mineração Corumbaense, in Semidecidual forest area, 19°15′45.8″S, 57°36′11.6″W, 21.II.2001, leg. I.H. Ishii s/n (COR).

Hyperphyscia adglutinata (Flörke) H. Mayrhofer & Poelt, Herzogia 5(1–2): 62. 1979.

Fig. 6.5b

Hyperphyscia adglutinata is characterized by the small foliose thallus, upper surface gray brow to dark brown; laciniae confluent, irregularly branched, truncate, and ascending apices; laminal and maculiform soralia, slightly capitate, with granular soredia; apothecia sessile to constricted at the base; disc plane, brown to black;

ascospores *Pachysporaria* to *Physcia*-type, 18–23 × 8–11 µm (Moberg 1983), but in the studied material apothecia was not found. Only traces of skyrin were found as a chemical constituent. *Hyperphyscia syncolla* is a closely related species but lacks vegetative propagules. This is the first record of this species for the state of Mato Grosso do Sul. See description in Moberg (1987).

Examined material: Corumbá municipality, Base de Estudos do Pantanal (UFMS), Baía da Medalha, on bark, 19°34′32.90″S, 57°00′51.50″W, 95m alt., 21.VIII.2011, leg. A.A. Spielmann 9596 (CGMS); Fazenda Nhumirim, Pomar da Sede, on bark, 26.X.1988, leg. V.J. Pott 681a (COR).

Hyperphyscia syncolla (Tuck. ex Nyl.) Kalb, Lichenes Neotropici 6(230): 11. 1983.

Hyperphyscia syncolla is characterized by the small foliose thallus, verrucose in the central parts, upper surface gray brow to dark brown; laciniae confluent, irregularly branched, truncate, and ascending apices; vegetative propagules absent; apothecia sessile to constricted at the base; disc plane, brown to black; ascospores *Pachysporaria*-type, 15–21 × 7–11 µm. Only traces of skyrin were found as a chemical constituent. See description in Moberg (1987).

Examined material: Corumbá municipality, Morraria do Urucum, on bark, 19°12′08.20″S, 57°36′04.60″W, 733m alt., 3.IX.2010, leg. L.S. Canêz 3270 (CGMS).

Lecanora achroa Nyl., J. Bot., Lond. 14: 263. 1876.

Lecanora achroa is characterized by the green to greenish-gray crustose thallus, apothecia with thalline margin (lecanorine), 0.35–0.75 mm, disc beige, epruinose, yellowish hymenium with little dark crystals that dissolve in KOH, simple and ellipsoid spores, 9–12.5 × 5–6 µm and the presence of atranorin and usnic acid as major chemical compounds. This species is similar to *L. helva* and *L. leprosa* Fée, but differs on their main chemistry: while *L. achroa* has atranorin and usnic acid, *L. helva* is mentioned in the literature to produce 2'-O-methylperlatolic acid, and *L. leprosa* produces mainly substances from the ganga leoidin chemosyndrome (Galloway et al. 2001). See description in Galloway et al. (2001), Guderley (1999).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Castelo, on the river margin, ruderal environment, on the stipe of a carandá palm, 18°35′26.00″S, 57°32′44.70″W, 88m alt., 22.XI.2010, leg. T.H. Stefanello 57 (CGMS); idem, RPPN Eliezer Batista (Novos Dourados), beginning of the trail, 18°01′09.20″S, 57°32′03.80″W, 95m alt., 24.XI.2010, leg. L.S. Canêz 3565a (CGMS).

Lecanora concilianda Vain., Acta Soc. Fauna Flora Fenn. 7: 85. 1890.

Lecanora concilianda is characterized by the crustose verrucose thallus, apothecia with thalline margin (lecanorine), with crenulate margins, 0.25–0.55 mm, brown to reddish brown disc, amphitecium with large crystals, some dissolving in KOH, yellowish hypothecium, ascospores simple and ellipsoid, 12.5–17.5 × 6–9 µm. Thallus C-, K+ yellow, UV-, hymenium I+ blue persistent. No substances were detected in the Pantanal material. *Lecanora concilianda* is similar to *L. concilians* (Nyl.) Cromb., the latter having apothecia with darker discs (black-brown) and larger ascospores (14–20 × 9–12 µm) (Cáceres 2007). See description in Vainio (1890).

Examined material: Corumbá municipality, Morro Tromba dos Macacos, in a Cerrado forest area, on bocaiúva trunk, 19°12′45.3″S, 57°40′26.8″W, 02.XI.1993, leg. M.P. Marcelli 24809 (COR).

Lecanora helva Stizenb., Ber. Tät. St Gall. naturw. Ges.: 218 (1890) [1888-89].*

Lecanora helva is characterized by the crustose gray thallus, apothecia with thalline margin (lecanorine), 0.25–0.9 mm, beige to ochre disc, epruinose, with persistent margin, hymenium pale with small dark crystals dissolving in KOH, simple and ellipsoid spores, 10–12.5 × 5–6.2 µm, and atranorin as the main chemical compound. This species is morphologically similar to *L. achroa* and *L. leprosa*, differing regarding their chemistry (check on *L. achroa*). See description in Galloway et al. (2001), Guderley (1999).

Examined material: Rio Negro municipality, margin of the road MS-419, between Rio Negro and Rio Verde de Mato Grosso, in an open area, on a wooden fence pole, 19°17′55.83″S, 55°06′1.04″W, 165m alt., 3.X.2013, leg. A.A. Spielmann 11135 (CGMS).

Leptogium austroamericanum (Malme) C.W. Dodge, Ann. Missouri Bot. Gard. 20: 419. 1933.

Leptogium austroamericanum is characterized by the agglomerated lobes with irregular wrinkles on the upper surface, and granular to cylindrical isidia with withered appearance. *Leptogium cyanescens* is an isidiate species, as *L. austroamericanum*, but has smooth to rugulose upper surface. See description in Kitaura (2012).

