

New species and records of *Graphidaceae* and *Gomphillaceae* (lichenized fungi) from Brazil

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Article info

Received: 8 Jun. 2023
Revision received: 30 Jul. 2023
Accepted: 3 Aug. 2023
Published: 29 Dec. 2023

Associate Editor

Martin Kukwa

Abstract. We describe 14 new lichen species in the family *Graphidaceae*, mainly from the Amazon basin: *Acanthothecis aggregata*, *Allographa ancelina*, *A. apicalinspersa*, *Chapsa constrictospora*, *C. diorygmoides*, *C. lichexanthonica*, *Clandestinotrema caloplacosporum*, *Diorygma defectoisidiatum*, *D. gyrosum*, *D. lichexanthonicum*, *D. norsubmuriforme*, *D. salxanthonicum*, *D. toensbergianum*, and *Ocellularia flavoradiata*. For each species, it is indicated where and how it would key out in a recent identification key. Two of the *Diorygma* species are sterile and were assigned to this genus by sequencing the mtSSU gene. Five additional species are new to Brazil and 27 others, including some *Gomphillaceae*, are new state records.

Key words: *Acanthothecis*, *Allographa*, *Chapsa*, *Clandestinotrema*, *Diorygma*, graphoid, *Ocellularia*, thelotremoid

Introduction

The family *Graphidaceae* is one of the largest families of lichenized fungi. It is most diverse in the tropics, where ~2200 species are known in just under 100 genera (Lücking et al. 2017). Brazil is the country with the highest known diversity in this family, with currently ~700 species known. *Graphidaceae* were among the first lichens described from this country in the 19th century (Eschweiler 1833, 1834; Fée 1873, 1874; Krempelhuber 1866, 1873; Leighton 1866), but the first comprehensive assessment of their diversity was provided a century later by Redinger (1933, 1934, 1935, 1936). With increasing knowledge and available material, it became clear, however, that Redinger's pioneering work covered less than half of the actual diversity. Major modern contributions were provided, e.g., by Staiger (2002), Frisch & Kalb (2006), Lücking et al. (2009, 2016), Rivas Plata et al. (2010), Sipman et al. (2012), Lücking (2014), Feuerstein et al. (2014, 2022a, b), and Neuwirth et al. (2017). The high diversity was accentuated by the description of many new species from a two-week field trip to Rondônia in 2012 (Cáceres et al. 2014).

In the past decade, we collected many additional specimens belonging to this family across most of Brazil. Especially in the Amazon basin, relatively many specimens seem to represent undescribed species. Here we describe 14 new species, in an effort to further advance the knowledge of the Brazilian *Graphidaceae*, and report several first country or state records of species of the family, as well as a sister family *Gomphillaceae*.

Material and methods

Specimens were observed with an Olympus SZX7 dissecting microscope and an Olympus SZ40 dissecting microscope, and pictures were taken with either a Nikon Coolpix camera attached to the dissecting scope or with a Canon Eos M5, including stacking with Genesis GMR-150 on Benro TMS07A with Sunwayfoto XB-2811. Hand-made sections of ascomata and thallus were studied in water, 5% KOH (K) and/or Lugol's reagent (1% I₂) after pre-treatment with KOH (IKI). Microscopic photographs were prepared using an Olympus BX50 compound microscope with Nomarski interference contrast and Nikon Coolpix 995. Chemical spot reactions are abbreviated as K (5% KOH), C (commercial bleach), KC (K followed by C), P (paraphenylenediamine), and UV (fluorescence at 366 nm). Thin-layer chromatography (Orange et al. 2010) was performed in solvents A and C.

For selected specimens of sterile lichens, we generated sequences of the mitochondrial small subunit rDNA, following the same methods as applied by Aptroot & Stech (2018), demonstrating their placement in the genus

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Table 1. GenBank accession numbers and voucher specimens used in the phylogenetic analysis. New sequences are marked in bold.

Genus	Species	Accession	Extract	Country	Collector	Number
<i>Diorygma</i>	<i>antillarum</i>	JX046452	–	–	–	–
	<i>antillarum</i>	JX046453	–	–	–	–
	<i>antillarum</i>	JX046451	–	–	–	–
	<i>antillarum</i>	JX046454	–	–	–	–
	<i>circumfusum</i>	DQ431963	–	–	–	–
	<i>defectoisiadiatum</i>	OR270821	040	Brazil	Cáceres	28966
	<i>defectoisiadiatum</i>	OR270822	047	Brazil	Cáceres	40192
	<i>erythrellum</i>	KJ440982	–	–	–	–
	<i>junghuhnii</i>	DQ431962	–	–	–	–
	<i>junghuhnii</i>	JX421023	–	–	–	–
	<i>microsporum</i>	JX421024	–	–	–	–
	<i>minisporum</i>	HQ639598	–	–	–	–
	<i>poitaei</i>	HQ639596	–	–	–	–
	<i>pruinsum</i>	DQ431964	–	–	–	–
	<i>sipmanii</i>	DQ431961	–	–	–	–
	sp.	JX421022	–	–	–	–
	sp.	OR270817	135	Brazil	Cáceres	40508
	sp.	OR270818	154	Brazil	Cáceres	40529
	sp.	OR270819	173	Brazil	Cáceres	40883
<i>tibellii</i>	JX421025	–	–	–	–	
<i>toensbergianum</i>	OR270820	138	Brazil	Cáceres	42003	
<i>Thalloloma</i>	<i>anguinum</i>	JX421336	–	–	–	–
	<i>anguinum</i>	JX421337	–	–	–	–
	<i>hypoleptum</i>	HQ639609	–	–	–	–
	<i>hypoleptum</i>	JF828970	–	–	–	–

Diorygma (Table 1) The sequences were blasted using NCBI Blast [https://blast.ncbi.nlm.nih.gov/Blast.cgi] and subsequently aligned with available sequences of *Diorygma* and *Thalloloma* using Mafft 7 (Katoh & Standley 2013) and rooted with *Thalloloma hypoleptum* and the *Diorygma poitaei* clade based on previously published phylogenies. The alignments were inspected manually and subjected to maximum likelihood tree search in RAxML 8 (Stamatakis 2014), using the GTR-Gamma model and 1000 bootstrap pseudoreplicates. Trees were visualized and edited in FigTree 1.4 (http://tree.bio.ed.ac.uk/software/figtree).

Results

New species

Acanthothecis aggregata Aptroot, Lücking & M. Cáceres, sp. nov. (Fig. 1A)

Mycobank MB 849436

Diagnosis: Corticolous *Acanthothecis* differing from all known species in the genus by the combination of the following characters: thallus bullate, without spot reactions, apothecia aggregate, orbicular, ascospores multiseptate, with constrictions at all 25–35 septa.

Type: Brazil, Rondônia: Porto Velho, Parque Natural Municipal, alt. 100 m, 8°41'10"S, 63°52'05"W, on tree in rain forest, 19 Nov. 2012, M.E.S. Cáceres 15561 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, more or less continuous, irregularly bullate to folded over, not corticate, dull, chalk white, up to 15 cm diam., up to 1.6 mm thick, not surrounded by a prothallus. Photobiont trentepohlioid.

Ascomata immersed in the thallus, aggregated in groups of up to 25, orbicular, 0.2–0.4 mm wide; disc yellowish brown, deeply concave, densely white pruinose; margin flush with the thallus or a bit exserted, yellowish brown, densely white pruinose, ~0.1 mm wide. Excipulum not carbonized. Hamathecium not interspersed; paraphyses branched and rough with spinulae. Ascospores 8/ascus, hyaline, ~25–35-septate, 90–110 × 9–12 µm, I-negative, constricted at each septum, with 1.5–3 µm thick, wavy gelatinous sheath. Pycnidia not observed.

Chemistry. Thallus UV–, K–, P–. TLC: unknown brown spot at Rf6 in solvent C.

