

## New Arthoniales from Santa Catarina (South Brazil)

André APTROOT<sup>a\*</sup>, Emerson L. GUMBOSKI<sup>b</sup>  
& Marcela Eugenia da Silva CÁCERES<sup>c</sup>

<sup>a</sup>ABL Herbarium, G. v. d. Veenstraat 107, NL-3762 XK Soest, The Netherlands

<sup>b</sup>Departamento de Ciências Biológicas, Universidade da Região de Joinville,  
CEP: 89219-710, Joinville, Santa Catarina, Brazil

<sup>c</sup>Departamento de Biociências, Universidade Federal de Sergipe,  
CEP: 49500-000, Itabaiana, Sergipe, Brazil

**Abstract** – The following new species of Arthoniales are described, from Santa Catarina state in South Brazil: *Herpothallon tricolor*, *Neosergipea bicolor*, and *Opegrapha xanthonica*. In addition, 92 species are reported new to Santa Catarina state, 15 of which are new to Brazil, mostly species that are widespread in temperate regions on the northern hemisphere.

**Corticolous / new species / restinga / *Herpothallon* / *Neosergipea* / *Opegrapha***

### INTRODUCTION

At the occasion of the eight Reunião Brasileira de Estudos Liquenológicos (8aREBEL), an Arthoniales workshop was held on Univille Campus in São Francisco do Sul, Santa Catarina State. This was the right place to organize such an event, as examples of most major genera were already available on the trees near the parking place of the University. We also visited several localities in the vicinity. Lichens were collected in October 2015 on all available substrata, but mostly from tree bark, in mangrove, ‘restinga’ vegetation, and gardens. Crustose lichens are dominant in all habitats.

The restinga belongs to the Mata Atlântica domain (Rizzini, 1997) and can be defined as a pioneer plant formation on the Brazilian coastal plains, on originally marine sediment deposition (Bigarella, 2001; IBGE, 2012; Melo Júnior & Boerger, 2015), on quaternary deposits formed by marine transgressions and regressions (Velooso *et al.*, 1991). The plant communities depend more on soil conditions than on climate and is composed of a mosaic of floristic and physiognomically distinct communities (Eiten, 1983; Velooso *et al.*, 1991; Magnano *et al.*, 2010). In the Parque Estadual Acaraí, the main site of collections, Melo Júnior & Boerger (2015) characterized the vegetative structure mainly as containing a gradient from herbaceous, shrubby to shrubby-arboreal communities, characteristic of the restinga, including a region further away from the sea composed by a transition forest containing larger trees, with distinctive edaphic and floristic features of the restinga, ending in a lowland region near the river.

\* Corresponding author: andreaproot@gmail.com

Here, we describe new species of Arthoniales. We also present a list of new records for Santa Catarina from visited locations. For this paper, most of the crustose groups have been examined, with the exception of foliicolous species, littoral saxicolous lichens and most of the *Graphidaceae* and *Gomphillaceae*, which will be treated in other publications.

## MATERIALS AND METHODS

The collections were made in the Municipality of São Francisco do Sul, Santa Catarina State, South Brasil (26°14'36" S; 48°38'17"W). The climate is classified as mesothermic and Cfa in Köppen's classification, strongly influenced by marine humidity. The annual average temperature is 20.5°C, precipitation is 1900 mm and the relative humidity is around 87%, (FATMA, 2002).

Identification and descriptive work was carried out in Itabaiana, Universidade Federal de Sergipe, using a Leica EZ4 stereomicroscope and a Leica DM500 compound microscope, and also in Soest using an Olympus SZX7 stereomicroscope and an Olympus BX50 compound microscope with interference contrast, connected to a Nikon Coolpix digital camera. Sections have been mounted in tap water, in which also all measurements were taken. The specimens from this study are preserved in ISE and ABL. The chemistry of the type specimens was investigated by thin layer chromatography (TLC) using solvent A (Orange *et al.*, 2001).