Examined material: Corumbá municipality, Tromba dos Macacos, 02.XI.1993, s/c. 24817 (COR); idem, on *Aspidosperma subincanum*, 2.XI.1993, leg. M.P. Marcelli 24820 pr. min. p. (COR); idem, on bocaiuva tree, 02.XI.1993, leg. M.P. Marcelli 24824 (COR); idem, s/d, leg. M.P. Marcelli s/n. pr. max. p. (COR); idem, s/d, s/c, s/n (COR); idem, sub-region Paraguay Pantanal, Castelo Bay, 18°33′52.80″S, 57°34′29.30″ W, 92 m. alt., corticolous on riparian forest, on rock, 22.XI.2010, leg. T.H. Stefanello 79 (CGMS); idem, RPPN Rumo ao Oeste, Guaia Bay, 17°44′18.10″S, 57°41′27.80″ W, 91 m. alt., riparian forest, 28.XI.2010, leg. A.A. Spielmann 8813, (CGMS); idem, Brazil-Bolivia Frontier, Subregion Pantanal of Paraguay, margin of Mandioré Bay (Bolivia side), 18°11′50.70″S, 57°30′39.70″W, 90 m. alt., 23.XI.2010, leg. A.A. Spielmann 8726 pr. max. p. (CGMS).

Leptogium chloromelum (Sw.) Nyl., M Soc. Natl. Sci. Nat. Math. Cherb., 5: 333. 1857.

Fig. 6.2b

Leptogium chloromelum is characterized by the presence of overlapping branches, adpressed, and with irregular and longitudinal ridges on the upper surface. The subpedicellate apothecia have thick paraplectenchymatous proper exciple, as the apothecia of *L. phyllocarpum*. However, the apothecia of *L. phyllocarpum* are constituted by lobuloid structures, whereas the apothecia of *L. chloromelum* are smooth, without lobuloid structures. Both species, *L. chloromelum* and *L. phyllocarpum*, have fusiform ascospores, which are submuriform and muriform, respectively. See description in Kitaura (2012).

Examined material: Corumbá municipality, Tromba dos Macacos, on bocaiuva, 02.XI.1993, s/c, s/n (COR); idem, s/d, leg. M.P. Marcelli s/n. (COR 3152); s/d, leg.

M.P. Marcelli s/n. (COR 3176); idem, s/d, leg. M.P. Marcelli s/n (COR 3177); idem, Forte Coimbra, on calcareous substrate, s/d, leg. I.H. Ishii s/n (COR 6038).

Leptogium cochleatum (Dicks.) Jørg. & James, Lichenologist 15(2): 113. 1983.

Leptogium cochleatum is characterized by distinctly striate upper surface, subpedicellate apothecia on the lamina, and thick paraplectenchmatous thalline exciple. The surface of *Leptogium cochleatum* differs from the surfaces of *L. azureum* and *L. moluccanum* that are smooth. Furthermore, the apothecia of *L. azureum* are pedicellate, with pedicel c. 1 mm long. See description in Aragón et al. (2005).

Examined material: Corumbá Municipality, Reserva Acurizal, Córrego Fundão, 2.5 Km of waterfall, near to the Gaita local, aluvial soil with organic material, inclined relief, 17°54′00.8″ S, 57°33′45″ W, 09.V.2003, leg. V.J. Pott 6281 (CGMS).

Leptogium cyanescens (Rabenh.) Körb., Systema Lichenum Germaniae 420. 1855.

Leptogium cyanescens is constituted by smooth thallus, c. 100 µm thick, bluish, with cylindrical to flattened isidia on the lamina and margins of the lobes. *Leptogium cyanescens* differs from *L. denticulatum* by the presence of isidia. *Leptogium denticulatum* has denticules only on the margin of apothecia, whereas *L. cyanescens* is an isidiate species, and has apothecia with smooth margins. See description in Kitaura (2012).

Examined material: Corumbá Municipality, Morro do Urucum, on the border, corticolous, 19°12′08.20″S, 57°36′04.60″W, 730 m alt., 3.IX.2010, leg. A.A. Spielmann 8520 (CGMS).

Leptogium diaphanum (Sw.) Mont., Ann. Sci. Nat. Bot. Biol. Vég. 10: 134. 1848.

Comments: *Leptogium diaphanum* has a translucent thallus, 30–45 µm thick, and delicate lobules or lobuliform structures on both the thallus and apothecia.

Lobules are commonly found on the thallus of *L. diaphanum* which distinguishes this species from *L. cyanescens*, *L. isidiosellum* and *L. austroamericanum* that are exclusively isidiate species. See description in Cunha (2007).

Examined material: Corumbá Municipality, morraria do Urucum, on the trail, on cortex of tree, 19°12′08.20″S, 57°36′04.60″ W, 733 m. alt., 3.IX.2010, leg. L.S. Canêz 3236 pr. min. p., 3246, 3256 (CGMS).

Leptogium fusisporum (Tuck.) C.W. Dodge, Ann. Missouri Bot. Gard. 20: 418. 1933.

Fig. 6.2c

Leptogium fusisporum is characterized by the thallus constituted by branches, covered by paraplectenchymatous cells, with densely irregular ridges that originate cerebroid structures. The transversely septate ascospores have 30–50 × 5.0–7.5 µm (4–6 × 1 cells). Usually, this species is found sterile and was previously identified as *L. floridanum* Sierk, which is a species with fusiform and submuriform ascospores, 22–35 × 9–14 µm (Sierk 1964). See description in Sierk (1964).

Examined material: Corumbá Municipality, subregion Pantanal of Paraguay, Mandioré Bay, 18°11′50.70″S, 57°30′39.70″W, 90 m. alt. corticolous in riparian forest, 23.XI.2010, leg. T.H.D. Leandro 64, 65 (CGMS); idem, Mandioré Bay (Bolivia side), 18°11′50.70″S, 57°30′39.70″W, 90 m. alt., 23.XI.2010, leg. A.A. Spielmann 8718, 8720 (CGMS); idem, Brazil-Bolivia Frontier, subregion

Pantanal of Paraguay, margin of Mandioré Bay (Bolivia side), 18°11′50.70″S, 57°30′39.70″W, 90 m. alt., 23.XI.2010, leg. A.A. Spielmann 8726 pr. min. p., 8729 (CGMS); idem, margin of Taquaral Bay, corticolous on riparian forest, 18°02′42.30″S, 57°30′15.20″W, 83 m alt., 26.XI.2010, leg. C.O. Dourado 72 (CGMS).

Leptogium isidiosellum (Riddle) Sierk, Bryologist 67(3): 282. 1964.