Etymology. The epithet refers to the aggregated ascomata.

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

Discussion. This species is well characterized by its bullate thallus, aggregate, orbicular apothecia, and multiseptate ascospores constricted at the septa. It would key out in the world key of *Acanthothecis* by Feuerstein et al. (2022a) in group key 1 at couplet 9, as “apothecia orbicular, aggregate; thallus bullate”. *Acanthothecis aquilonia* A.W. Archer from Australia has similar ascospores but differs in the dispersed, chroodiscoid apothecia resembling a species of *Chapsa* (Feuerstein et al. 2022a). The Brazilian *A. multiseptata* Aptroot, Lücking & M. Cáceres has distinctly lirelliform ascomata and shorter ascospores (Feuerstein et al. 2022a).

Additional material. BRAZIL. Rondônia: Same as the type, 15563 (ISE, ABL).

Allographa ancilina Aptroot & M. Cáceres, sp. nov.
(Fig. 1B)

Mycobank MB 849437

Diagnosis: Corticolous *Allographa* differing from all known species in the genus by the combination of the following characters: ascomata of the *acharii*-type with inspersed hamathecium and muriform ascospores of 125–140 µm long with apical gelatinous appendices, thallus with norstictic acid.

Type: Brazil, Amapá: Macapá, Plantio da Ancel near Curicaca, mun. Itaubau, 6 km on AP 110, alt. 30 m, 0°40'N, 50°56'W, on tree bark in primary rain forest, 17 Aug. 2015, M.E.S. Cáceres 27017 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, continuous, somewhat verrucose, corticate, glossy, very pale olivaceous green, up to 7 cm diam., up to 0.2 mm thick, surrounded by a ~0.1 mm wide black prothallus line. Photobiont trentepohlioid. Ascomata solitary, superficial on the thallus, linear, often wavy and but not branched, 0.5–0.8 mm wide, up to 5 mm long, often higher than wide and up to 1.5 mm high; disc closed, thinly white pruinose; labia strongly striate, with complete, thin thalline cover (*acharii*-morph cf. Lücking et al. 2009). Excipulum completely carbonized. Hamathecium inspersed. Ascospores 2–4/ascus, hyaline, muriform, 18–22 × 1–2-septate, I+ violet, 125–140 × 14–17 µm, with ~3 µm long gelatinous appendices at both tips. Pycnidia not observed.

Chemistry. Thallus UV–, K+ yellow > red, P–. TLC: norstictic acid.

Etymology. Named after the type locality, Plantio da Ancel.

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

Discussion. This new species displays *acharii*-type ascomata and produces large, muriform ascospores with apical gelatinous appendices, combined with the presence of norstictic acid. It would key out in the world key of *Graphis* by Lücking et al. (2009) in group key 20 at couplet 2 as “thallus with norstictic acid; ascospores large (over 100 µm)”. The most similar species is the Asian *A. norvestitoides* (Sutjar.) Lücking & Kalb, which differs in having submuriform ascospores, with only a few segments producing longitudinal septa (Lücking et al. 2009).

Allographa apicalinspersa Aptroot & M. Cáceres,
sp. nov. (Fig. 1C)

Mycobank MB 849438

Diagnosis: Corticolous *Allographa* differing from all known species in the genus by the combination of the following characters: hymenium only apically inspersed and lirellae of the *acharii*-morph.

Type: Brazil, Rio Grande do Sul: Agudo, Cascata Raddatz, alt. 250 m, 29°35'12"S, 53°10'49"W, on tree bark in forest remnant, 15 Jul. 2019, A. Aptroot 79191 (CGMS – holotype; ABL – isotype).

Description. Thallus crustose, continuous, following the surface of the substratum, corticate, glossy, metallic grey,

up to 7 cm diam., up to 0.1 mm thick, surrounded by a ~0.1 mm wide black prothallus line. Photobiont trentepohlioid. Ascomata solitary, superficial on the thallus, linear, often wavy or branched, dividing up into parts, 0.4–0.6 mm wide, up to 10 mm long, up to 0.5 mm high; disc closed, thinly white pruinose; labia usually striate, with complete thin thalline cover (*acharii*-morph cf. Lücking et al. 2009). Excipulum completely carbonized. Hamathecium only apically inspersed. Ascospores 4/ascus, hyaline, submuriform, 19–25 × 0–1-septate, I+ violet, 72–77 × 10–13 µm, with ~3 µm long gelatinous appendices at both tips. Pycnidia not observed.

Chemistry. Thallus UV–, K+ yellow > red, P–. TLC: norstictic.

Etymology. The epithet refers to the apically inspersed hymenium.

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

Discussion. This species combines *acharii*-type ascomata with medium-sized, submuriform ascospores with apical gelatinous appendices, an only apically inspersed hymenium, and the presence of norstictic acid. It would key out in the world key of *Graphis* by Lücking et al. (2009) in group key 20 at couplet 2 as “thallus with norstictic acid; hymenium apically inspersed; ascospores medium-sized (around 75 µm)”. The new species is most similar to the Colombian *A. suprainspersa* Moncada & Lücking, which agrees in the only apically inspersed hymenium, but has transversally septate ascospores only (Lücking et al. 2023).

Chapsa constrictospora Aptroot, Lücking & M. Cáceres,
sp. nov. (Fig. 1D)

Mycobank MB 849439

Diagnosis: Corticolous *Chapsa* differing from all known species in the genus by the combination of the following characters: hamathecium inspersed, ascospores 7-septate, hyaline, 27–32 × 5–6 µm, constricted at each septum.

Type: Brazil, Bahia: Chapada Diamantina, Lençóis, Cachoeira do Mosquito, alt. 450 m, 12°23'S, 41°22'40"W, on tree bark in primary Atlantic rain forest, 22 Jul. 2017, M.E.S. Cáceres 40843 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, continuous, smooth, thinly corticate, somewhat glossy, pale metallic green, up to 10 cm diam., up to 0.2 mm thick, with numerous large hyaline calcium oxalate crystals, surrounded by a ~0.1 mm wide black prothallus line. Photobiont trentepohlioid. Ascomata immersed in the thallus, chroodiscoid, single, angular, ~0.5–1.5 mm wide; disc pale pinkish, flat, not pruinose; margin inclined to mostly vertically arranged, yellowish brown, not pruinose, ~0.1 mm wide. Excipulum not carbonized. Hamathecium inspersed. Ascospores 8/ascus, hyaline, I-negative, 7-septate, 27–32 × 5–6 µm, constricted at each septum, somewhat clavate, walls not thickened, with ~3 µm thick gelatinous sheath. Pycnidia not observed.