## RESULTS

### New records

Table 1 cites 92 species that are reported new to Santa Catarina state, 15 of which are new to Brazil, mostly species that are widespread in temperate regions on the northern hemisphere.

Table 1. New lichen records from Santa Catarina, all from São Francisco do Sul, October 2015, leg. Cáceres & Aptroot. BR = new to Brazil; SC = new to Santa Catarina

BR	<i>Acanthothesis</i>	<i>rosea</i>	(Vain.) Staiger & Kalb
SC	<i>Agonimia</i>	<i>pacifica</i>	(H. Harada) Diederich
SC	<i>Amandinea</i>	<i>efflorescens</i>	(Müll. Arg.) Marbach
SC	<i>Amandinea</i>	<i>extenuata</i>	(Müll. Arg.) Marbach
BR	<i>Ancistrosporella</i>	<i>psoromica</i>	Komposch, Aptroot & Hafellner
SC	<i>Anisomeridium</i>	<i>anisolobum</i>	(Müll. Arg.) Aptroot
SC	<i>Arthonia</i>	<i>parantillarum</i>	Aptroot
SC	<i>Aspidothelium</i>	<i>cinerascens</i>	Vain.
SC	<i>Aspidothelium</i>	<i>geminiparum</i>	(Malme) R. Sant.
SC	<i>Aspidothelium</i>	<i>glabrum</i>	Lücking, Aptroot & Sipman

BR	<i>Aspidothelium</i>	<i>ornatum</i>	Lücking
SC	<i>Astrothelium</i>	<i>aeneum</i>	(Eschw.) Aptroot & Lücking
SC	<i>Astrothelium</i>	<i>bicolor</i>	(Taylor) Aptroot & Lücking
SC	<i>Astrothelium</i>	<i>cartilagineum</i>	(Fée) Aptroot & Lücking
SC	<i>Astrothelium</i>	<i>ceratinum</i>	(Fée) Aptroot & Lücking
SC	<i>Astrothelium</i>	<i>cinnamomeum</i>	(Eschw.) Müll. Arg.
BR	<i>Astrothelium</i>	<i>floridanum</i>	Zahlbr. ex M. Choisy
SC	<i>Astrothelium</i>	<i>nitidiusculum</i>	(Nyl.) Aptroot & Lücking
SC	<i>Astrothelium</i>	<i>papulosum</i>	(Nyl.) Aptroot & Lücking
SC	<i>Astrothelium</i>	<i>phlyctaena</i>	(Fée) Aptroot & Lücking
SC	<i>Astrothelium</i>	<i>scoria</i>	(Fée) Aptroot & Lücking
SC	<i>Bacidia</i>	<i>heterochroa</i>	(Müll. Arg.) Zahlbr.
BR	<i>Bacidina</i>	<i>pseudohyphophorifera</i>	(Lücking & Sérus.) Lücking 2008
SC	<i>Bactrospora</i>	<i>angularis</i>	Sobreira, Aptroot & M. Cáceres
SC	<i>Bactrospora</i>	<i>jenikii</i>	(Vězda) Egea & Torrente
SC	<i>Buellia</i>	<i>griseovirens</i>	(Turner & Borrer ex Sm.) Almb.
SC	<i>Buellia</i>	<i>mamillana</i>	(Tuck.) W.A. Weber
SC	<i>Buellia</i>	<i>subdisciformis</i>	(Leight.) Jatta
SC	<i>Byssoloma</i>	<i>subdiscordans</i>	(Nyl.) P. James
SC	<i>Calopadia</i>	<i>subcoerulescens</i>	(Zahlbr.) Vězda
SC	<i>Chiodecton</i>	<i>malmei</i>	G. Thor
SC	<i>Coccocarpia</i>	<i>prostrata</i>	Lücking, Aptroot & Sipman
SC	<i>Coenogonium</i>	<i>disjunctum</i>	Nyl.
SC	<i>Coenogonium</i>	<i>subdentatum</i>	(Vězda & G. Thor) Rivas Plata, Lücking, Umaña & Chaves
SC	<i>Cresponea</i>	<i>melanocheloides</i>	(Vain.) Egea & Torrente
SC	<i>Crocynia</i>	<i>pyxinoides</i>	Nyl.
SC	<i>Cryptothecia</i>	<i>lichexanthonica</i>	E.L. Lima, Aptroot & M. Cáceres
SC	<i>Cryptothecia</i>	<i>striata</i>	G. Thor
SC	<i>Diorygma</i>	<i>antillarum</i>	(Vain.) Nelsen, Lücking & Rivas Plata
SC	<i>Diploschistes</i>	<i>diacapsis</i>	(Ach.) Lumbsch
SC	<i>Encephalographa</i>	<i>anthracothecii</i>	Diederich
SC	<i>Enterographa</i>	<i>leucolyta</i>	(Nyl.) Redinger
SC	<i>Enterographa</i>	<i>multilocularis</i>	(Müll. Arg.) Sparrius
BR	<i>Enterographa</i>	<i>tropica</i>	Sparrius
SC	<i>Erioderma</i>	<i>leylandii</i>	(Taylor) Müll. Arg.
SC	<i>Graphis</i>	<i>elongata</i>	Vain.
BR	<i>Gyalideopsis</i>	<i>brevipilosa</i>	(Kalb & Vězda) Lücking, Sérus. & Vězda
SC	<i>Haematomma</i>	<i>persoonii</i>	(Fée) A. Massal.
SC	<i>Herpothallon</i>	<i>pustulatum</i>	G. Thor
SC	<i>Herpothallon</i>	<i>roseocinctum</i>	(Fr.) Aptroot, Lücking & G. Thor
BR	<i>Jamesiella</i>	<i>chaverriae</i>	Chaves, Umaña & Lücking

