An Acad Bras Cienc (2023) 95(1): e20201937 DOI 10.1590/0001-3765202320201937
Anais da Academia Brasileira de Ciências | *Annals of the Brazilian Academy of Sciences*
Printed ISSN 0001-3765 I Online ISSN 1678-2690
www.scielo.br/aabc | www.fb.com/aabcjournal

ECOSYSTEMS

Spatial distribution and faunal composition of millipedes of the family Spirostreptidae Brandt, 1833 in the Brazilian Atlantic Forest (Diplopoda, Juliformia, Spirostreptida)

LUIZ F.M. INIESTA, RODRIGO S. BOUZAN & ANTONIO D. BRESCOVIT

Abstract: The Atlantic Forest is known for its richness and diversity of species. Nonetheless, the diversity of millipedes in the biome is still poorly known. In this work, the distribution and the faunal composition of millipedes of the family Spirostreptidae Brandt, 1833 (order Spirostreptida) from the Atlantic Forest are provided. A total of 159 occurrence points were compiled, and 59 species in 17 genera were listed. *Gymnostreptus* Brölemann, 1902 was recovered as the richest genus in the Atlantic Forest with 14 species and one subspecies. The species *Plusioporus setiger* (Brölemann, 1902) presented the highest number of records, with 22 occurrence points in at least 20 municipalities. A total of 35 species were recorded from only one municipality. Considering all the threats on the biome, this paper is important for our understanding of the Brazilian millipede fauna and can be useful to determine places that require valuations for collecting efforts and conservation policies.

Key words: Neotropical, São Paulo, Rio de Janeiro, Schubart, Brölemann, Atlantic province.

INTRODUCTION

The Atlantic Forest is recognized for its remarkable biodiversity of vertebrate and invertebrate species (Silva et al. 2004, Pinto-da-Rocha et al. 2005, Sigrist & Carvalho 2008, DaSilva et al. 2017). The biome is an important biodiversity hotspot in the world in terms of the endemicity of species and their threats by human activities (Fonseca 1985, Myers et al. 2000, Colombo & Joly 2010). The accelerated deforestation and consequent fragmentation effects on the forest is due to mining, logging, regional medium and large-scale farming activities (for instance, sugar cane, coffee, and orange), and more recently an indiscriminate urban expansion and industrialization process (see Fonseca 1985, Lembi et al. 2020). The Atlantic Forest originally covered an area corresponding to 16% of Brazilian territory (Rezende et al. 2018), and nowadays approximately 10% of its original area is preserved, including regenerating areas and small patches of forests (Colombo & Joly 2010, Joly et al. 2014, Rezende et al. 2018).

The family Spirostreptidae Brandt, 1833 includes 61 genera and 275 species (Shear 2011, Enghoff et al. 2015), being one of the most diverse groups within the order Spirostrepida. The family is widely distributed in Africa (including Madagascar), Central and South America, and marginally North America (Jeekel 1985, Shelley & Golovatch 2011, Enghoff et al. 2015). In Brazil, most of the information on Spirostreptidae has resulted from extensive studies conducted by Schubart and Brölemann in the last century and more recently by Hoffman (Brölemann 1902a, Schubart 1945b, Hoffman 1980, Krabbe 1982,

Iniesta et al. 2022). Nonetheless, the diversity of Spirostreptidae in the Atlantic Forest is still poorly known, especially compared to other millipede groups such as Chelodesmidae (Polydesmida) and Rhinocricidae (Spirobolida) (Schubart 1951, 1962, Hoffman 1975, 1976, 1981, 1990, Bouzan et al. 2018).

In this perspective, understanding the richness of the family and its geographical distribution is of considerable importance, especially when focused on an area as threatened as the Atlantic Forest. Thus, to promote further studies on Spirostreptidae diversity in the biome, this study presents an updated list of species and their distribution pattern from a biogeographical perspective.

MATERIALS AND METHODS

The list of species of Spirostreptidae documented from the Atlantic Forest was extracted through a series of queries on associated literature. Species with doubtful records (for instance, occurrence points from unknown regions not found in gazetteers) or without exact location were not included. The geographical coordinates were obtained from the geoLoc tool of speciesLink (http://splink.cria.org.br/geoloc). The limits of the Atlantic Forest suggested by the Brazilian Ministry of Environment (MMA) and the Brazilian Institute for Geography and Statistics (IBGE) were used for all mapping and analysis. In addition, the biogeographical provinces proposed by Morrone (2014) were mapped on the limits of the Atlantic Forest to cover all occurrence points compiled. Records of species in areas narrowly close to limits of the biome were kept for listing purposes. The provinces follow the indication of colours/nomenclature (Fig. 1). All the maps were prepared from DIVA-GIS version 7.5.0.0. The number of records of species and richness were calculated from the number of occurrence points and number of species by grid of 1°.