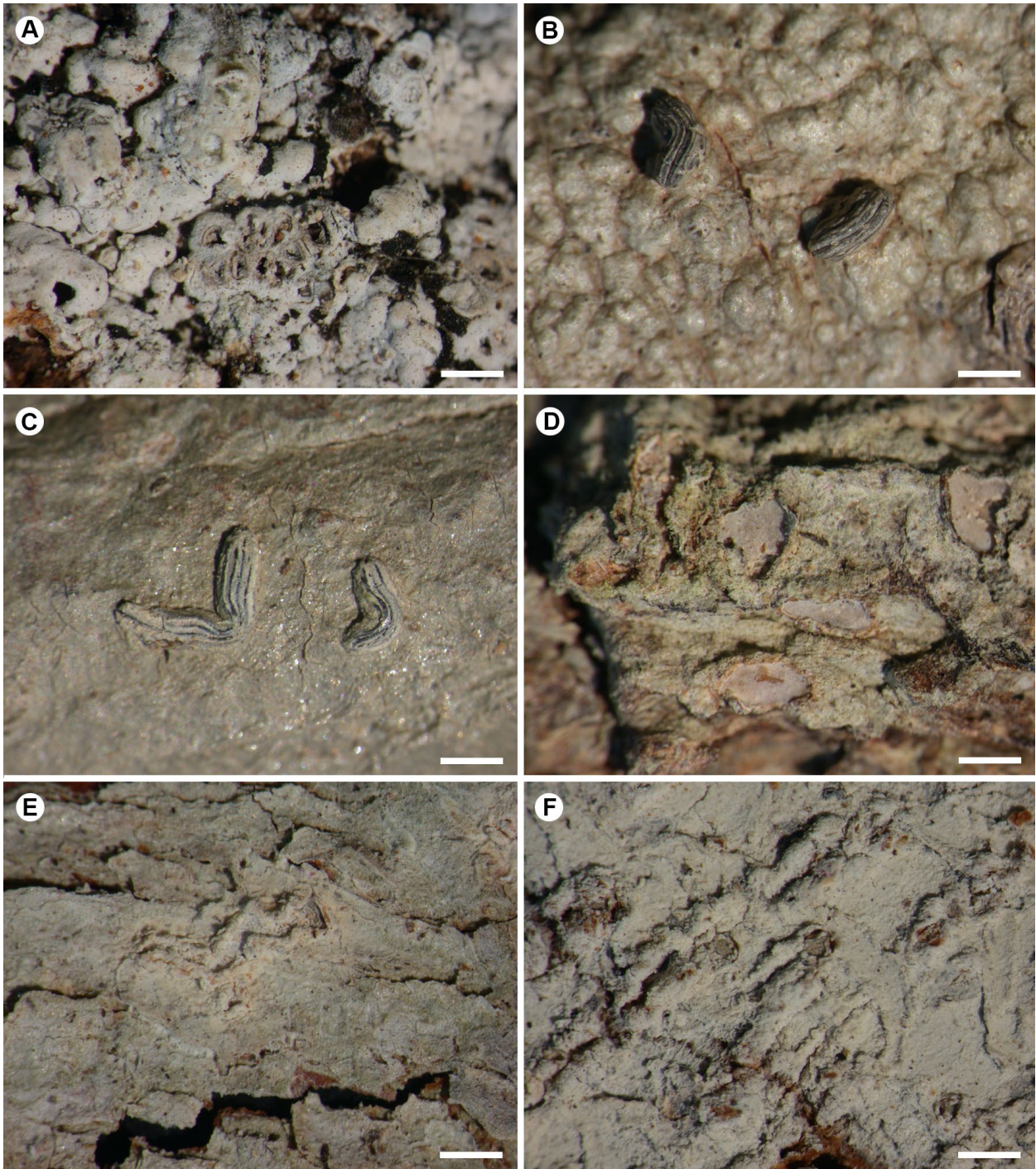


Figure 1. Habitus pictures of new species, all isotypes in ABL. A – *Acanthothecis aggregata*; B – *Allographa ancelina*; C – *A. apicalinspersa*; D – *Chapsa constrictospora*; E – *C. diorygmoides*; F – *C. lichexanthonica*. Scales = 1 mm.

Chemistry. Thallus UV–, K+ yellow, P–. TLC: stictic acid.

Etymology. Named after the ascospores that are constricted at each septum.

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

Discussion. *Chapsa constrictospora* is well characterized by the inspersed hamathecium and the 7-septate, hyaline ascospores of $27\text{--}32 \times 5\text{--}6 \mu\text{m}$, which are constricted at the septa. It would key out in the world key of *Chapsa*

by Rivas Plata et al. (2010) in group key 1 at couplet 5 as “ascospores 7-septate, constricted at each septum, $27\text{--}32 \times 5\text{--}6 \mu\text{m}$ ”. The new species is similar to *C. pseudoschizostoma* (Hale) Sipman in having an inspersed hymenium, and small, transversely septate ascospores (Sipman et al. 2012). However, the latter differs in the more deeply immersed disc which is divided into sections by irregular cracks, surrounded by a rather thick margin, and by the ecorticate thallus. *Chapsa inspersa* E.L. Lima & Lüicking agrees in the inspersed hymenium and small, transversely septate ascospores, but differs in its distinctly corticate thallus (Lima et al. 2019).

Chapsa diorygmoides Aptroot, Lücking & M. Cáceres, sp. nov. (Fig. 1E)

Mycobank MB 849440

Diagnosis: Corticolous *Chapsa* differing from other species in the genus by the combination of the following characters: ascomata lobate to lirelloid, with lichexanthone, hamathecium heavily inspersed, ascospores muriform, 4–8/ascus, hyaline, $75\text{--}85 \times 15\text{--}18 \mu\text{m}$.

Type: Brazil, Amapá: Macapá, near Povoado Abacate da Pedreira, km 34 on AP 070, alt. 30 m, $0^\circ 15' \text{N}$, $50^\circ 55' \text{W}$, on tree bark in cerrado forest, 18 Aug. 2015, M.E.S. Cáceres 27109 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, continuous, smooth, thinly corticate, somewhat glossy, pale metallic green, up to 5 cm diam., up to 0.1 mm thick, surrounded by a ~ 0.1 mm wide black prothallus line. Photobiont trentepohlioid. Ascomata immersed in the thallus, single, lobate to usually broadly lirellate, simple to sparingly branched, $\sim 0.4\text{--}0.6$ mm wide, up to 2.5 mm long; disc pale grey, flat, thickly white pruinose; margin mostly vertically arranged, irregular and crenate or interrupted, yellowish brown, densely yellowish white pruinose, ~ 0.2 mm wide. Excipulum not carbonized. Hamathecium heavily inspersed. Ascospores 4–8/ascus, hyaline, muriform, I-negative, $75\text{--}85 \times 15\text{--}18 \mu\text{m}$, without gelatinous sheath. Pycnidia not observed.

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

Etymology. Named for its superficial similarity with the genus *Diorygma*.

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

Discussion. This new species is well characterized by its lobate to lirelloid ascomata, the thallus producing lichexanthone, a heavily inspersed hymenium, and 4–8 ascospores per ascus which are muriform, hyaline, and $75\text{--}85 \times 15\text{--}18 \mu\text{m}$ in size. It would key out in the world key of *Chapsa* by Rivas Plata et al. (2010) in group key 3 at couplet 2 (hymenium inspersed) as “On bark; apothecia erumpent; thallus ecorticate; thallus with lichexanthone”. Most similar is the Australian *Chapsa niveocarpa* Mangold, which differs in the absence of lichexanthone and in the more robust, rounded ascomata (Rivas Plata et al. 2010). Externally, the new species can be confused with *Pseudochapsa dilatata* (Müll. Arg.) Parmen, Lücking & Lumbsch, which may also produce lirellate ascomata but has transversely septate, I+ violet ascospores and instead of lichexanthone produces stictic acid (Rivas Plata et al. 2010; Parmen et al. 2012).

Chapsa lichexanthonica Aptroot, Lücking & M. Cáceres, sp. nov. (Fig. 1F)

Mycobank MB 849441

Diagnosis: Corticolous *Chapsa* differing from all known species in the genus by the combination of the following characters: thallus with lichexanthone, ascomata round, ascospores 21–25-septate, $65\text{--}78 \times 7\text{--}8 \mu\text{m}$.

Type: Brazil, Amapá: Macapá, near Povoado Abacate da Pedreira, km 34 on AP 070, alt. 30 m, $0^\circ 15' \text{N}$, $50^\circ 55' \text{W}$, on tree bark in cerrado forest, 18 Aug. 2015, M.E.S. Cáceres 27124a & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, more or less continuous, following the surface of the substratum, not corticate, dull, pale cream white, up to 5 cm diam., up to 0.1 mm thick, surrounded by a ~ 0.2 mm wide black prothallus line. Photobiont trentepohlioid. Ascomata immersed in the thallus, single or aggregated in groups of up to 5, rounded, $\sim 0.2\text{--}0.4$ mm wide, up to 0.7 mm long; disc grey, flat, thickly white pruinose; margin mostly inclined, yellowish white, ~ 0.2 mm wide. Excipulum not carbonized. Hamathecium not inspersed. Ascospores at least 4/ascus, hyaline, 21–25-septate, $65\text{--}80 \times 7\text{--}8 \mu\text{m}$, I-negative, walls thickened leaving lenticular lumina, without gelatinous sheath. Pycnidia not observed.