Leptogium isidiosellum is characterized by irregular and longitudinal ridges on the upper surface, with cylindrical isidia on the lamina and margins of the lobes. The apothecia, when present, are constituted by thalline exciple with paraplectenchymatous cortex, 4–6 cells thick. *Leptogium isidiosellum* differs from *L. austroamericanum* and *L. cyanescens* mainly by the surface of the thallus. *Leptogium isidiosellum* has ridged upper surface, while *L. austroamericanum* has wrinkled upper surface, and *L. cyanescens* has smooth to rugulose upper surface. See descriptions in Sierk (1964) and Kitaura (2012).

Examined material: Corumbá municipality, Tromba dos Macacos, on *Aspidosperma subincarum*, 2.XI.1993, leg. M.P. Marcelli 24820 pr. max. p. (COR); idem, Fazenda Gaíva (Jaguaribe), Pantanal of Paraguay river, corticolous, open cerradão, with taboca (*Bambus* sp.) e *Zamia*, sandy soil, plane relief, 17°54′22.7″S, 57°38′40.0″W, alt. 155 m., 30.III.2003, leg. V.J. Pott 6110 (CGMS); idem, subregion Pantanal of Paraguay, Mandioré Bay, 18°11′50.70″S, 57°30′39.70″W, alt. 90 m, corticolous, on riparian forest, 23.XI.2010, leg. T.H.D. Leandro 49, 50 (CGMS).

Leptogium marginellum (Sw.) Gray, A Natur. Arrang. Brit. Plants 1: 401. 1821. Fig. 6.2d

Leptogium marginellum has thallus with irregular ridges, apothecia restricted to the margin of the lobes, with up to 0.5 mm diam., usually abundant. Lobules only on the margin of apothecia. When sterile, *L. marginellum* can be confused with *L. phyllocarpum* because of the ridged thallus. Both species are differentiated only with the presence of apothecia, which is abundant and marginal in *L. marginellum*, andlaminal and submarginal in *L. phyllocarpum*. See description in Kitaura (2012).

Examined material: Corumbá Municipality, Morraria do Urucum, on the trail, on cortex, 19°12′08.20″S, 57°36′04.60″ W, 733 m. alt., 3.IX.2010, leg. L.S. Canêz 3236 pr. max. p., 3265 (CGMS).

Leptogium phyllocarpum (Pers.) Mont., Ann. Sci. Nat. Bot. Biol. Vég., 10: 134. 1848.

Leptogium phyllocarpum is characterized by the upper surface with longitudinal to irregular ridges, and lobuloid structures restricted to the apothecia, with 1.0 mm diam. *L. phyllocarpum* has laminal and submarginal apothecia with lobuloid propagules that differs from *L. chloromelum,* which has only submarginal apothecia without lobuloid propagules. See description in Sierk (1964) and Cunha (2007).

Examined material: Corumbá Municipality, Morraria do Urucum, on the trail, on cortex of tree, 19°12′08.20″S, 57°36′04.60″ W, 733 m. alt., 3.IX.2010, leg. L.S. Canêz 3241, 3248 (CGMS).

Marcelaria purpurina (Nyl.) Aptroot, Nelsen & Parnmen, Glalia 5(2): 9. 2013.

Marcelaria purpurina is characterized by the olive-green, crustose thallus with patches of red pruina, the ascoma warts 0.5–0.9 mm diam. and covered by a thick

red pruina, muriform, hyaline ascospores, 110–170 × 14–26 µm (Aptroot et al. 2013; ascospores not found in the examined material). According to Aptroot et al. (2013), this species differs from *M. benguelensis* (Müll. Arg.) Aptroot, Nelsen & Parnmen and *M. cumingii* (Mont.) Aptroot, Nelsen & Parnmen mainly by the red and not orange or yellow pruina, the generally larger ascomata and ascospores. See description in Aptroot et al. (2013).

Examined material: Rio Verde de Mato Grosso municipality, sítio Passarim, in an open area, riparian forest, on trunk in the margin of Verde river, 18°56′26.6″S, 54°55′16.6″W, 390m alt., 23.VIII.2015, leg. A.A. Spielmann 11937 (CGMS).

Myelochroa lindmanii (Lynge) Elix & Hale, Mycotaxon 29: 241, 1987.

This is a lichen with flat, adnate lobes, short cilia restricted to the lobe axils, and a yellow medulla (secalonic acids). It could be confused with *Canoparmelia* or *Parmotrema*; but no *Canoparmelia* species are known to develop a yellow medulla in Brazil, and although one can find some *Parmotrema* with yellow medulla, usually the loosely attached and wide lobes can be helpful to differentiate the genera. There was a proposition to classify this species in *Parmotrema* (Kurokawa & Arakawa 1997), but it was not widely accepted. Probably genetic data can help to accommodate it better in some other genus. For additional data, see Spielmann & Marcelli (2008).

Specimens examined: Corumbá, Urucum mountains, in fallen branch at the trail, 19°12′08.2″S, 57°36′04.6″W, 730 m alt., 03.IX.2010, leg. A.A. Spielmann et al. 8491 (CGMS).

Neoprotoparmelia multifera (Nyl.) Garima Singh, Lumbsch & I. Schmitt, in Singh, Aptroot, Rico, Otte, Divakar, Crespo, Cáceres, Lumbsch & Schmitt, MycoKeys 44: 41 (2018).

Neoprotoparmelia multifera is characterized by the crustose thallus (UV+ green) with lecanorine apothecia slightly convex, with brown disc, thaline margin thin, apothecia medulla UV+ green asci 64-spored, ascospores simple and hyaline ascospores, 6.2–7.5 × 1.7–2.5 µm. Species of *Neoprotoparmelia* Garima Singh, Lumbsch & I. Schmitt (formerly *Maronina* Hafellner & R.W. Rogers) are similar to *Protoparmelia* species, being together classified in a separate subfamily within *Parmeliaceae* (*Protoparmelioideae*) by Divakar et al. (2017) based on molecular data. According to these authors, the main differences among these genera are the distribution and the habitat where they occur: while *Neoprotoparmelia* consists of mostly tropical species growing on bark, *Protoparmelia* s. str. occurs in temperate regions, growing on siliceous rocks (Divakar et al. 2017). This is *N. multifera* in the strict sense, the occurrence of which is herewith confirmed for Brazil. No specimens of this species were found in the Northwest of Brazil, but it apparently occurs in the Central West. See description in Vainio (1890) as *Maronea multifera* (Nyl.) Vain and Santos *et al*. 2019.