RESULTS

A total of 159 occurrence points of species of Spirostreptidae were compiled for the Brazilian Atlantic Forest (Figs 2-4). The Atlantic province presented the highest number of records and species by grid, while the Araucaria Forest province had the lowest values of records by species and richness (Fig. 5a-b). A total of 59 species and subspecies in 17 genera were recorded. *Gymnostreptus* Brölemann, 1902 was recovered as the richest genus with 14 species and one subspecies listed (Fig. 5c-d). *Plusioporus setiger* (Brölemann, 1902) was one of the most widely distributed species with occurrence points in at least 20 municipalities, while 35 species were recorded from only one municipality.

List of species of Spirostreptidae in Atlantic Forest

Suborder Spirostreptidea Brandt, 1833 Family Spirostreptidae Brandt, 1833

Genus *Calathostreptus* Schubart, 1959

Calathostreptus Schubart 1959: 482. Type-species: *Calathostreptus fluminensis* Schubart, 1959 by monotypy.

Remarks. The genus occurs in the Atlantic province from the state of Rio de Janeiro.

Calathostreptus fluminensis Schubart, 1959

Calathostreptus fluminensis Schubart 1959: 483, Krabbe 1982: 294.

Records from Atlantic Forest: ***Rio de Janeiro*:** Rio de Janeiro [22°55'30.7"S; 43°13'26.9"W] (Schubart 1959).

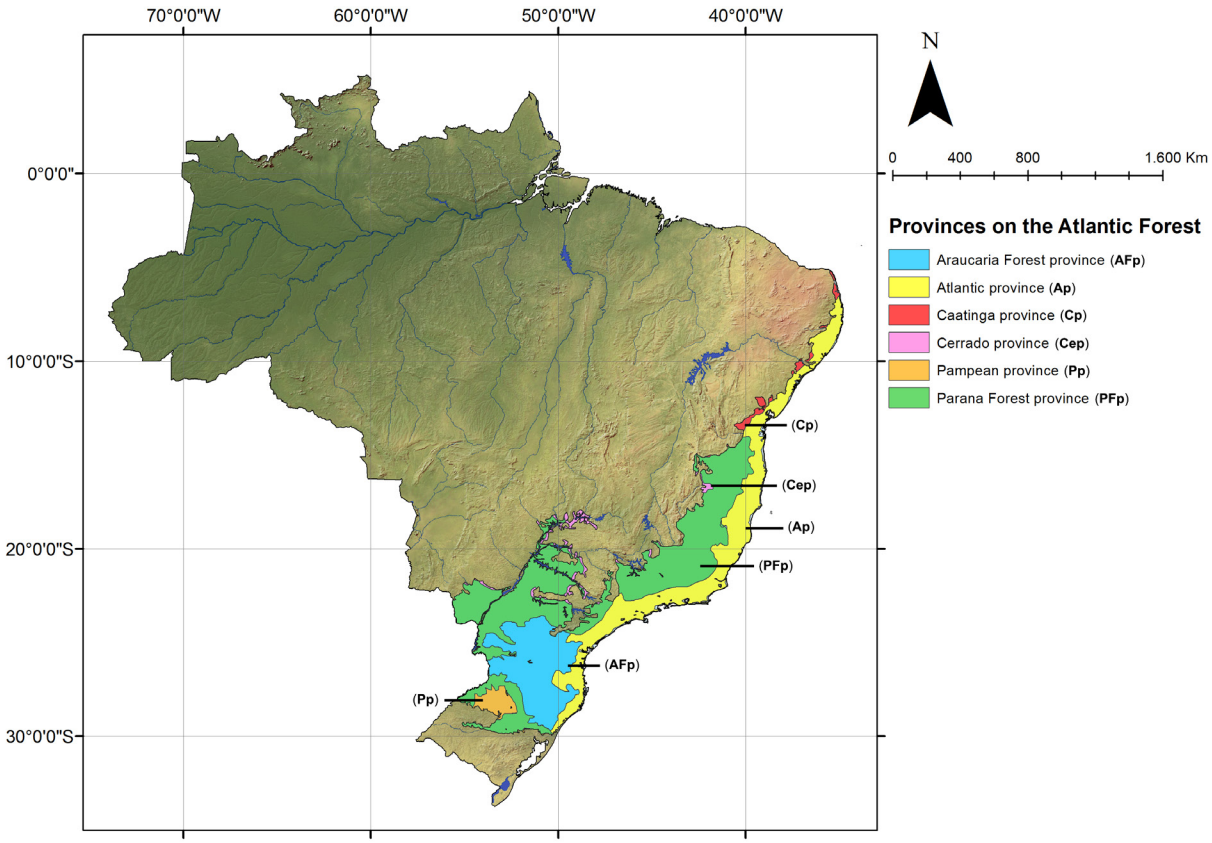

Figure 1. Map of Brazil with the original area of Atlantic Forest highlighted. The colours refer to the provinces on the Atlantic Forest (see Morrone 2014).

Calathostreptus fulvus (Schubart, 1960)

Collostreptus fulvus Schubart 1960: 77, Hoffman & Knight 1970: 7.

Calathostreptus fulvus:-- Krabbe 1982: 294.

Remarks. Schubart (1960: 77) mentions the occurrence of the species in Caxias, an area supposedly located in the former province of Rio de Janeiro, and not Guanabara. This doubtful record may be a misspelling of Duque de Caxias, although this municipality is in the region of the Guanabara Bay.