SC	<i>Lecanactis</i>	<i>elaeocarpa</i>	(Nyl.) Tehler
SC	<i>Lecanactis</i>	<i>epileuca</i>	(Nyl.) Tehler
SC	<i>Lecanora</i>	<i>helva</i>	Stizenb.
SC	<i>Lecanora</i>	<i>leproplaca</i>	Zahlbr.
SC	<i>Malmidea</i>	<i>furfurosa</i>	(Tuck. ex Nyl.) Kalb & Lücking
SC	<i>Malmidea</i>	<i>incrassata</i>	Kalb
SC	<i>Mazosia</i>	<i>carnea</i>	(Eckfeldt) Aptroot & M. Cáceres
BR	<i>Micarea</i>	<i>denigrata</i>	(Fr.) Hedl.
SC	<i>Micarea</i>	<i>stipitata</i>	Coppins & P. James
SC	<i>Mycoporum</i>	<i>eschweileri</i>	(Müll. Arg.) R.C. Harris
SC	<i>Mycoporum</i>	<i>lacteam</i>	(Ach.) R.C. Harris
SC	<i>Myriostigma</i>	<i>miniatum</i>	(Lücking) Aptroot, Ertz, Grube & M. Cáceres
SC	<i>Ochrolechia</i>	<i>africana</i>	Zahlbr.
SC	<i>Opographa</i>	<i>anguinella</i>	(Nyl.) Ertz & Diederich
SC	<i>Opographa</i>	<i>lithyrgiza</i>	Vain.
SC	<i>Opographa</i>	<i>urosperma</i>	Fée
BR	<i>Phyllopsora</i>	<i>lacerata</i>	Timdal
SC	<i>Physcia</i>	<i>kalbii</i>	Moberg
SC	<i>Physcia</i>	<i>phaeocarpa</i>	(Nyl.) Hue
SC	<i>Polymeridium</i>	<i>albobinereum</i>	(Kremp.) R.C. Harris
SC	<i>Porina</i>	<i>farinosa</i>	C. Knight
SC	<i>Porina</i>	<i>simulans</i>	Müll. Arg.
SC	<i>Protoparmelia</i>	<i>isidiata</i>	Diederich, Aptroot & Sérus.
BR	<i>Pseudopyrenula</i>	<i>media</i>	Aptroot & Diederich
SC	<i>Psoroglaena</i>	<i>cubensis</i>	Müll. Arg.
SC	<i>Pyrenula</i>	<i>acutispora</i>	Kalb & Hafellner
SC	<i>Pyrenula</i>	<i>cubana</i>	(Müll. Arg.) R.C. Harris
SC	<i>Pyrenula</i>	<i>microtheca</i>	R.C. Harris
SC	<i>Pyrenula</i>	<i>nitidula</i>	(Bres.) R.C. Harris
SC	<i>Pyrenula</i>	<i>psoriformis</i>	Zahlbr.
SC	<i>Pyrenula</i>	<i>pyrenuloides</i>	(Mont.) R.C. Harris
SC	<i>Pyrenula</i>	<i>septicollaris</i>	(Eschw.) R.C. Harris
SC	<i>Pyxine</i>	<i>convexior</i>	(Müll. Arg.) Swinscow & Krog
SC	<i>Rinodina</i>	<i>maculans</i>	(Kremp.) Müll. Arg.
SC	<i>Stirtonia</i>	<i>macrocarpa</i>	Makhija & Patw.
SC	<i>Sulzbacheromyces</i>	<i>caatingae</i>	(Sulzbacher & Lücking) B.P. Hodk. & Lücking
BR	<i>Syncesia</i>	<i>depressa</i>	(Fée) Tehler
SC	<i>Syncesia</i>	<i>rhizomorpha</i>	Tehler
BR	<i>Thelidium</i>	<i>minutulum</i>	Körb.
BR	<i>Trapeliopsis</i>	<i>granulosa</i>	(Hoffm.) Lumbsch
BR	<i>Veizdaea</i>	<i>stipitata</i>	Poelt & Döbbeler