Examined material: Corumbá municipality, margin of Baía do Taquaral, riparian forest, on twig of *Licania* sp., 18°02′42.30″S, 57°30′15.20″W, 83m alt., 26.XI.2010, leg. L.S. Canêz 3616 (CGMS).

Opegrapha astraea Tuck., Lichens of California (Berkeley): 33. 1866.

Opegrapha astraea is characterized by a very thin crustose thallus, with small lirellae (0.3–3.5 mm) with exposed disc in maturity, which is covered by a white pruina. Its lirellae has irregular carbonization, clear hymenium, I+ orange-red, olive green hypohymenium, hyaline and transversely septated spores, with a perispore and having 4 to 5 septa in the Pantanal material, 20–27.5 × 5–6 µm. We found the presence of atranorin and terpenes through TLC analysis in our material. According to Ertz (2009), *O. subcentrifuga* Nyl. is similar to *O. astraea* and probably belongs to the same group but differs by the small and 3-septate ascospores (11–14.2 × 3.2–3.9 µm). See description in Ertz (2009).

Examined material: Corumbá municipality, Morro Tromba dos Macacos, on tree trunk, 19°12′45.3″S, 57°40′26.8″W, 02.XI.1993, leg. M.P. Marcelli 24829 (COR).

Opegrapha rissoensis Redinger Ark. f. bot. 29A (19): 1940.

Opegrapha rissoensis is characterized by the small ascomatas (up to 0.5 mm), rounded to lirelliform, clear hymenium, I+ orange, excipulum with basal and irregular carbonization, spores with 4 septa, 20 × 2.5 µm, with isodiametric cells, baciliform and bifusiform conidia, many pycnidia along the thallus. The Pantanal material did not have pruina on the ascomatas. No chemical substance was detected in our material (TLC). See description in Redinger (1940).

Examined material: Corumbá municipality, Fazenda Nhumirim, Salina do 8, Reserva, Bordo de Salina – forest, on tree trunk, 18°59′01.8″S, 56°36′56.9″W, 10.IX.1988, leg. V.J. Pott 614 (COR).

Parmotrema argentinum (Kremp.) Hale, Phytologia 28: 334, 1974.

This species has ciliate lobes, ciliate apothecia and medulla producing alectoronic acid (UV+ greenish medulla). Relatively common in Mato Grosso do Sul, it is still much unrecorded for the Pantanal region. See descriptions in Canêz (2005) and Hale (1965).

Specimens examined: Corumbá, Urucum mountains, in fallen branch at the trail, 19°12′08.2″S, 57°36′04.6″W, 730 m alt., 03.IX.2010, leg. A.A. Spielmann et al. 8506 (CGMS).

Parmotrema confusum Hale, Bibliotheca Lichenologica 38: 113, 1990.

Fig. 6.6a

Parmotrema confusum can be recognized by the well-developed, substipitate, and imperforate apothecia with involute rim, eciliate lobes, and the production of protocetraric acid (medulla K+ dirty yellow, P+ orange). At first sight, this species can be confused with *Parmotrema mesotropum*, a lichen with negative medullary tests (only fatty acids). Some keys (e.g. Hale 1965, Sipman 2005) would lead to *Parmotrema zollingeri* (Hepp) Hale. Taking the revision of the group made by Elix (1998), one can discover that the medullary chemisty of *P. zollingeri* is quite complex, with fumarprotocetraric acid, succinprotocetraric acid, and protocetraric acid. Using the different chemistry of the synonyms of *P. zollingeri* studied, Elix (1998) recognized several of them as good species. But for some reason, *Parmelia latissima* var. *minima* Lynge was not included. This taxon was described by Lynge (1914), and inconclusively revised by Hale (1960). Only 30 years later, Hale (1990) reassessed it, concluding that it was a good species, with with a new name, *Parmotrema confusum* Hale.

This species was known only from the type, from Mato Grosso State, Brazil.

Specimens examined: Corumbá, Urucum mountains, in fallen branch at the trail, 19°12′08.2″S, 57°36′04.6″W, 733 m alt., 03.IX.2010, leg. L.S. Canêz et al. 3277, 3278 *p.parte,* 3294, 3312, 3320, 3322, 3323, 3324, 3326, 3331, 3339, 3343, 3346 (CGMS).

Parmotrema consors (Nyl.) Krog & Swinscow, Lichenologist 15: 129, 1983.

The short, tapered, and thick cilia can be helpful to set apart this species from the other *Parmotrema*, together with the negative medullary reactions (only fatty acids found). For additional data about this and other species previously classified in *Canomaculina* Elix & Hale, see Spielmann & Marcelli (2009).

Specimens examined: Corumbá, Passo do Lontra, "Base de Estudos do Pantanal – UFMS", in the stipe of a "Buriti", at the roadside, 19°34′27.6″S, 57°01′23.0″W, 95 m alt., 21.VIII.2011, leg. A.A. Spielmann et al. 9436 (CGMS).

Parmotrema dilatatum (Vain.) Hale, Phytologia 28: 335, 1974.

This is a sorediate, eciliate species with medullary protocetraric and echinocarpic acids (K+ yellow, P+ orange), and cortical atranorin and usnic acid. Descriptions and comments can be found in Hale (1965) and Benatti & Marcelli (2010).

Specimens examined: Corumbá, Urucum mountains, in fallen branch at the trail, 19°12′08.2″S, 57°36′04.6″W, 733 m alt., 03.IX.2010, leg. L.S. Canêz et al. 3303, 3335 (CGMS).

Parmotrema melanochaetum (Kurok.) Blanco et al., Mycologia 97: 157, 2005.

The abundant isidiate cilia and the medulla C+ rose (gyrophoric acid) are the main features to identify this species. Descriptions in Hale (1976), Marcelli (1993) and Jungbluth (2006).

Specimens examined: Corumbá, Urucum mountains, corticicolous, at the forest border, 19°12′08.2″S, 57°36′04.6″W, 730 m alt., 03.IX.2010, leg. A.A. Spielmann et al. 8500, 8547, 8549 (CGMS); idem, leg. L.S. Canêz et al. 3237, 3247 (CGMS); idem, Sub-região Pantanal do Paraguai, Baía do Mandioré, corticicolous, in riparian forest, 18°11′50.7″S, 57°30′39.7″W, 90 m alt., 23.XI.2010, leg. T.H.D. Leandro et al. 43 (CGMS).