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

Etymology. The epithet refers to the presence of lichexanthone.

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

Discussion. This new species is well characterized by the presence of lichexanthone and the rounded ascomata with hyaline, 21–25-septate ascospores of $65\text{--}78 \times 7\text{--}8 \mu\text{m}$. It would key out in the world key of *Chapsa* by Rivas Plata et al. (2010) in group 1 at couplet 8 (“Thallus ecorticate, white-grey to pale green-grey; apothecial disc pruinose; ascospores non-amyloid”) as “Ascospores $65\text{--}80 \mu\text{m}$ long, 21–25-septate; thallus with lichexanthone”. *Chapsa indica* A. Massal. and *C. pulchra* (Müll. Arg.) Mangold, which also key out here, lack lichexanthone (Rivas Plata et al. 2010).

Clandestinotrema caloplacosporum Aptroot & M. Cáceres, sp. nov. (Fig. 2A)

Mycobank MB 849445

Diagnosis: Corticolous *Clandestinotrema* differing from all known species in the genus by the combination of the following characters: ascospores polaridiblastic, excipulum laterally carbonized.

Type: Brazil, Bahia: Chapada Diamantina, Lençóis, Cachoeira do Mosquito, alt. 450 m, $12^\circ 23' \text{S}$, $41^\circ 22' 40'' \text{W}$, on tree bark in primary Atlantic rain forest, 22 Jul. 2017, M.E.S. Cáceres 40667 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, continuous, following the surface of the substratum, corticate, somewhat shiny, creamish white, up to 5 cm diam., under 0.1 mm thick, surrounded by a ~ 0.1 mm wide black prothallus line. Photobiont trentepohlioid. Ascomata erumpent, solitary, more or less conical, 0.1–0.3 mm diam., ~ 0.1 mm high; ascomatal pore ~ 0.1 mm wide; disc ring-shaped, grey; columella broad, carbonized, thinly white pruinose; margin black, usually with thin thalline cover. Excipulum laterally carbonized. Hamathecium not inspersed. Ascospores 8/ascus, hyaline, 1-septate, $16\text{--}18 \times 5.5\text{--}6.5 \mu\text{m}$,

I-negative, septum much thickened resulting in a shape similar to polardiblastic, without gelatinous sheath. Pycnidia not observed.

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

Etymology. Named after ascospores that resemble those in *Caloplaca*.

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

Discussion. *Clandestinotrema caloplacosporum* is well characterized by its ascospores, which resemble the polardiblastic ascospores of *Caloplaca*. The peculiar ascospores arise from being the 1-septate representation of the ascospores typical of *Clandestinotrema*, which are normally 3-septate to (sub-)muriform but with distinctly thickened walls and septa leaving diamond-shaped lumina. The new species would key out in the key to species of *Clandestinotrema* by Sipman et al. (2012) at couplet 7 as “Ascospores 1-septate; no substances; excipulum carbonized.

Additional material. BRAZIL. Same as the type, M.E.S. Cáceres 40686 & A. Aptroot (ISE; ABL).

Diorygma defectoisidiatum Aptroot & M. Cáceres, sp. nov. (Fig. 2B)

Mycobank MB 849446, GenBank OR 270821

Diagnosis: Corticolous *Diorygma* differing from other isidiate species in the genus by the absence of secondary substances.

Type: Brazil, Tocantins: Itaguatins, alt. 150 m, 5°44'48"S, 47°33'46"W, on tree bark in cerrado forest, 23 Oct. 2016, M.E.S. Cáceres 28966 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, continuous, following the surface of the substratum, not corticate, dull, dirty creamish white, up to 7 cm diam., up to 0.1 mm thick, not surrounded by a prothallus, without hypothallus. Isidia covering most of the thallus, cylindrical, not corticate, much irregularly branched, cream, up to 0.1 mm thick, up to 0.5 mm high. Photobiont trentepohlioid. Ascomata and pycnidia not observed.

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

Etymology. The epithet refers to the absence of secondary substances and the presence of isidia.

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

Discussion. This species is well characterized by its yellowish cream cylindrical, branched isidia (or pseudisidia if one sticks to the strict definition of isidia as corticated structures). So far, only three isidiate species were known in the genus: *Diorygma australasicum* (Elix) Lücking, Elix & A.W. Archer produces protocetraric acid as the major compound; *D. antillarum* (Vain.) Nelsen, Lücking & Rivas Plata contains norstictic and salazinic acid as main substances and has a brittle, black hypothallus; and *D. isidiolichexanthonicum* Aptroot, contains lichexanthone and stictic acid and also has a brittle, black hypothallus

(Feuerstein et al. 2014). Another new isidiate species described below, *D. toensbergianum*, differs in producing lichexanthone and norstictic acid. DNA sequences (Fig. 4) support the placement of the new species in *Diorygma*, sister to *D. toensbergianum* and both sister to *D. antillarum*, forming a clade of sterile, isidiate species with different chemistry. The new species would key out in the world key of *Diorygma* by Feuerstein et al. (2014) at couplet 2 as “No substances; no black hypothallus present”.

Additional material. BRAZIL. Pará: Dom Eliseu, Vila Nazaré, S Fazenda Pantera, alt. 120 m, 3°53'56"S, 48°05'44"W, on tree bark in primary rain forest, 29 Oct. 2016, M.E.S. Cáceres 40192 & A. Aptroot (ISE, ABL); GenBank No: OR270822.

Diorygma gyrosom Aptroot, Lücking & M. Cáceres, sp. nov. (Fig. 2C)

Mycobank MB 849447

Diagnosis: Corticolous *Diorygma* differing from all known species in the genus by the combination of the following characters: thallus with lichexanthone and salazinic acid, ascospores 2/ascus, muriform, 70–80 × 20–24 µm.

Type: Brazil, Rondônia: Porto Velho, Parque Natural Municipal, alt. 100 m, 8°41'10"S, 63°52'05"W, on tree bark in rain forest, 16 Nov. 2012, M.E.S. Cáceres 15238 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, continuous, cracked and slightly verrucose, not corticate, a bit shiny, cream, up to 7 cm diam., under 0.1 mm thick, not surrounded by a prothallus and without hypothallus. Photobiont trentepohlioid. Ascomata sessile on the thallus, solitary, rounded, aggregated in groups of 3–7, 0.5–0.9 mm wide, disc closed, ~0.05 mm wide, thickly white pruinose; labia outside of thallus color and structure. Hamathecium not interspersed. Ascospores 2/ascus, hyaline, muriform, 70–80 × 20–24 µm, without gelatinous sheath, I+ violet. Pycnidia not observed.

Chemistry. Thallus UV+ yellow, K+ red, P–. TLC: lichexanthone and salazinic acid.

Etymology. Named after the almost gyrose apothecia.

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

Discussion. This species is well characterized by presence in thallus and apothecium margins of lichexanthone and salazinic acid and the ascospores which are 2/ascus, muriform, and 70–80 × 20–24 µm in size. It would key out in the world key of *Diorygma* by Feuerstein et al. (2014) at couplet 17 (“Lichexanthone present (thallus UV+ yellow)”) as “Asci 1–2-spored; ascospores 70–80 × 20–24 µm; apothecia short, often aggregate; without black hypothallus”. Most similar is *D. alagoense* M. Cáceres & Lücking, which agrees well in external morphology and the presence of lichexanthone but has smaller ascospores in numbers of 6–8 per ascus and produces stictic instead of salazinic acid as an additional substance (Feuerstein et al. 2014; Lima et al. 2019).