Records from Atlantic Forest: ***Rio de Janeiro*:** Rio de Janeiro, Grajaú [22°55'31.1"S; 43°15'35.6"W], Silvestre [22°56'11.1"S; 43°12'06.9"W]; Paraty, Pedra Branca [23°12'00.4"S; 44°45'55.6"W]; São Gonçalo [22°48'58.7"S; 43°02'12.2"W] (Schubart 1960).

Genus Cearostreptus Schubart, 1945

Cearostreptus Schubart 1945a: 280. Type-species: *Cearostreptus triangulatus* Schubart, 1945 by monotypy.

Remarks. The genus is restricted only to the Atlantic Forest in the city of Rio de Janeiro.

Cearostreptus schubarti Krabbe, 1982

Guanabarastreptus triangulatus Schubart 1960: 76, Hoffman & Knight 1970: 5.

Cearostreptus schubarti Krabbe 1982: 297 (replacement name for *C. triangulatus* (Schubart, 1960), preoccupied by *C. triangulatus* Schubart, 1945).

Records from Atlantic Forest: ***Rio de Janeiro*:** Guanabara, Serra da Carioca [22°57'30.7"S; 43°15'26.9"W] (Schubart 1960).

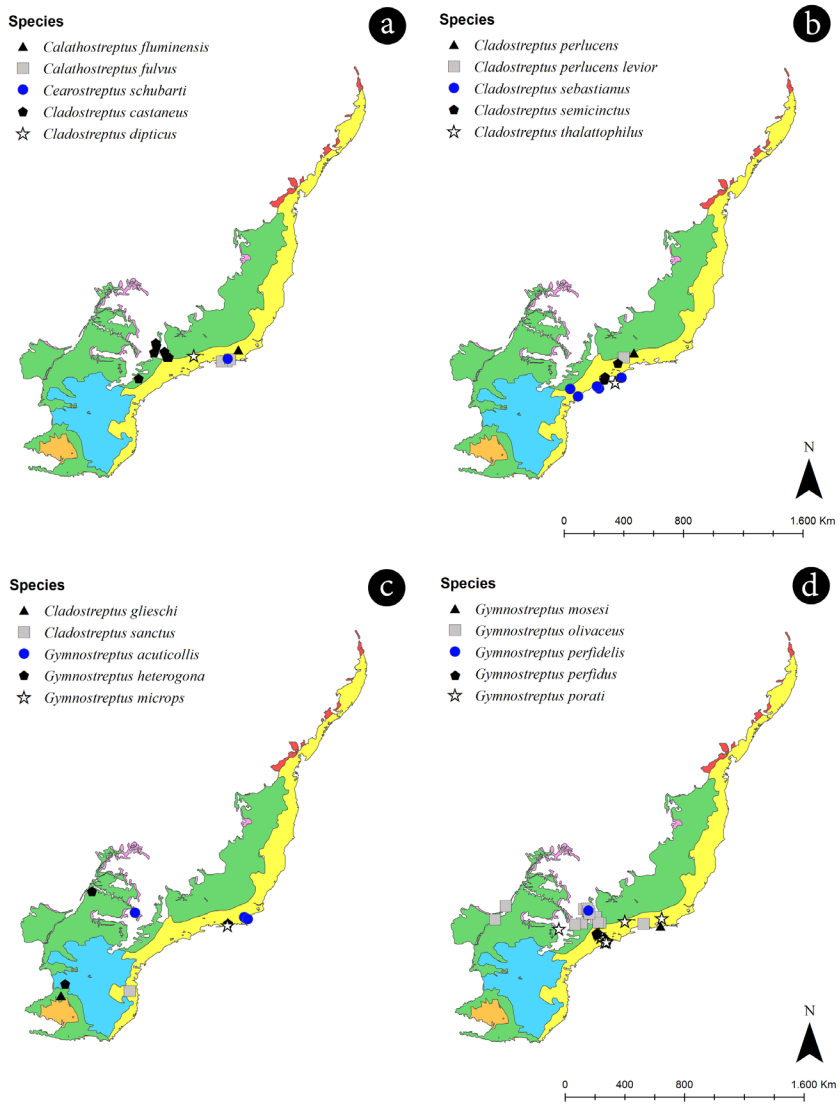

Figure 2. Distribution map of species of Spirostreptidae from Atlantic Forest: a) ***Calathostreptus fluminensis***, ***Calathostreptus fulvus***, ***Cearostreptus schubarti***, ***Cladostreptus castaneus***, and ***Cladostreptus dipticus***; b) ***Cladostreptus perlucens***, ***Cladostreptus perlucens levior***, ***Cladostreptus sebastianus***, ***Cladostreptus semicinctus***, and ***Cladostreptus thalattophilus***; c) ***Cladostreptus glieschi***, ***Cladostreptus sanctus***, ***Gymnostreptus acuticollis***, ***Gymnostreptus heterogona***, and ***Gymnostreptus microps***; d) ***Gymnostreptus mosesi***, ***Gymnostreptus olivaceus***, ***Gymnostreptus perfidelis***, ***Gymnostreptus perfidus***, and ***Gymnostreptus porati***.