Parmotrema mesotropum (Müll. Arg.) Hale, Phytologia 28: 337, 1974.

Fig. 6.6b

The eciliate lobes, imperforate apothecia, and negative spot tests in the medulla (fatty acids) are characteristics for this species. Usually the upper surface of the thallus is distinctly wrinkled, a feature also found in *Parmotrema confusum*, a common species. See descriptions in Hale (1965) and Jungbluth (2006).

Specimens examined: Corumbá, Sub-região Pantanal do Paraguai, RPPN Acurizal, próximo à sede da Ecotropica, corticícola, em tronco podre caído no chão da mata, 17°52′38.2″S, 57°33′12.0″W, 138 m alt., 27.XI.2010, leg. T.S. Amaral et al. 152 (CGMS); idem, Baía do Mandioré, 18°11′50.7″S, 57°30′39.7″W, 90 m alt., 23.XI.2010, leg. T.H.D. Leandro et al. 32, 34 (CGMS); idem, margem da Baía do Taquaral, 18°02′42.3″S, 57°30′15.2″W, 83 m alt., 26.XI.2010, leg. C.O. Dourado et al. 118 (CGMS).

Parmotrema mordenii (Hale) Hale, Phytologia 28: 337, 1974.

Fig. 6.6c

Remarkably similar to *Parmotrema praesorediosum*, this is a sorediate, saxicolous species recognized by the K+ yellow reaction (medulla with atranorin). A genetic study of this group is highly necessary. See descriptions in Hale (1971) and Spielmann & Marcelli (2009).

Specimens examined: Corumbá, Sub-região Pantanal do Paraguai, RPPN Rumo ao Oeste, Baía Guaíba, riparian forest, saxicolous at the border of the bay, 17°44′18.1″S, 57°41′27.8″W, 91 m alt., 28.XI.2010, leg. L.S. Canêz et al. 3648 (CGMS); idem, Baía do Taquaral, corticicolous in a branch of *Licania*, riparian forest, 18°02′42.3″S, 57°30′15.2″W, 83 m alt., 26/XI/2010, leg. C.O Dourado et al. 46 (CGMS).

Parmotrema praesorediosum (Nyl.) Hale, Phytologia 28: 338, 1974.

Similar to *Parmotrema mordenii*, in this species the medulla is K- (without atranorin). See descriptions in Jungbluth (2006) and Spielmann & Marcelli (2009).

Specimens examined: Corumbá, Sub-região Pantanal do Paraguai, RPPN Eliezer Batista (Novos Dourados), topo do morro, 18°05′33.4″S, 57°29′31.2″W, 208 m alt., 24.XI.2010, leg. L.S. Canêz et al. 3573 (CGMS).

Parmotrema soredioaliphaticum Estrabou & Adler, Mycotaxon 66: 134, 1998.

The identity of this taxon is tentative. It belongs to a group of saxicolous, eciliate species that produces only fatty acids at the medulla. This species is a new record to Mato Grosso do Sul State, being previously known to Rio Grande do Sul (Canêz 2005), Argentina (Estrabou and Adler 1998) and Galápagos (Bungartz and Spielmann 2019). Full descriptions can be found in these references.

Specimens examined: Corumbá, Sub-região Pantanal do Paraguai, RPPN Acurizal, mata do fundão, saxicolous at the trail, shaded, 17°52′38.2″S, 57°33′12.0″W, 138 m alt., 27.XI.2010, leg. L.S. Canêz et al. 3642 (CGMS).

Parmotrema tinctorum (Dèspr. ex Nyl.) Hale, Phytologia 28: 339, 1974.

The isidiate, eciliate lobes and the medulla C+ reddish (lecanoric acid) are the main features of this species. A very common, cosmopolitan lichen.

Specimens examined: Corumbá, Urucum mountains, in fallen branch at the trail, 19°12′08.2″S, 57°36′04.6″W, 733 m alt., 03.IX.2010, leg. L.S. Canêz et al. 3338, 3345 (CGMS); idem, corticicolous at the forest border, leg. A.A. Spielmann et al. 8497 (CGMS).

Peltula auriculata Büdel, Schultz & Gröger, Plant Biology 2: 484, 2000.

Peltula auriculata is characterized by the squamulose thallus with ear-shaped, upper surface olive green, and spherical ascospores with 2.5–4.0 μm diam. The diversity of *Peltulaceae* is underestimated in the Pantanal as revealed by preliminar molecular studies still not published. *Peltula auriculata* is known to Roraima state (Schultz and Aptroot 2008), and reported here by the first time to Mato Grosso do Sul state.

Examined material: Corumbá municipality, sub-região Pantanal do Paraguay, RPPN Rumo ao Oeste, Baía Gaiba, 17°44′18.10″ S, 57°41′27.80″ W alt. 91 m, 28.XI.2010, leg. T.H. Stephanello 382, 383, 384, 385, 386 (CGMS).

Phyllopsora chlorophaea (Müll. Arg.) Zahlbr., Denkschr. Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 83: 133. 1909.

Phyllopsora chlorophaea is characterized by the squamulose thallus, formed by small ascending squamules less than 1 mm wide, with well-developed prothallus, white in herbarium but green when fresh. Its apothecia is brown, with dark reddish brown hypothecium and excipulum, simple ascospores, 10–11 × 2.5 µm. According to Swinscow & Krog (1981), *P. parvifoliella* (Nyl.) Müll. Arg. and *P. pyrrhomelaena* (Tuck.) Swinscow & Krog are similar species, having smaller ascospores: *P. parvifoliella*: 6–8 × 2–3 µm; *P. pyrrhomelaena*: 5–8 × 2.5–3 µm. No chemical substance was detected in our material (TLC). See description in Swinscow & Krog (1981) and Timdal (2008).

Examined material: Corumbá municipality, Morro Tromba dos Macacos, on tree trunk, 19°12′45.3″S, 57°40′26.8″W, 260m, 02.XI.1993, leg. M.P. Marcelli 24832 (COR).

Phyllopsora pyxinoides (Nyl.) Kistenich, Timdal, Bendiksby & S. Ekman, Taxon 67(5): 894. 2018.