Diorygma lichexanthonicum Aptroot, Lücking & M. Cáceres, sp. nov. (Fig. 2D)

Mycobank MB 849448

Diagnosis: Corticolous *Diorygma* differing from all known species in the genus by the combination of the following characters: thallus with lichexanthone, hamathecium inspersed, ascospores 4/ascus, muriform, $60\text{--}67 \times 16\text{--}18 \mu\text{m}$.

Type: Brazil, Amapá: Macapá, near Povoado Abacate da Pedreira, km 34 on AP 070, alt. 30 m, $0^{\circ}15'N$, $50^{\circ}55'W$, on tree bark in cerrado forest, 18 Aug. 2015, M.E.S. Cáceres 27116 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, continuous, slightly verrucose, not corticate, partly dull, partly shiny, cream, up to 5 cm diam., under 0.1 mm thick, not surrounded by a prothallus and without hypothallus. Photobiont trentepohlioid. Ascomata erumpent from the thallus, solitary, linear, not branched but wavy, 0.4–0.7 mm wide, up to 3 mm long, disc flat, open, ~ 0.3 mm wide, thickly white pruinose; labia of thallus color and structure, but cracked or crenulated. Hamathecium inspersed. Ascospores 4/ascus, hyaline, muriform, $60\text{--}67 \times 16\text{--}18 \mu\text{m}$, without gelatinous sheath I+ violet. Pycnidia not observed.

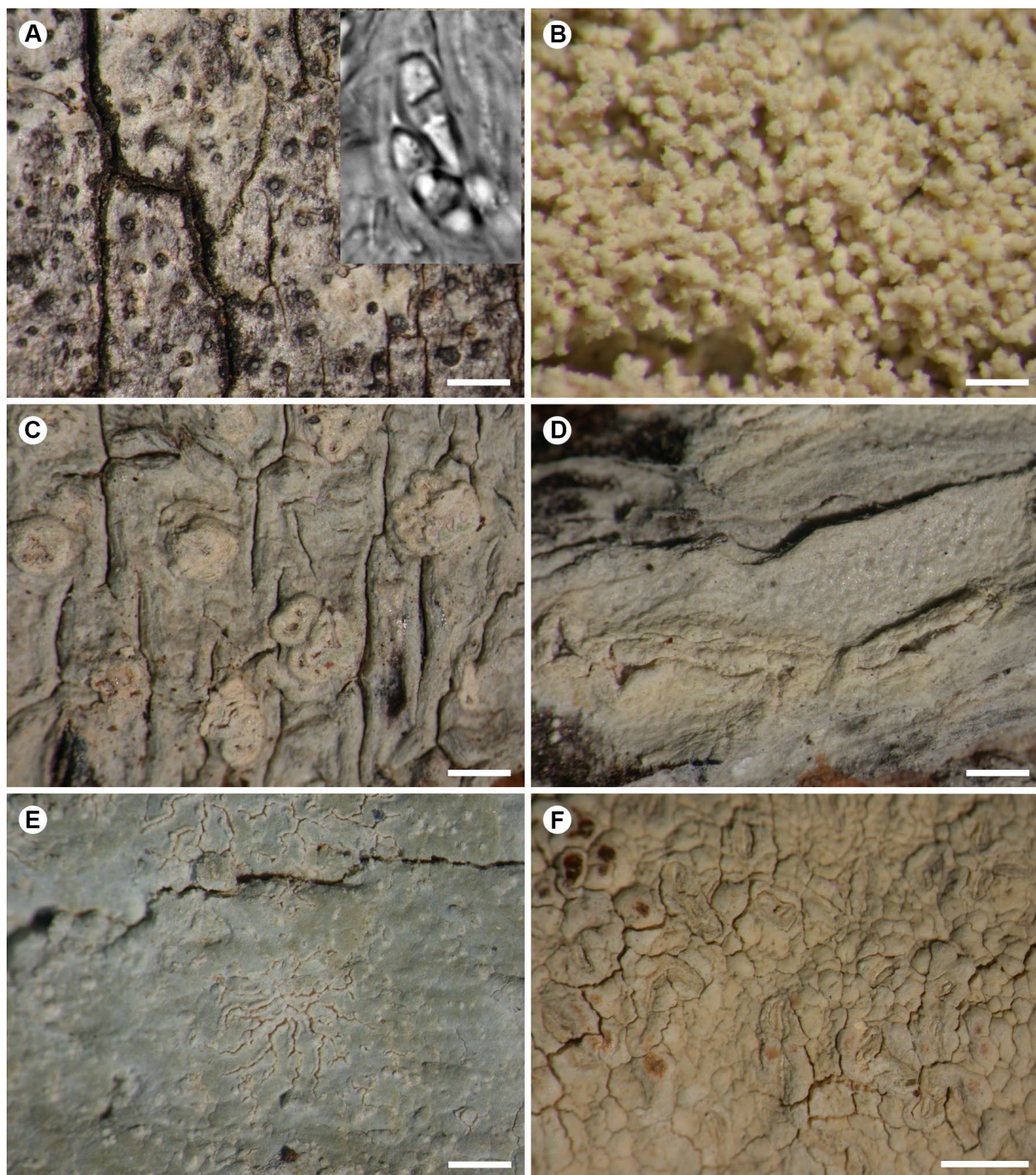


Figure 2. Habitus pictures of new species, all isotypes in ABL. A – *Cladestinotrema caloplacosporum*. Inset: ascospores; B – *Diorygma defectoisidiatum*; C – *D. gyrosum*; D – *D. lichexanthonicum*; E – *D. norsubmuriforme*; F – *D. salxanthonicum*. Scales: A, D–F = 1 mm; B–C = 0.25 mm.

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

Etymology. The epithet refers to the presence of lichexanthone.

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

Discussion. This new species combines the presence of lichexanthone with an inspersed hamathecium; the ascospores are 4/ascus, muriform, and $60\text{--}67 \times 16\text{--}18 \mu\text{m}$ in size. *Diorygma lichexanthonicum* would key out in the world key of *Diorygma* by Feuerstein et al. (2014) at couplet 16 as “Lichexanthone present (thallus UV+ yellow); no additional substances”; the other species keying out here all have stictic acid or in one case salazinic acid. Among these, only *Diorygma alagoense* has similar-sized ascospores, but that species differs clearly in the short, aggregate ascomata (Feuerstein et al. 2014; Lima et al. 2019).

Diorygma norsubmuriforme Aptroot, Lücking & M. Cáceres, sp. nov. (Fig. 2E)

Mycobank MB 849449

Diagnosis: Corticolous *Diorygma* differing from all known species in the genus by the combination of the following characters: thallus with norstictic acid and ascospores becoming submuriform, $6\text{--}7 \times 3\text{--}5 \mu\text{m}$.

Type: Brazil, Amapá: Mazagão, Reserva Extrativista do Maracá, along BR 156, alt. 30 m, $0^{\circ}02'N$, $51^{\circ}45'W$, on tree bark in disturbed forest, 21 Aug. 2015, M.E.S. Cáceres 27555 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, continuous, following the surface of the substratum, not corticate, dull, whitish grey with numerous up to 0.1 mm diam. superficial white hyphal (not crystalline) dots, up to 15 cm diam., up to 0.1 mm thick, not surrounded by a prothallus. Photobiont trentepohlioid. Ascomata immersed in the thallus, solitary or in loose groups, linear, but repeatedly branched, ~ 0.2 mm wide, up to 5 mm in diam., disc flesh-colored, ~ 0.05 mm wide, thinly white pruinose; labia whitish, raised above the thallus. Excipulum completely uncarbonized. Hamathecium not inspersed; epihymenium unpigmented. Ascospores 8/ascus, hyaline, 1–3-septate to submuriform with up to 6 locules, $6\text{--}7 \times 3\text{--}5 \mu\text{m}$, without gelatinous sheath, I+ violet. Pycnidia not observed.