Genus *Cladostreptus* Brölemann, 1902

Cladostreptus Brölemann 1902a: 166. Type-species: *Spirostreptus (Cladostreptus) sebastianus* Brölemann, 1902 by subsequent designation of Pocock 1910: 92.

Remarks. The genus *Cladostreptus* is widespread in the Southeast region from the Atlantic province, occurring in islands, urban area, and large patches of forests.

Cladostreptus castaneus Schubart, 1944

Cladostreptus castaneus Schubart 1944: 398, 1945a: 293, 1945b: 66, 1950: 617, 1952: 417, 1958: 249, Demange 1964: 198, Krabbe 1982: 302.

Records from Atlantic Forest: ***São Paulo*:** Mogi Guaçu [22°14'48.3"S; 46°56'13.2"W] (Schubart 1944); Pirassununga [22°00'05.6"S; 47°24'50.6"W]; Rio Claro [22°24'55.2"S; 47°33'55.7"W] (Schubart 1944; 1945b; 1952); Monte Alegre do Sul [22°41'25.1"S; 46°40'56.5"W] (Schubart1945a); Amparo [22°42'31.8"S; 46°44'02.5"W] (Schubart 1945b); Leme [22°10'56.1"S; 47°23'18.3"W]; Porto

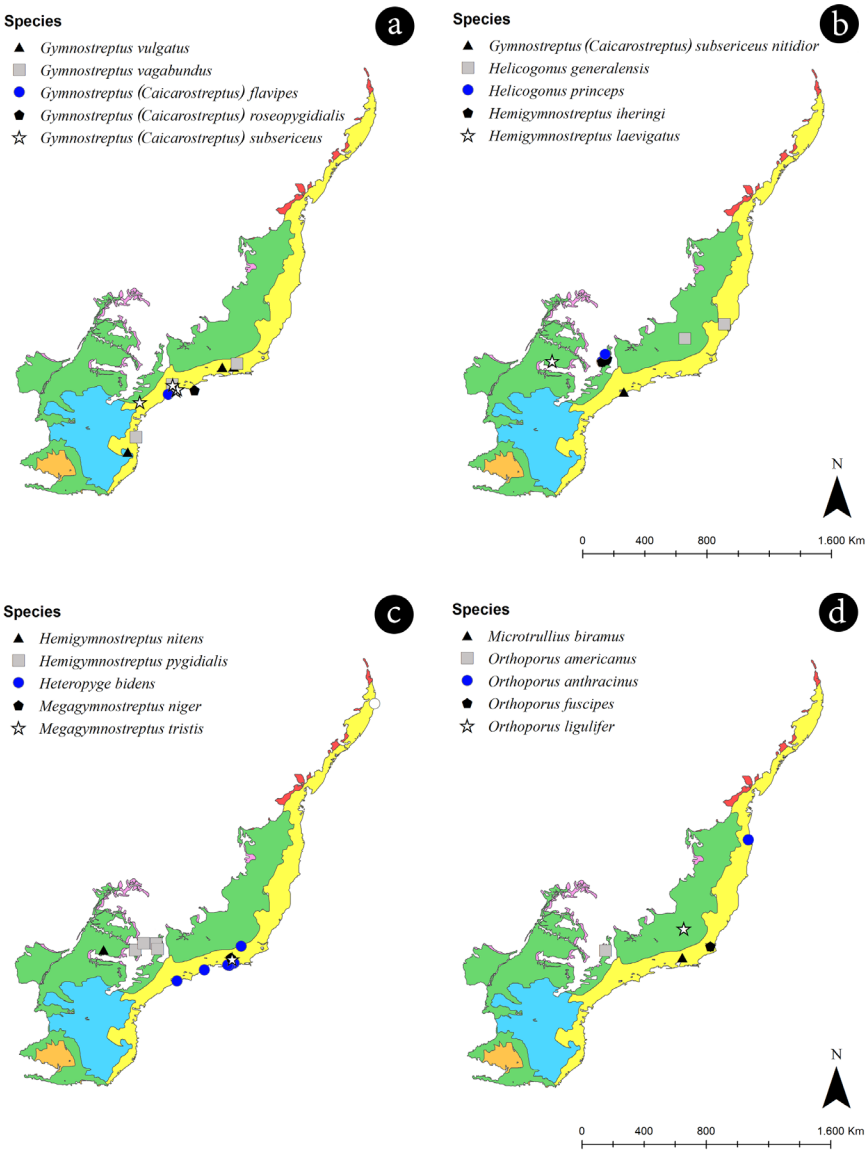

Figure 3. Distribution map of species of Spirostreptidae from Atlantic Forest: a) ***Gymnostreptus vulgatus***, ***Gymnostreptus vagabundus***, ***Gymnostreptus (Caicarostreptus) flavipes***, ***Gymnostreptus (Caicarostreptus) roseopygidialis***, and ***Gymnostreptus (Caicarostreptus) subsericeus***; b) ***Gymnostreptus (Caicarostreptus) subsericeus nitidior***, ***Helicogonus generalensis***, ***Helicogonus princeps***, ***Hemigymnostreptus iheringi***, and ***Hemigymnostreptus laevigatus***; c) ***Hemigymnostreptus nitens***, ***Hemigymnostreptus pygidialis***, ***Heteropyge bidens***, ***Megagymnostreptus niger***, and ***Megagymnostreptus tristis***; d) ***Microtrullius biramus***, ***Orthoporus americanus***, ***Orthoporus anthracinus***, ***Orthoporus fuscipes***, and ***Orthoporus ligulifer***.