Fig. 6.4b

Phyllopsora pyxinoides is characterized by the byssoid, squamulose to almost microfoliose thallus (squamules are connected in a rosette-like form), with a black hypothallus, lacking upper cortex, with laminal to marginal soredia and the presence of a few small, black apothecia without thalline margin (not found in the Pantanal material). The only similar species is *P. gossypina* (Sw.) Kistenich, Timdal, Bendiksby & S. Ekman, which has, however, a pale hypothallus and pinkish brown apothecia with a pale margin (Aptroot and Cáceres 2014, as *Crocynia gossypina*). See description in Brodo et al. (2001).

Examined material: Corumbá municipality, RPPN Acurizal, next to the head office of Ecotropica, 17°52′38.20″S, 57°33′12.00″W, 27.XI.2010, leg. T.S. Amaral 136, 137 (CGMS).

Physcia aipolia (Humb.) Fürnr., Naturhist. Topogr. Regensburg 2: 249. 1839.

Fig. 6.5c

Physcia aipolia is characterized by the foliose thallus, plane to convex in central parts, upper surface gray, with punctiform and abundant maculae; laciniae contiguous, irregularly branched, truncate apices, lower surface pale brown to dark brown, lower cortex prosoplectenchymatous to intermediate; vegetative propagules absent; apothecia sessile to constricted at the base; disc plane, brown to black, whitish-pruinose; ascospores *Physcia* to *Pachysporaria*-type, 20–22 × 8–11 µm. The chemical constituents are atranorin, zeorine and triterpenes. *Physcia convexa* is a closely related species, but it is saxicolous, and has white lower surface with pink pigment. See description in Moberg (1990) and Jungbluth (2010).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Mandioré, on bark, 18°11′50.70″S, 57°30′39.70″W, 90m alt., 23.XI.2010, leg. T.H.D. Leandro 36 (CGMS).

Physcia convexa Müll. Arg. Rev. Mycol. 10: 57. 1888.

Physcia convexa is characterized by the foliose thallus, convex in central parts, upper surface gray, with punctiform and abundant maculae; laciniae discrete to contiguous, irregularly to subdichotomously branched, subtruncate apices, white lower surface with pink pigment, lower cortex prosoplectenchymatous, with a thin layer

of paraplectenchymatous cells bellow; vegetative propagules absent; apothecia sessile to constricted at the base; disc plane, dark brown, scarce whitish-pruinose; ascospores *Physcia*-type, 16–18 × 6–8 µm. The chemical constituents are atranorin, zeorine and triterpenes. This is the first record of this species for the state of Mato Grosso do Sul. See description in Moberg (1990) and Jungbluth (2010).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, RPPN Rumo ao Oeste, Baía Guaíba, on rock, 17°44′18.10″S, 57°41′27.80″W, 91m alt., 28.XI.2010, leg. LS. Canêz 3649 (CGMS), T.H. Stefanello 391, 392, 400, 406, 414 (CGMS).

Physcia manuelii Moberg, Nord. J. Bot. 10: 334. 1990.

Physcia manuelii is characterized by the foliose thallus, plane in central parts, upper surface green-grayish; laciniae discrete to contiguous, irregularly branched, rounded apices, lower surface white, lower cortex prosoplectenchymatous, with a more or less thin layer of paraplectenchymatous cells bellow; phyllidia marginal to laminal; apothecia sessile to constricted at the base; disc plane, black, white pruinose; ascospores *Pachysporaria*-type, (18–) 20–23(–25) × 6–11(–12) µm. Only atranorin was found as chemical constituent. This is the first record of this species for Brazil. See description in Moberg (1990).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Castelo, on bark, 18°33′52.80″S, 57°34′29.30″W, 92m alt., 22.XI.2010, leg. LS. Canêz 3510 (CGMS), T.H. Stefanello 88 (CGMS); idem, Baía do Mandioré, 18°11′50.70″S, 57°30′39.70″W, 90m alt., 23.XI.2010, leg. T.H.D. Leandro 47, 60, 89 (CGMS).

Physcia tribacia (Ach.) Nyl., Flora 57: 307. 1874.

Physcia tribacia is characterized by the foliose thallus, convex in central parts, upper surface subscrobiculate, gray; laciniae imbricate to contiguous, irregularly branched, apices irregular, lower surface white, lower cortex paraplectenchymatous; apothecia sessile to constricted at the base; disc plane, dark brown to black, without pruina; ascospores *Physcia* to *Pachysporaria*-type, (17–) 18–21 (–23) × (8–) 9–11(–12) µm. Only atranorin was found as a chemical constituent. This is the first record of this species to Mato Grosso do Sul state. See description in Moberg (1990). Jungbluth (2010) described the soralia as absent but pointed out the production of submarginal granules. The material from the Pantanal differs from typical material by the almost isidioid soredia and the pruinose thallus, and can represent a new taxon.

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Castelo, on bark, 18°33′52.80″S, 57°34′29.30″W, 92 m alt., 22.XI.2010, leg. T.H. Stefanello 70 (CGMS); idem, RPPN Rumo ao Oeste, Baía Guaíba, 17°44′18.10″S, 57°41′27.80″W, 91 m alt., 28.XI.2010, leg. L.S. Canêz 3651, 3652 (CGMS).

Porina cryptostomoides Lücking, Aptroot & Spielmann **nom. nov.**

MycoBank MB 835682

Porina cryptostoma Malme, Ark. Bot. 23A(1): 21. 1929; non Mont., Annls Sci. Nat. Bot. Sér. 3, 7: 176. 1847.

Examined material. Brazil. Mato Grosso do Sul: Corumbá; 29 July 1894, Malme s.n. (S-L 839, lectotype, here designated; MBT392540).

Pyrenula anomala (Ach.) Vain., Ann. Acad. Sci. fenn., Ser. A 6 (no. 7): 189. 1915.

Pyrenula anomala is characterized by the corticate, crustose thallus, UV-, the laterally fused, pseudostromatic black perithecia not covered by thallus, with separate apical ostioles, a clear hamathecium, gray-brown spores with usually 3 septa, 17.5–20 × 2.5–7.5(–8) µm. This species is similar to *P. arthoniotheca* Upreti, which has smaller ascospores. See description in Aptroot et al. (2008).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Castelo, in riparian forest, next to the river margin, on embaúba trunk [*Cecropia* sp.], 18°34′52.20″S, 57°31′36.60″W, 95m alt., 22.XI.2010, leg. L.S. Canêz 3494 (CGMS).