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## New species

*Herpothallon tricolor* Aptroot & M. Cáceres, *sp. nov.*

Fig. 1A-B

*Mycobank* MB 821118

**Diagnosis:** Corticolous *Herpothallon* differing from *H. rubrocinctum* by the greyish thallus with bright red hypothallus underneath and at the margins, and orange pseudoisidia in the central part of the thallus; containing chiodectonic and confluent acids.

**Type:** Brazil, Santa Catarina, São Francisco do Sul, Parque Estadual Acaraí, alt. c. 10 m, 26°17'20" S, 48°32'35" W, on tree in restinga, 6 October 2015, M.E.S. Cáceres & A. Aptroot ISE 27759 (holotype JOI, isotype ABL).

**Thallus** corticolous, whitish grey, c. 0.2 mm thick, easily detached from the substratum, up to 20 cm diam., hypothallus and prothallus hyphal, dense, bright red. **Pseudoisidia** orange, numerous in the centre of the thallus, c. 0.1 mm diam. 0.1-0.3 mm high, simple and globose or cylindrical and branched, pseudocortex with crystals. **Ascomata** and **pycnidia** not observed. **Chemistry** thallus (grey parts) UV-, C-, P-, K-; pseudoisidia (orange parts) UV-, C-, P-, K-; hypothallus (red parts) UV-, C-, P-, K+ blood red. TLC: Chiodectonic and confluent acids.

**Ecology and distribution:** On tree bark in restinga; only known from Brazil.

**Discussion:** This is such a characteristic species that it was already recognized in the field as an undescribed species. *Herpothallon* was resurrected by Aptroot *et al.* (2009) for a group of 29 mostly sterile lichens, and 15 species have been added since in numerous publications, mostly from the palaeotropics. None have the combination of a grey thallus with bright red hypothallus and margin and orange-tipped pseudoisidia, as shown by this new species.