Ferreira [21°50'32.2"S; 47°28'16.4"W] (Schubart 1952).

Cladostreptus dipticus (Brölemann, 1904)

Spirosteptus (Cladostreptus) flavofasciatus Brölemann 1902a: 180, Camargo-Andrade 1938: 698.

Spirosteptus (Cladostreptus) dipticus Brölemann 1904: 91 (replacement name for *S. (C.)flavofasciatus* Brölemann, 1902, preoccupied by *Spirostreptus flavofasciatus* (Brandt, 1840)), Attems 1914: 74.

Cladostreptus dipictus [sic!]:-- Schubart 1945b: 66, Krabbe 1982: 436.

Epistreptus dipticus:-- Attems 1950: 220.

Tibiozus dipictus [sic!]:-- Schubart 1958: 249.

Remarks. The species was considered *incertae sedis* by Krabbe (1982).

Records from Atlantic Forest: ***São Paulo*:** Piquete [22°36'46.9"S; 45°10'44.9"W] (Brölemann 1902a).

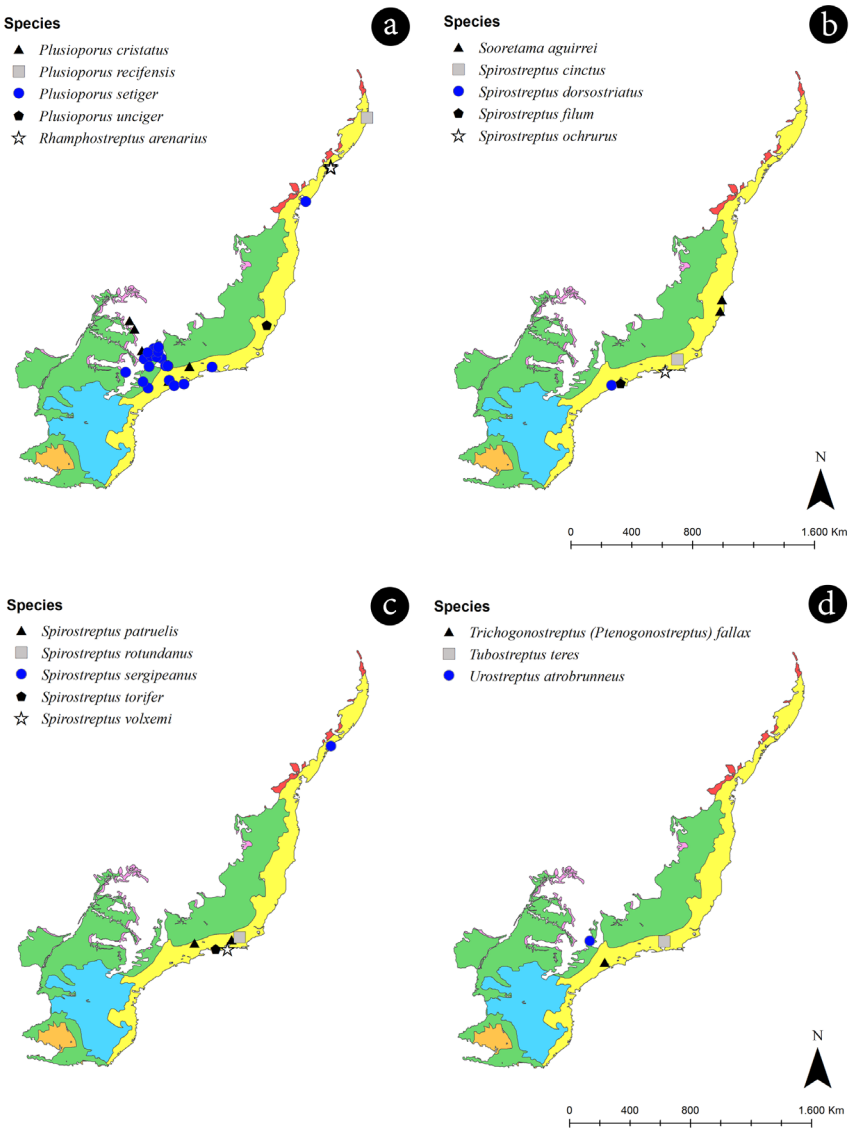

Figure 4. Distribution map of species of Spirostreptidae from Atlantic Forest: a) ***Plusioporus cristatus***, ***Plusioporus recifensis***, ***Plusioporus setiger***, ***Plusioporus unciger***, and ***Rhamphostreptus arenarius***; b) ***Sooretama aguirrei***, ***Spirostreptus cinctus***, ***Spirostreptus dorsostriatus***, ***Spirostreptus filum***, and ***Spirostreptus ochrurus***; c) ***Spirostreptus patruelis***, ***Spirostreptus rotundanus***, ***Spirostreptus sergipeanus***, ***Spirostreptus torifer***, and ***Spirostreptus volxemi***; d) ***Trichogonostreptus (Ptenogonostreptus) fallax***, ***Tubostreptus teres***, and ***Urostreptus atrobunneus***.