Pyrenula xanthoglobulifera Aptroot, Lücking & M. Cáceres, Bryologist 116: 303. 2013.

Pyrenula xanthoglobulifera is characterized by the crustose thallus with lichexanthone (UV+ yellow), the white pseudocyphellae on the thallus, erumpent to prominent perithecia with partial thalline cover and with apical ostioles, the inspersed hamathecium, brown, muriform, and large ascospores, 112 × 25 µm. This species is similar to *P. globifera* (Eschw.) Aptroot, but differs from this by the presence of lichexanthone and the thalline cover on the perithecia (Menezes et al. 2013). *Pyrenula lyoni* (Zahlbr.) Aptroot also has some similar characteristics, but the ostioles of the perithecia are lateral and it lacks lichenxanthone. See description in Menezes et al. (2013).

Examined material: Corumbá municipality, RPPN Rumo ao Oeste, Baía Gaiba, riparian forest in a rocky outcrop, on tree trunk, 17°44′18.10″S, 57°41′27.80″W, 91m alt., 28.XI.2010, leg. T.H. Stefanello 409 (CGMS).

Pyxine berteriana (Fée.) Imshaug, Trans Am. Micros. Soc. 76(3): 254. 1957.

Pyxine berteriana is characterized by the foliose thallus, upper surface brownish white to brownish gray; laciniae contiguous, irregularly to dichotomously branched, apices subtrucate and concave, medulla yellow in the upper layer and white in the lower layer; apothecia sessile to constricted at the base, *cocoës*-type; disc plane to convex, black, epruinose, white internal stipe; ascospores *Dirinaria*-type, 16–20 × 6–8 µm. The chemical constituents are lichexanthone and terpenes. See description in Imshaug (1957), Kalb (1987) and Jungbluth (2010).

Examined material: Corumbá municipality, Morraria do Urucum, on bark, 19°12′08.20″S, 57°36′04.60″W, 733m alt., 3.IX.2010, leg. L.S. Canêz 3291, 3302 (CGMS).

Pyxine coccifera (Fée.) Nyl., Mém. Soc. Imp. Sci. Nat. Cherbourgh 5: 108. 1857.

Pyxine coccifera is characterized by the foliose thallus, upper surface brownish gray; laciniae contiguous, irregularly branched, rounded apices, medulla yellow with a white layer below, with red pigment under the maculae; maculae red and irregular; soralia cinnabar red, orbicular to linear and marginal to submarginal, with granular soredia; apothecia sessile to constricted at the base, *obscurascens*-type; disc plane to convex, black, epruinose, white internal stipe; ascospores

Dirinaria-type, 14–18 × 6–8 µm. The chemical constituents are atranorin, chiodectonic acid, and triterpenes. Only this species has red maculae and soralia. See description in Kalb (1987), Jungbluth (2010).

Examined material: Rio Verde de Mato Grosso municipality, Sítio Passarim, on bark, 18°56′26.6″S, 54°55′16.6″W, 390m alt., 23.VIII.2013, leg. A.A. Spielmann 11939 (CGMS).

Pyxine cocoës (Sw.) Nyl., Mém. Soc. Imp. Sci. Nat. Cherbourgh 5: 108. 1857. Fig. 6.5d

Pyxine cocoës is characterized by the foliose thallus, upper surface brownish white; laciniae contiguous, irregularly branched, rounded apices; medulla totally white; soralia white, orbicular to irregular and laminal, with farinose to granular soredia; apothecia sessile to constricted at the base, *cocoës*-type; disc plane to concave, black, epruinose, with reddish brown internal stipe; ascospores *Dirinaria*-type, 14–19 × 7–9 µm. The chemical constituents are lichexanthone and triterpenes. *Pyxine subcinerea* differs by its crescent-shape soralia. See descriptions in Kalb (1987), Jungbluth (2010).

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Castelo, em poste de cerca, 18°35′26.00″S, 57°32′44.70″W, 88m alt., 22.XI.2010, leg. L.S. Canêz 3502 (CGMS); idem, RPPN Eliezer Batista (Novos Dourados), on rock, 18°05′29.70″S, 57°28′27.40″W, 87m alt., 24.XI.2010, leg. L.S. Canêz 3546 (CGMS); idem, Baía do Taquaral, on rock, 18°02′42.30″S, 57°30′15.20″W, 83m alt., 26.XI.2010, leg. L.S. Canêz 3607 (CGMS); idem, RPPN Rumo ao Oeste, Baía Guaíba, on rock, 17°44′18.10″S, 57°41′27.80″W, 91m alt., 28.XI.2010, leg. A.A. Spielmann 8815 (CGMS); L.S. Canêz 3644 (CGMS); T.H. Stefanello 402 (CGMS); idem, Fazenda Nhumirim, Pomar da sede, 26.X.1988, leg. V.J. Pott 692 (COR); Bolivia, Departamento Santa Cruz, Provícia Germán Busch Puerto Quijarro municipality, Baía do Mandioré, on rock, 18°11′50.70″S, 57°30′39.70″W, 90m alt., 23.XI.2010, leg. A.A. Spielmann 8733 (CGMS).

Pyxine eschweileri (Tuck.) Vain., Acta Soc. Fauna et Flora fenn. 7: 156. 1890.

Pyxine eschweileri is characterized by the foliose thallus, upper surface brownish gray, usually with reticulate maculae; laciniae contiguous, irregularly branched, rounded apices, medulla cream-colored to yellowish above with a white lower layer; marginal to submarginal polysidiagia, with irregular soralia and granular soredia; apothecia sessile to constricted at the base, *obscurascens*-type; disc plane to concave, black, epruinose, white internal stipe; ascospores *Dirinaria*-type, 2 and 3-septate, (14–)16–20(–24) × (4–)6–10 µm. The chemical constituents are atranorin and triterpenes. See description in Imshaug (1957), Kalb (1987), Jungbluth (2010).

Examined material: Corumbá municipality, Morraria do Urucum, on bark, 19°12′08.20″S, 57°36′04.60″W, 733m alt., 3.IX.2010, leg. L.S. Canêz 3285, 3305 (CGMS).

Pyxine petricola Nyl. in Cromb., Journ. Bot. Lond. 14: 263. 1876.