*Neosergipea bicolor* Aptroot & M. Cáceres, *sp. nov.*

Fig. 1C &amp; 1E

*Mycobank* MB 821119

**Diagnosis:** Corticolous *Neosergipea* differing from the other species in the genus by whitish grey thallus and whitish grey, mostly conical, black-tipped pycnidia with bright orange pruina at the base and partly at the sides; conidia hyaline, 3-septate, narrowly fusiform, 20-25 × 2-2.5 µm, with pointed ends.

**Type:** Brazil, Santa Catarina, São Francisco do Sul, Parque Estadual Acaraí, alt. c. 10 m, 26°19'14" S, 48°33'13" W, on tree in restinga, 7 October 2015, M.E.S. Cáceres & A. Aptroot ISE 27875 (holotype JOI, isotype ABL).

**Thallus** less than 0.1 mm thick, dull, indistinctly corticate, whitish grey, not surrounded by a prothallus. *Algae* trentepohlioid, c. 6 × 5-9 µm. **Ascomata** not observed. **Pycnidia** abundant whitish grey, mostly conical, black-tipped, with bright orange pruina at the base and partly at the sides, c. 0.2 mm diam., c. 0.2 mm high. **Conidia** hyaline, 3-septate, narrowly fusiform, 20-25 × 2-2.5 µm, with pointed ends. **Chemistry** thallus UV-, C-, P-, K-; orange pruina on pycnidia UV+ pink, K+ blood red. TLC: An anthraquinone, probably parietin.

**Ecology and distribution:** On tree bark in restinga and park; only known from Brazil.

**Discussion:** This species belongs to the species group treated in a key to *Arthoniales* with whitish stalked pycnidia (Frisch *et al.*, 2015). This new species is close to an Amazonian species we sequenced which clustered close to the so far monotypic genus *Sergipea* (Aptroot *et al.*, 2013), which has been renamed as *Neosergipea* because there exists a fossil dinoflagellate spore genus with the name *Sergipea*. Therefore, the new species is described in the genus *Neosergipea*.

*Additional material examined:* Brazil, Santa Catarina, São Francisco do Sul, Forte Marechal Luz, alt. c. 60 m, 26°09'59" S, 48°31'52" W, on tree, 10 October 2015, M.E.S. Cáceres & A. Aptroot ISE 28035 (ABL).

*Opegrapha xanthonica* Aptroot & M. Cáceres, *sp. nov.*

Fig. 1D & 1F

*Mycobank* MB 821120

*Diagnosis:* Corticolous *Opegrapha* differing from all *Opegrapha* species by whitish cream thallus with more or less globose pale brown pycnidia of c. 0.1 mm diam. and high; conidia hyaline, simple, curved, c.  $4 \times 1 \mu\text{m}$ ; thallus and pycnidia with a UV+ pink xanthone.