Cladostreptus interruptus (Brölemann, 1902)

(Fig. 6a)

Spirostreptus (Cladostreptus) interruptus Brölemann 1902a: 171, Camargo-Andrade 1938: 698.

Spirostreptus (Epistreptus) interruptus:-- Attems 1914: 75.

Cladostreptus interruptus:-- Schubart 1945b: 67.

Mardonius interruptus:-- Attems 1950: 210.

Spirostreptus interruptus:-- Schubart 1958: 246.

Records from Atlantic Forest: ***Paraná*:** Uncertain locality in Atlantic Forest of the Paraná state (Brölemann 1902a).

Cladostreptus perlucens (Brölemann, 1902)

(Fig. 2b)

Spirostreptus (Cladostreptus) perlucens Brölemann 1902a: 168, Camargo-Andrade 1938: 698.

Spirostreptus (Cladostreptus) perlucens perlucens Brölemann 1902a: 168.

Spirostreptus (Epistreptus) perlucens:-- Attems 1914: 75.

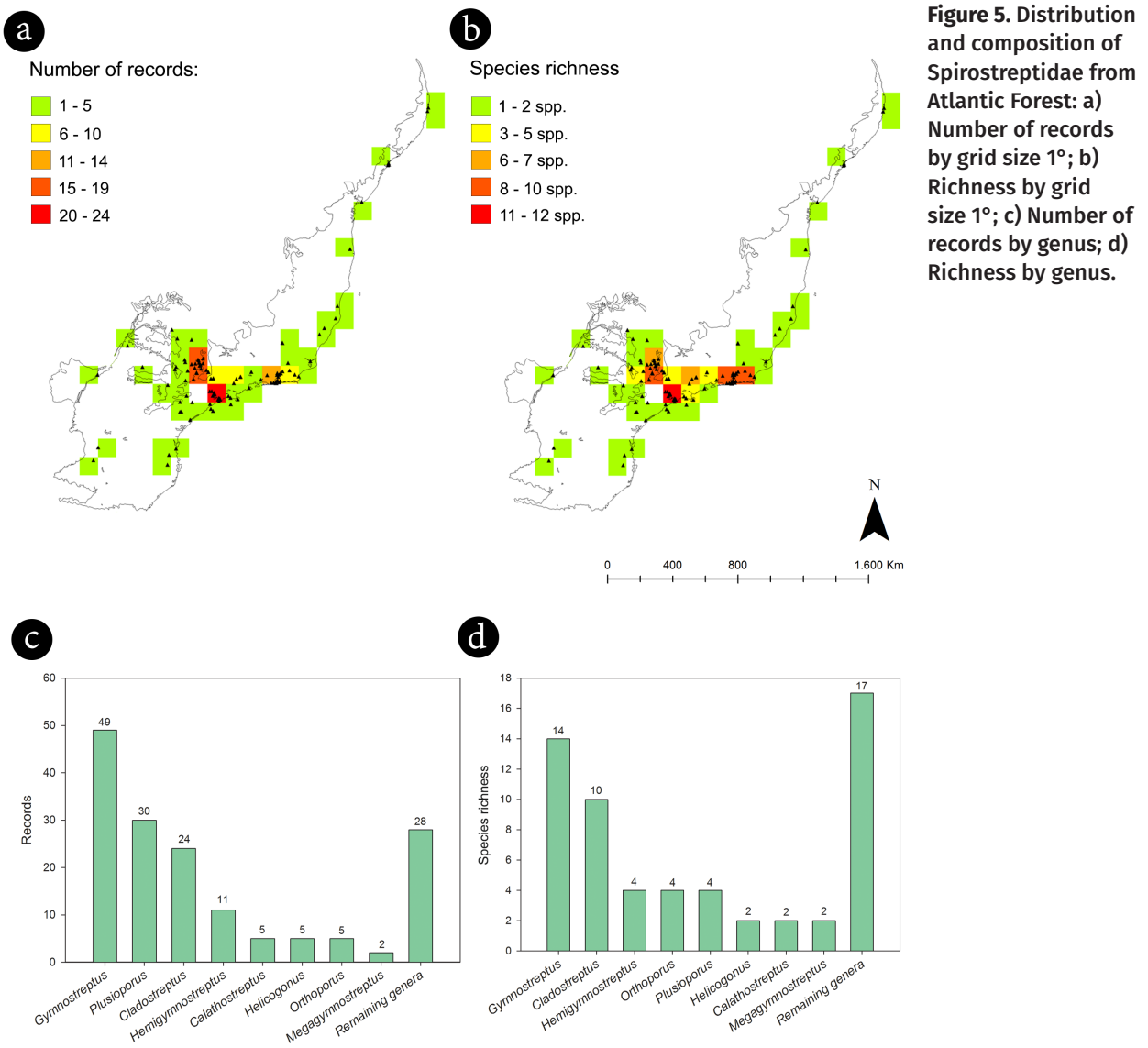

Figure 5. Distribution and composition of Spirostreptidae from Atlantic Forest: a) Number of records by grid size 1°; b) Richness by grid size 1°; c) Number of records by genus; d) Richness by genus.