Pyxine petricola is characterized by the foliose thallus, upper surface gray; laciniae contiguous, irregularly to dichotomously branched, subrounded to rounded apices, medulla totally white; apothecia sessile to constricted at the base, *cocoës*-type; disc plane to convex, black, epruinose, reddish brown internal stipe; ascospores

Dirinaria-type, 14–18 × 5–7 µm. The chemical constituents are lichexanthone and terpenes. See description in Kalb (1987), Jungbluth (2010).

Examined material: Corumbá municipality, Base de Estudos do Pantanal (UFMS), estrada de acesso, on bark, 19°34′27.60″S, 57°01′23.00″W, 95m alt., 21.VIII.2011, leg. L.S. Canêz 9435, 9437, 9444 (CGMS); idem, Sub-região Pantanal do Paraguai, Baía do Castelo, on bark, 18°35′17.30″S, 57°32′10.80″W, 86 m alt., 22.XI.2010, leg. T.H. Stefanello 11 (CGMS); idem, 18°33′52.80″S, 57°34′29.30″W, 92 m alt., 22.XI.2010, leg. T.H. Stefanello 77, 90 (CGMS); idem, Baía do Mandioré, on bark, 18°11′50.70″S, 57°30′39.70″W, 90 m alt., 23.XI.2010, leg. T.H.D. Leandro 39 (CGMS); idem, RPPN Eliezer Batista (Novos Dourados), início da trilha, on bark, 18°01′09.20″S, 57°32′03.80″W, 95m alt., 24.XI.2010, leg. L.S. Canêz 3562, 3563, 3570 (CGMS); idem, Fazenda Nhumirim salina do oito, on bark, 10.IX.1988, leg. V.J. Pott 623 (COR); idem, Pomar da sede, on bark, 26.X.1988, leg. V.J. Pott 836, 837, 838 (COR); idem, Tromba dos Macacos, on bark, 24.VIII.1993, leg. M.P. Marcelli 24819, s/n (COR).

Pyxine subcinerea Stirt., Trans. New Zeland Inst. 30: 397. 1897.

Pyxine subcinerea is characterized by the foliose thallus, upper surface gray to brownish gray; laciniae contiguous, irregularly branched, rounded apices, medulla yellow above and with white lower layer; soralia marginal, white and with crescent-shape, with granular soredia; apothecia sessile to constricted at the base, *obscurascens*-type; disc plane, black, epruinose, white internal stipe; ascospores *Dirinaria*-type, (13–)14–19 × 6–8 µm. The chemical constituents are lichexanthone and triterpenes. For comparisons see the *P. cocoës* comment. See description in Kalb (1987), and Jungbluth (2010).

Examined material: Corumbá municipality, Morro do Urucum, on bark, 19°12′08.2″S, 57°36′04.6″W, 730m alt., 3.IX.2010, leg. A.A. Spielmann 8489 (CGMS); leg. L.S. Canêz 3296 (CGMS).

Ramboldia russula (Ach.) Kalb, Lumbsch & Elix, Nova Hedwigia 86(1-2): 37. 2008.

Fig. 6.4c

Ramboldia russula is characterized by the crustose continuous to aerolate thallus, having red apothecia with proper margin, with the same color as the disc, hymenium containing red pigment K+ purple and small crystals that dissolve in KOH, ascospores simple, ellipsoid and hyaline, 10–12.5 × 2.5–3 µm. Fumarprotocetraric acid (TLC) and lichexanthone (thallus UV+ yellow) were found in the Pantanal material. According to Kalb et al. (2008), other substances as protocetraric, confumarprotocetraric, and quaesitic acid can be found in minor concentrations in the thallus of this species. *R. russula* is similar to *R. haematites* (Fée) Kalb, Lumbsch & Elix, differing mainly by its chemistry, the latter having norstictic acid and lichexanthone as major substances, lacking fumarprotocetraric or other related acids (Kalb et al. 2008). This author also mentions that *R. russula* prefers more or less shady habitats, close to humid forests, while *R. haematites* is usually found in savannas and dry forests. See description in Vainio (1890) as *Lecidea russula* Ach.

Examined material: Rio Negro municipality, margin of the road MS-419, between Rio Negro and Rio Verde de Mato Grosso, Pantanal da Nhecolândia, on the

edge of Cerrado forest, on a wooden fence pole, 19°17′55.83″S, 55°06′1.04″W, 165m alt., 3.X.2013, leg. A.P. de Souza 47 (CGMS).

Sanguinotrema wightii (Taylor) Lücking, Bot. J. Linn. Soc.: 441. 2015.

Fig. 6.4d

Sanguinotrema wightii is characterized by the crustose thallus with red crystals in the medulla, apothecia immersed in the thallus, visible as black pores, clear hymenium, brown and muriform ascospores, 17.5–22.5 × 10 µm. This species is similar to various *Leucodecton* species, but differs by the conspicuous red crystals in the thallus. See description in Frisch (2006), as *Leptotrema wightii* (Tayl.) Müll. Arg.

Examined material: Corumbá municipality, Sub-região Pantanal do Paraguai, Baía do Castelo, riparian forest in a rock outcrop, on tree trunk, 18°33′52.80″S, 57°34′29.30″W, 92m alt., 22.XI.2010, leg. T.H. Stefanello 84, 85 (CGMS).

Usnea subparvula A. Gerlach & P. Clerc, Lichenologist 49(3): 23. 2017.

Fig. 6.6D

Usnea subparvula is a shrubby-erect fruticose thallus, non-sorediate (often with apothecia) species characterized by the presence of spinulose fibrils, with lateral branches that are often somewhat wider at the ramification point, a thick cortex (8–10%), and the production of protocetraric acid (K−, P+ red) in the medulla.

Usnea parvula Motyka has a similar morphology to *U. subparvula*, with its numerous spinulose fibrils and irregular branches. It differs mainly by the K−, P− reacting medulla, the density of spinulose fibrils (*U. parvula*: 16–24/mm^2, *U. subparvula*: 10–15/mm^2) and distribution. *Usnea subparvula* is a common species in Mato Grosso do Sul; on the other hand *U. parvula* is more frequent in the Southern Brazil, not found so far in Mato Grosso do Sul state. See comments in Gerlach et al. (2017). This genus is reported for the first time from the Pantanal.

Specimens examined: Corumbá, sub-região Pantanal do Paraguai, on margin of Taquaral Bay, 18°02′42·3”S, 57°30’15·2”W, 83m, 2010, leg. A.A. Spielmann 8784 (CGMS).

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