Chemistry. Thallus UV–, K+ yellow > red, P–. TLC: norstictic acid.

Etymology. Named after the chemistry and the submuriform ascospores.

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

Discussion. *Diorygma norsubmuriforme* is well characterized by the small, submuriform ascospores, together with the delicate, radiating lirellae. It would key out in the world key of *Diorygma* by Feuerstein et al. (2014) at couplet 22 as ascospores “Ascospores $6\text{--}7 \times 3\text{--}5 \mu\text{m}$;

thallus without cortex”. Coincidentally, *D. nothofagi* (A.W. Archer) A.W. Archer is keyed out incorrectly in that couplet, as “thallus without cortex”, when in fact the species has a well-developed cortex and is overall similar to the also corticate *D. erythrellum* (Mont. & Bosch) Kalb, Staiger & Elix, differing in the much smaller ascospores (Feuerstein et al. 2014).

On account of the overall appearance, the very small ascospores, and the presence of norstictic acid, the new species may be mistaken for a member of *Anomomorpha* or *Platythecium*. However, the second always has a corticate thallus and mostly lacks norstictic acid, whereas the first features an inspersed hymenium (Staiger 2002; Lücking & Rivas Plata 2008). Another superficially similar genus is *Phaeographopsis*, which differs in the brown ascospores (Lücking & Rivas Plata 2008). *Thallolooma* species have much larger ascospores and a stronger pigmentation of the disc, as well as thickened, straight paraphyses. Species of *Gymnographopsis* also have larger ascospores, but these are non-amyloid, and produce more robust lirellae (Lücking & Rivas Plata 2008).

Diorygma salxanthonicum Aptroot, Lücking & M. Cáceres, sp. nov. (Fig. 2F)

Mycobank MB 849450

Diagnosis: Corticolous *Diorygma* differing from all known species in the genus by the combination of the following characters: thallus with lichexanthone and salazinic acid, ascospores 1/ascus, muriform, $130\text{--}140 \times 29\text{--}32 \mu\text{m}$.

Type: Brazil, Bahia: Chapada Diamantina, Lençóis, Morro do Pai Inácio, alt. 1100 m, $12^{\circ}27'24''S$, $41^{\circ}28'20''W$, on tree bark on table mountain, 23 Jul. 2017, M.E.S. Cáceres 40931 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, continuous, cracked and slightly verrucose, not corticate, dull, cream, up to 7 cm diam., up to 0.2 mm thick, not surrounded by a prothallus and without hypothallus. Photobiont trentepohlioid. Ascomata immersed in the thallus, solitary, linear, not branched, 0.3–0.5 mm wide, up to 1 mm long, disc closed, ~ 0.05 mm wide, thickly white pruinose; labia of thallus color and structure. Hamathecium not inspersed. Ascospores 1/ascus, hyaline, muriform, $130\text{--}140 \times 29\text{--}32 \mu\text{m}$, without gelatinous sheath I+ violet. Pycnidia not observed.

Chemistry. Thallus UV+ yellow, K+ red, P–. TLC: lichexanthone and salazinic acid.

Etymology. The epithet refers to the chemistry of this new species.

Ecology and distribution. On tree bark and *Vellozia* stems on table mountain; only known from Brazil.

Discussion. This species is characterized by presence of lichexanthone and salazinic acid and the ascospores which are 1/ascus, muriform, $130\text{--}140 \times 29\text{--}32 \mu\text{m}$. It would key out in the world key of *Diorygma* by Feuerstein et al. (2014) at couplet 16 as “Lichexanthone present (thallus UV+ yellow); additionally with salazinic acid”; the other species keying out here all have stictic acid and the two species with single-spored asci and large ascospores,

D. confluens and *D. epiglaucum*, have a brittle thallus with black hypothallus (Feuerstein et al. 2014).

Additional material. Same locality as the type, collectors 42045 (on *Vellozia* stem), 42074, 42089, 42172 (all ISE, ABL).

Diorygma toensbergianum Aptroot & M. Cáceres, sp. nov. (Fig. 3A)

MycoBank MB 849451, GenBank OR 270820

Diagnosis: Saxicolous *Diorygma* differing from all known species in the genus by the combination of the following characters: thallus with lichexanthone and norstictic acid.

Type: Brazil, Bahia: Chapada Diamantina, Lençóis, Serrano along Rio de Lençóis, alt. 500 m, 12°34'S, 41°23'55"W, on siliceous rock along river, 24 Jul. 2017, M.E.S. Cáceres 42003 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, continuous, following the surface of the substratum, not corticate, dull, pale creamish white, up to 7 cm diam., up to 0.1 mm thick, not surrounded by a prothallus. Photobiont trentepohlioid. Ascomata and pycnidia not observed.

Chemistry. Thallus UV+ yellow, K+ yellow > red, P–. TLC: lichexanthone and norstictic acid.

Etymology. Named in honour of our esteemed colleague, Tor Tønsberg, for his numerous contributions to lichenology and lichen taxonomy.

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

Discussion. *Diorygma toensbergianum* is characterized by the presence of lichexanthone and norstictic acid, a combination of secondary metabolites that was so far unknown from the genus (Feuerstein et al. 2014). The placement of this new taxon in *Diorygma* was confirmed by DNA sequence data (Fig. 4). The type specimen seems to be parasitized by a lichenicolous basidiomycete forming pink, globular galls. This may well be an undescribed species of *Tremella* (no basidia or basidiospores seen however, which is not unusual in such lichenicolous species), as in the current taxonomy of such lichenicolous

fungi (Diederich et al. 2022) most species are restricted to one host genus, and none have been described from the genus *Diorygma* so far.

Ocellularia flavoradiata Aptroot, Lücking & M. Cáceres, sp. nov. (Fig. 3B)

MycoBank MB 849452

Diagnosis: Corticolous *Ocellularia* differing from all known species in the genus by the combination of the following characters: hymenium yellow, not inspersed, ascospores medium-sized, transversely septate, ascomata with radiate cracks.

Type: Brazil, Amazonas: Manaus, Reserva Florestal Adolpho Ducke, along trails in vicinity of field station, alt. 50 m, 2°56'S, 59°57'W, on tree bark in primary rain forest, 3–8 Jun. 2016, M.E.S. Cáceres 28301 & A. Aptroot (ISE – holotype; ABL – isotype).

Description. Thallus crustose, more or less continuous but cracked, somewhat verrucose, without pseudocyphellae, corticate, glossy, olivaceous green, up to 15 cm diam., up to 0.2 mm thick, not surrounded by a prothallus. Photobiont trentepohlioid. Ascomata half-immersed in the thallus when young, later mostly superficial, single, hemispherical, 0.5–2.0 mm wide; disc yellowish orange, flat, but at the bottom of deeply concave ascomata; margin forming the hemispherical dome, of thallus color and structure, with several radiate cracks and partly showing the medulla after the cortex flakes off; medulla of the ascomata thick, white. Columella absent. Excipulum apically to almost laterally carbonized. Hamathecium not inspersed, yellow, most intensely so in the epihymenium, K-negative. Ascospores 8/ascus, hyaline, ~13–15-septate, I+ violet, 62–67 × 10–12 μm, without gelatinous sheath. Pycnidia not observed.

Chemistry. Thallus UV–, K–, P–. TLC: an unidentified pigment.

Etymology. The epithet refers to the yellow hymenium and the radiate cracks in the disc.