Mardonius perlucens:-- Attems 1950: 211.

Cladostreptus perlucens:-- Schubart 1945b: 67, Krabbe 1982: 303.

Spirostreptus (Spirostreptus) perlucens:-- Schubart 1958: 249.

Records from Atlantic Forest: ***São Paulo*:** Piquete [22°36'46.9"S; 45°10'44.9"W] (Brölemann 1902a); ***Rio do Janeiro*:** Itatiaia mountain range [22°23'29.9"S; 44°37'38.7"W] (Attems 1950).

Cladostreptus perlucens levior (Brölemann, 1902)

(Fig. 2b)

Spirostreptus (Cladostreptus) perlucens levior Brölemann 1902a: 171, Camargo-Andrade 1938: 698.

Spirostreptus (Epistreptus) perlucens levior:-- Attems 1914: 75.

Cladostreptus perlucens levior:-- Schubart 1945b: 67, Krabbe 1982: 304.

Figure 6. Living specimens of Spirostreptidae from Atlantic Forest: a) *Cladostreptus interruptus* from Paraná state; b) *Gymnostreptus olivaceus* from São Paulo state.

Records from Atlantic Forest: ***São Paulo*:** Piquete [22°36'46.9"S; 45°10'44.9"W] (Brölemann 1902a; Schubart 1945a).

Cladostreptus sebastianus (Brölemann, 1902)

(Fig. 2b)

Spirostreptus (Cladostreptus) sebastianus Brölemann 1902a: 166, Camargo-Andrade 1938: 698.

Cladostreptus sebastianus:-- Pocock 1910: 92, Schubart 1945b: 67, 1949: 211, 1958: 249, Krabbe 1982: 304.

Spirostreptus (Epistreptus) sebastianus:-- Attems 1914: 75.

Tibiozus sebastianus:-- Attems 1950: 224.

Records from Atlantic Forest: ***São Paulo***: São Sebastião [23°46'12.3"S; 45°36'34.5"W] (Brölemann 1902a); São Paulo [23°32'53.7"S; 46°38'03.8"W] (Attems 1914); Santos [23°57'08.7"S; 46°19'35.9"W]; Cubatão [23°53'27.3"S; 46°25'15.9"W]; Ilhabela [23°48'58.6"S; 45°21'57.6"W] (Schubart 1945a); Itanhaém, Queimada Grande Island [24°29'21.4"S; 46°40'26.0"W], QueimadaPequena Island [24°29'34.9"S; 46°40'31.0"W] (Schubart 1949).

Cladostreptus semicinctus (Brölemann, 1902)

(Fig. 2b)

Spirostreptus (Cladostreptus) semicinctus Brölemann 1902a: 173, Camargo-Andrade 1938: 698.

Cladostreptus semicinctus:-- Schubart 1945b: 67, Krabbe 1982: 305.

Spirostreptus (Epistreptus) semicinctus:-- Attems 1914: 75.

Mardonius semicinctus:-- Attems 1950: 189.

Records from Atlantic Forest: ***São Paulo*:** Santo André, Alto da Serra (= Paranapiacaba) [23°46'39.3"S; 46°17'59.3"W] (Brölemann 1902a); Santos [23°57'08.7"S; 46°19'35.9"W]; São Paulo, Tremembé [23°27'59.7"S; 46°37'10.0"W] (Schubart 1945a).

Cladostreptus thalattophilus Schubart, 1949

(Fig. 2b)

Cladostreptus thalattophilus Schubart 1949: 226, 1958: 249, Demange 1964: 198, Krabbe 1982: 305.

Records from Atlantic Forest: ***São Paulo*:** Alcatrazes Island [24°06'06.4"S; 45°41'29.8"W] (Schubart 1949).

Cladostreptus glieschi (Schubart, 1960)

(Fig. 2c)

Spirostreptus (Spirostreptus) glieschi Schubart 1960: 75.

Cladostreptus glieschi:-- Hoffman & Knight 1970: 4.

Cladostreptus (?) *glieschi*:-- Krabbe 1982: 306.

Records from Atlantic Forest: ***Rio Grande do Sul*:** Iraí [27°11'27.3"S; 53°15'39.0"W] (Schubart 1960).

Cladostreptus sanctus (Silvestri, 1897)

(Fig. 2c)

Archispirostreptus sanctus Silvestri 1897a: 347.

Archispirostreptus lobulatus Attems 1901: 115, Silvestri 1902: 12 (syn.).

Nanostreptus sanctus:-- Schubart 1945b: 65.

Spirostreptus lobulatus:-- Attems 1914: 67.

Spirostreptus sanctus:-- Attems 1914: 67.

Spirostreptus (Spirostreptus) sanctus:-- Attems 1950: 194, Schubart 1958: 247.