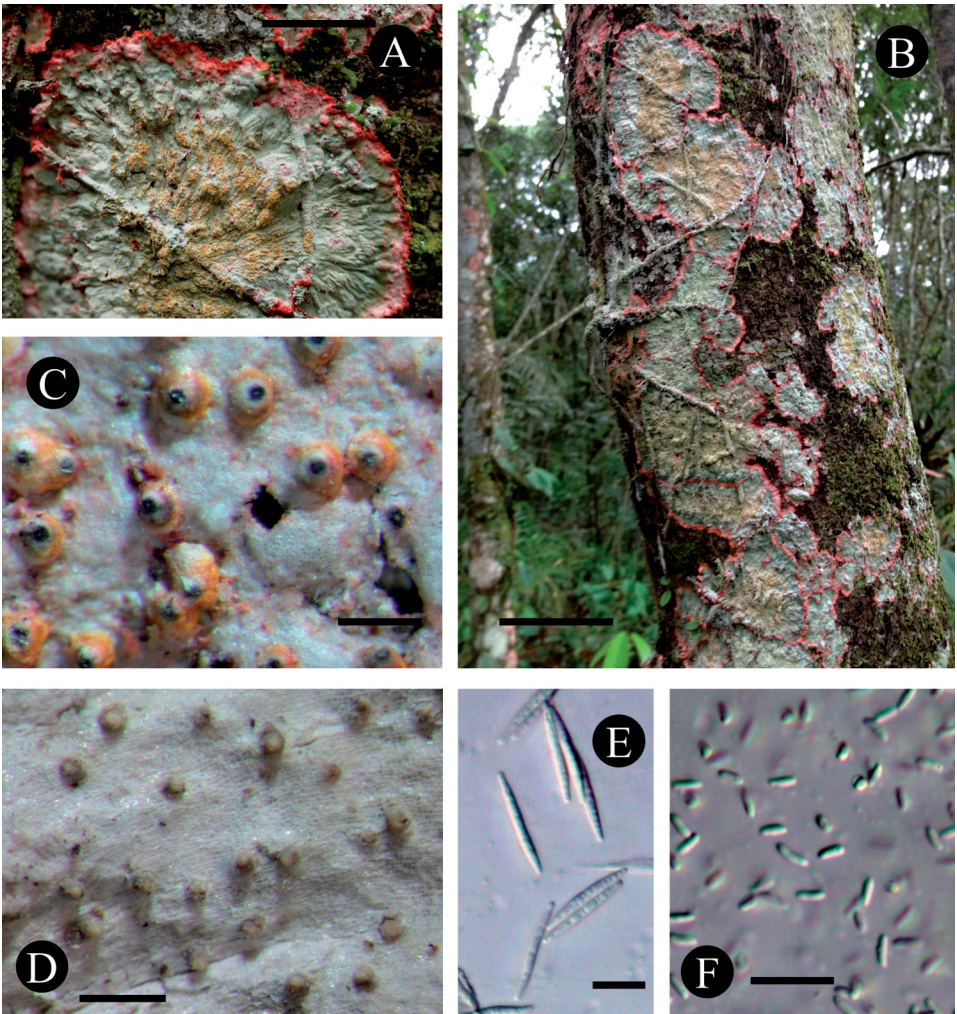


Fig. 1. A-B. *Herpothallon tricolor*. A. Isotype, habitus. B. Holotype, habitus in the field. C & E. *Neosergipea bicolor* (isotype). C. Habitus. E. Conidia. D & F. *Opegrapha xanthonica*. D. Habitus. F. Conidia. Scale: A = 1 cm; B = 3 cm; C-D = 0.5 mm; E-F = 10  $\mu\text{m}$ .

*Type:* Brazil, Santa Catarina, São Francisco do Sul, Univille Unidade São Francisco do Sul, alt. c. 10 m, 26°13' S, 48°34' W, on tree on campus, 5 October 2015, M.E.S. Cáceres & A. Aptroot ISE 28663 (holotype JOI, isotype ABL).

**Thallus** less than 0.1 mm thick, dull, not corticate, whitish cream, without prothallus. *Algae* trentepohlioid c.  $5 \times 5\text{--}8 \mu\text{m}$ . **Ascomata** not observed. **Pycnidia** abundant, more or less globose, pale brown, c. 0.1 mm diam. and high. **Conidia** hyaline, simple, curved, c.  $4 \times 1 \mu\text{m}$ , with rounded ends. **Chemistry** thallus and pycnidia UV+ pink, C–, P–, K–. TLC: Unidentified xanthone.

*Ecology and distribution:* On tree bark on a campus; only known from Brazil.

*Discussion:* This species belongs to the species group treated in a key to *Arthoniales* with whitish stalked pycnidia (Frisch *et al.*, 2015). But it clearly differs from any species treated in there and is thus described as new, in the genus *Opegrapha*, as it resembles species of that genus closest.

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