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

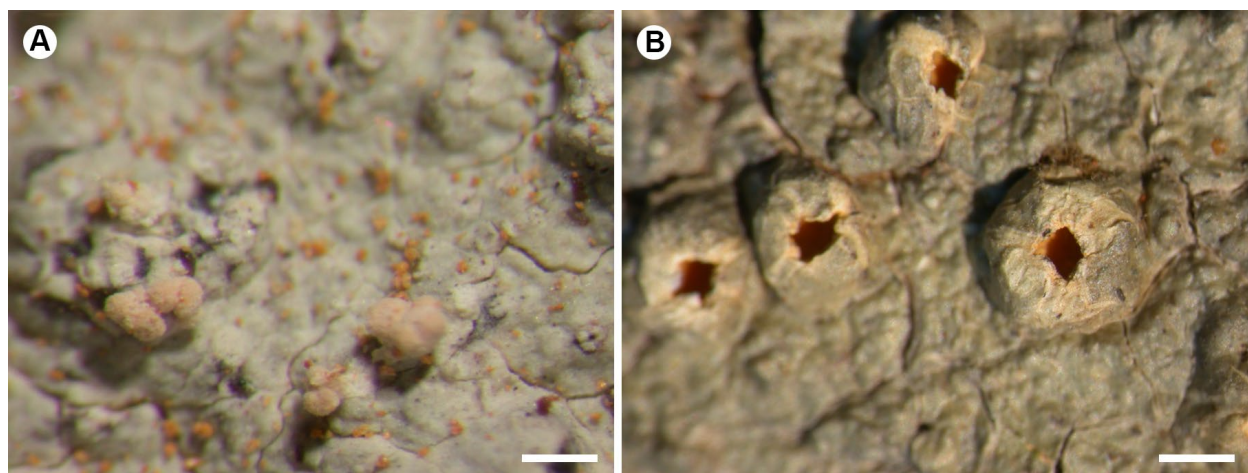


Figure 3. Habitus pictures of new species, all isotypes in ABL. A – *Diorygma toensbergianum*; B – *Ocellularia flavoradiata*. Scales: B = 1 mm; A = 0.25 mm.

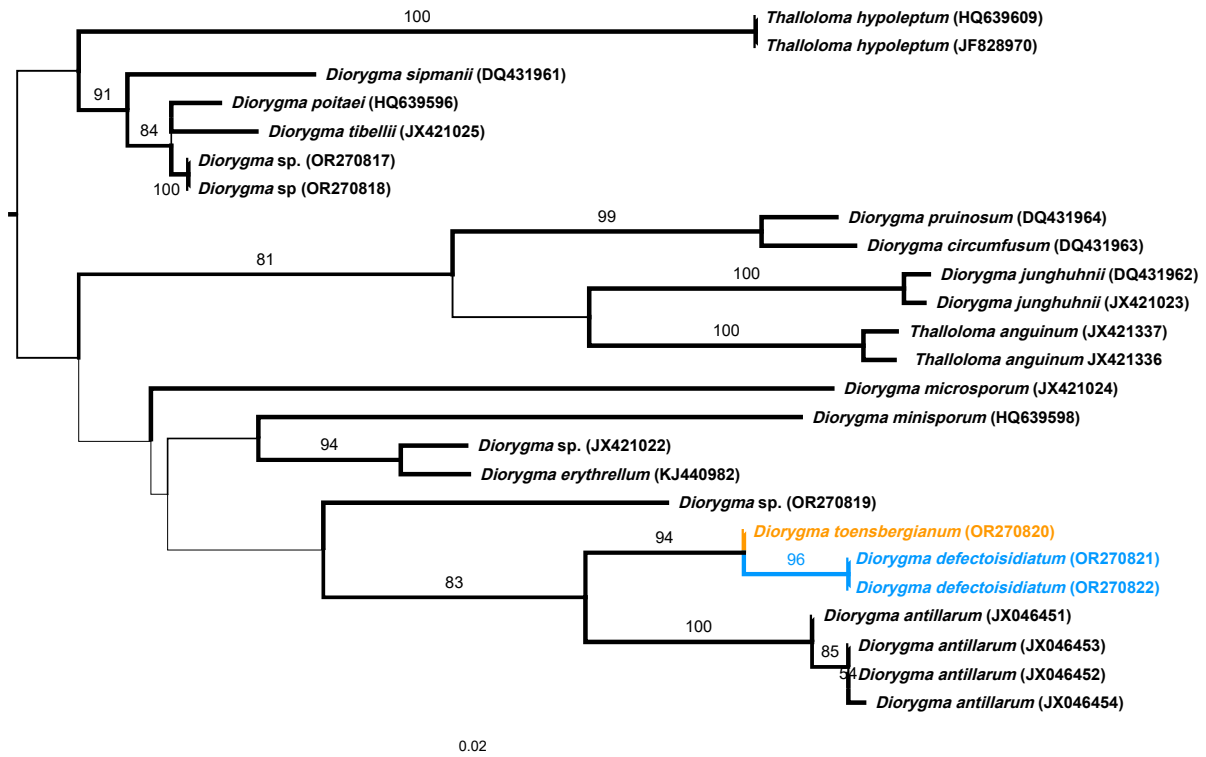


Figure 4. Cladogram of mtSSU sequences of *Diorygma* and *Thallolema* species, with bootstrap values.

Discussion. The genus *Ocellularia* contains so far only seven species with medium-sized, transversely septate ascospores. Four of these produce diverse secondary substances and of these, three have columellate apothecia. The only eolumellate species, *O. gentingensis* Nagarkar & Hale from India (Nagarkar & Hale 1989), has very narrow, pore-like openings. The three species agreeing with the new taxon in lacking secondary substances all also have columellate apothecia, including the otherwise similar *O. bipindensis* Frisch from Africa (Frisch 2006). None of them was described as having a yellow hymenium. The new species is thus well characterized by the yellow, yet non-inspersed hymenium and the eolumellate apothecia, besides the medium-sized, transversely septate ascospores.

New records

While identifying material of *Graphidaceae* and its sister family, *Gomphillaceae*, from Brazil, we also came across some new state records, some of which are also first records for Brazil; these are listed below. One representative collection is mentioned per state.

Aderkomyces papilliferus (Lücking) Lücking, Sérus. & Vězda

Specimens examined. BRAZIL. Santa Catarina: São Francisco do Sul, Parque Estadual do Acaraí, M.E.S. Cáceres 27789 & A. Aptroot (ISE, ABL).

Ampliotrema rimosum (Hale) Merc.-Díaz, Lücking & Parmen

Specimens examined. BRAZIL. Amazonas: Manaus, Reserva Florestal Adolpho Ducke, along trails in vicinity of field

station, M.E.S. Cáceres 28318 & A. Aptroot (ISE, ABL). New to Brazil.

Astrochapsa calathiformis (Vain.) Parmen, Lücking & Lumbsch

New to Brazil.

Specimens examined. BRAZIL. Amazonas: Manaus, Reserva Florestal Adolpho Ducke, along trails in vicinity of field station, M.E.S. Cáceres 28293 & A. Aptroot (ISE, ABL).

Astrochapsa pseudophlyctis (Nyl.) Parmen, Lücking & Lumbsch

Specimens examined. BRAZIL. Bahia: Chapada Diamantina, Serrano along Rio Lençois, M.E.S. Cáceres 40597 & A. Aptroot (ISE, ABL).

Chapsa dissuta (Hale) Mangold

Specimens examined. BRAZIL. Pará: 80 km N of Dom Eliseu, M.E.S. Cáceres 40299 & A. Aptroot (ISE, ABL).

Chapsa rivis-platae Lücking

Specimens examined. BRAZIL. Amapá: Macapá, near Povoado Abacate da Pedreira, M.E.S. Cáceres 27116a & A. Aptroot (ISE, ABL).

Chapsa soreliata Kalb

Specimens examined. BRAZIL. Amapá: Macapá, Peixe Boi, near Rio Curicaca, M.E.S. Cáceres 27042 & A. Aptroot (ISE, ABL).

Cruentotrema amazonum M. Cáceres, Aptroot & Lücking

Specimens examined. BRAZIL. Amapá: Macapá, Peixe Boi, near Rio Curicaca, M.E.S. Cáceres 27071 & A. Aptroot (ISE, ABL).

Cryptoschizotrema cryptotrema (Nyl.) Aptroot, Lücking & M. Cáceres

Specimens examined. BRAZIL. Amazonas: Manaus, Reserva Florestal Ducke, M.E.S. Cáceres 28333 & A. Aptroot (ISE, ABL).

Cryptoschizotrema minus E.L. Lima & Lücking

Specimens examined. BRAZIL. Amapá: Macapá, near Povoado Abacate da Pedreira, M.E.S. Cáceres 27146 & A. Aptroot (ISE, ABL).

Diploschistella urceolata Vain.

Specimens examined. BRAZIL. Sergipe: Parque Nacional Serra de Itabaiana, M.E.S. Cáceres 18128 & A. Aptroot (ISE, ABL).

Fibrillithecis sprucei Mangold, Lücking & Lumbsch

Specimens examined. BRAZIL. Rondônia: Porto Velho, Estação Ecológica de Cuniã, km 760 on road BR 319 N of Porto Velho, M.E.S. Cáceres 15830 & A. Aptroot (ISE, ABL).

Fissurina alligatorensis Lendemer & R.C. Harris

This species was described from and so far only known from the coastal plain of the USA (literature). It is not the first species that was described from there and subsequently found in Brazil. Other examples in the same family are *Graphis haleana* R.C. Harris, which is now known already from four states in Brazil, and was even described from there too (as *Graphis cuiabensis* Staiger), and *Graphis xylophaga* (R.C. Harris) Lendemer, which is known from two states in Brazil. It shows that part of the tropical lichen flora in the USA may be outliers of broader tropical distributions, rather than endemic species.

Specimens examined. BRAZIL. Rondônia: Porto Velho, Estação Ecológica de Cuniã, km 760 on road BR 319 N of Porto Velho, M.E.S. Cáceres 15679 & A. Aptroot (ISE, ABL). New to Brazil.

Geisleria sychnogonoides Nitschke

Specimens examined. BRAZIL. Bahia: Chapada Diamantina, Lençóis, Cachoeira do Mosquito, M.E.S. Cáceres 40722 & A. Aptroot (ISE, ABL).

Glaucotrema glaucophaenum (Kremp.) Rivas Plata & Lumbsch

Specimens examined. BRAZIL. Pará: 80 km N of Dom Eliseu, M.E.S. Cáceres 40228 & A. Aptroot (ISE, ABL).

Gyalideopsis aptrootii Xavier-Leite, M. Cáceres & Lücking

Specimens examined. BRAZIL. Bahia: Chapada Diamantina, Lençóis, Morro do Pai Inácio, M.E.S. Cáceres 42034 & A. Aptroot (ISE, ABL).

Gyalideopsis confluens Kalb & Vězda

Specimens examined. BRAZIL. Bahia: Chapada Diamantina, Serrano along Rio Lençóis, M.E.S. Cáceres 42015 & A. Aptroot (ISE, ABL).

Gyalideopsis macarthurii Lücking, L. Umaña & Aptroot

Specimens examined. BRAZIL. Santa Catarina: São Francisco do Sul, Parque Estadual do Acaraí, M.E.S. Cáceres 27879 & A. Aptroot (ISE, ABL).

Graphis microsperma (Chitale, Makhija & B.O. Sharma) Lücking & Kalb

New to Brazil.

Specimens examined. BRAZIL. Amazonas: Rio Roosevelt, Aptroot 87254 (CGMS, ABL).

Gyalideopsis marcellii Xavier-Leite, M. Cáceres & Lücking

Specimens examined. BRAZIL. Bahia: Chapada Diamantina, Lençóis, Morro do Pai Inácio, M.E.S. Cáceres 40926 & A. Aptroot (ISE, ABL).

Melanotrema lynceodes (Nyl.) Rivas Plata, Lücking & Lumbsch

New to Brazil.

Specimens examined. BRAZIL. Amapá: Floresta Nacional do Amapá, upstream of the station, M.E.S. Cáceres 27447 & A. Aptroot (ISE, ABL).

Myriotrema clandestinum (Fée) Hale

Specimens examined. BRAZIL. Amazonas: Manaus, Reserva Florestal Ducke, M.E.S. Cáceres 28203 & A. Aptroot; Rondônia: Estação Ecológica de Cuniã, M.E.S. Cáceres 15662 & A. Aptroot (all ISE, ABL).

Myriotrema glauculum (Nyl.) Hale

Specimens examined. BRAZIL. Pará: 80 km N of Dom Eliseu, M.E.S. Cáceres 40241 & A. Aptroot (ISE, ABL).

Myriotrema olivaceum Fée

Specimens examined. BRAZIL. Amapá: Floresta Nacional do Amapá, near station, M.E.S. Cáceres 27231 & A. Aptroot; Rondônia: Porto Velho, Parque Natural Municipal, M.E.S. Cáceres 15581 & A. Aptroot (all ISE, ABL).

Myriotrema subconforme (Nyl.) Hale

Specimens examined. BRAZIL. Amapá: Floresta Nacional do Amapá, near station, M.E.S. Cáceres 27255 & A. Aptroot; Amazonas: Manaus, Reserva Florestal Ducke, M.E.S. Cáceres 28266 & A. Aptroot; Santa Catarina: São Francisco do Sul, Univille campus, M.E.S. Cáceres 27702 & A. Aptroot (all ISE, ABL).

Myriotrema viridialbum (Kremp.) Hale

Specimens examined. BRAZIL. Amazonas: Manaus, Reserva Florestal Ducke, M.E.S. Cáceres 28185 & A. Aptroot (ISE, ABL).

Ocellularia lacerata M. Cáceres, Aptroot & Lücking

Specimens examined. BRAZIL. Pará: 80 km N of Dom Eliseu, M.E.S. Cáceres 40266 & A. Aptroot (ISE, ABL).

Ocellularia referta Hale

Specimens examined. BRAZIL. Pará: 80 km N of Dom Eliseu, M.E.S. Cáceres 40298 & A. Aptroot (ISE, ABL).

Redingeria glaucoglyphiza (Sipman) Frisch

Specimens examined. BRAZIL. Amapá: Mazagão, Reserva Extrativista do Maracá, along BR 156, M.E.S. Cáceres 27554 & A. Aptroot (ISE, ABL).

Stegobolus berkeleyanus Mont.

Specimens examined. BRAZIL. Pará: 85 km N of Dom Eliseu, M.E.S. Cáceres 40451 & A. Aptroot (ISE, ABL).

Thelotrema adjectum Nyl.

Specimens examined. BRAZIL. Amapá: Floresta Nacional do Amapá, upstream of the station, M.E.S. Cáceres 27434 & A. Aptroot (ISE, ABL).

Acknowledgments

All materials cited were collected under corresponding permits and holotypes are kept in the Brazilian herbaria CGMS or ISE. The colleagues at INPA are thanked for organizing the second field excursion to Ducke Reserve in Manaus and Jadson J. S. Oliveira for assistance with the collecting permit. Various other colleagues organized the field trips to Amapá, Bahia, Pará, Rondônia, Rio Grande do Sul and Tocantins. The costs of the collecting expeditions were partly financed by the Conselho Nacional de Pesquisa e Desenvolvimento – CNPQ (e.g., CNPq-Sisbiota Processo 563342/201-2 and Processo 401186/2014-8) and research grants to MESC (Processos 309058/2015-5 and 307569/2019-5). This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – (CAPES Brasil) – Finance Code 001 who provided a visiting professorship to the first author. The first author warmly thanks the Stichting Hugo de Vries-fonds for various travel funds.

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