Spirostreptus (Spirostreptus) lobulatus:-- Attems 1950: 201, Schubart 1958: 247.

Cladostreptus (?) *sanctus*:-- Krabbe 1982: 306.

Records from Atlantic Forest: ***Santa Catarina*:** Blumenau [26°53'40.7"S; 49°07'17.3"W] (Attems1901, 1950).

Genus *Gymnostreptus* Brölemann, 1902

Gymnostreptus Brölemann 1902a: 153. Type-species: *Gymnostreptus perfidus* Brölemann, 1902 by subsequent designation by Pocock 1910: 92.

Remarks. The genus *Gymnostreptus* is widely distributed in the Araucaria Forest, Atlantic, and Paraná Forest provinces from states of Rio de Janeiro, Santa Catarina, and São Paulo.

Gymnostreptus acuticollis Hofmann, 1975

(Fig. 2c)

Gymnostreptus acuticollis Hoffman 1975: 246, Krabbe 1982: 315.

Records from Atlantic Forest: ***São Paulo*:** Salesópolis, Estação Biológica de Boracéia [23°31'53.5"S; 45°50'45.9"W] (Hoffman 1975); ***Rio de Janeiro*:** Casimiro de Abreu, Barra de São João [22°34'28.3"S; 41°59'12.6"W] (Hoffman 1975).

Gymnostreptus heterogona (Silvestri, 1902)

(Fig. 2c)

Orthoporus heterogona Silvestri, 1902: 14, Schubart 1945b: 84.

Gymnostreptus (Orthoporus) heterogona:-- Attems 1914: 135.

Paulistostreptus digitalis Schubart 1945b: 80, 1958: 248, Krabbe 1982: 318 (syn.).

Tibiozus armatus Attems, 1950: 223, Hoffman 1975: 251 (syn. of *G. digitatus*).

Conchostreptus armatus:-- Demange 1970: 404.

Gymnostreptus armatus:-- Hoffman 1975: 251.

Gymnostreptus digitatus:-- Hoffman 1975: 251.

Gymnostreptus heterogona:-- Krabbe 1982: 318.

Records from Atlantic Forest: ***São Paulo*:** Andradina [20°53'29.9"S; 51°22'10.6"W] (Schubart 1945b); ***Santa Catarina***: São Bernardino [26°28'29.4"S; 52°58'08.9"W] (Attems 1914).

Gymnostreptus microps (Porat, 1876)

(Fig. 2c)

Spirostreptus microps Porat 1876: 41, Porat 1888: 226, Brölemann 1909: 51, Golovatch 1997: 96.

Mardonius legationis Attems 1950: 214, Hoffman 1997: 70 (syn.).

Caicarostreptus legationis:-- Schubart 1958: 246, Demange 1970: 404.

Gymnostreptus legationis:-- Krabbe 1982: 319.

Records from Atlantic Forest: ***Rio de Janeiro*:** Rio de Janeiro, Corcovado [22°57'09.1"S; 43°12'42.1"W] (Porat 1876, Attems 1950).

***Gymnostreptus mosesi* (Schubart, 1959)**

(Fig. 2d)

Spirostreptus (Eumekius) mosesi Schubart 1959: 479.

Gymnostreptus (?) *mosesi*:-- Krabbe 1982: 437.

Remarks. The species was considered *incertae sedis* by Krabbe (1982).

Records from Atlantic Forest: ***Rio de Janeiro*:** Niterói [22°53'24.6"S; 43°06'56.9"W] (Schubart1959).

***Gymnostreptus olivaceus* Schubart, 1944**

(Figs 2d, 6b)

Gymnostreptus olivaceus Schubart 1944: 402, 1945b: 68, 1945a: 293, 1952: 417, Tuzet & Manier 1957: 138, Hoffman 1975: 250, Krabbe 1982: 320, Hoffman 1997: 75.

Spirostreptus (Eumekius) olivaceus:-- Schubart 1958: 234, Demange 1964: 202, 1967: 93.

Records from Atlantic Forest: ***São Paulo*:** Pirassununga [22°00'05.6"S; 47°24'50.6"W] (Schubart 1944); Mogi Guaçu [22°14'48.3"S; 46°56'13.2"W]; Descalvado [21°54'37.3"S; 47°37'09.5"W]; Porto Ferreira [21°50'32.2"S; 47°28'16.4"W] (Schubart 1944, 1945b); Monte Alegre do Sul [22°41'25.1"S; 46°40'56.5"W] (Schubart 1945b); Amparo [22°42'31.8"S; 46°44'02.5"W]; Piracicaba[22°43'55.3"S; 47°37'54.5"W] (Schubart 1945b); Leme [22°10'56.1"S; 47°23'18.3"W] (Schubart 1952); São Paulo, Anhembi [22°47'17.4"S; 48°08'05.7"W] (Hoffman 1997); Rio Claro [22°24'55.2"S; 47°33'55.7"W] (Schubart 1944, 1945b, Hoffman 1997).

***Gymnostreptus perfidelis* Schubart, 1944**

(Fig. 2d)

Gymnostreptus perfidelis Schubart 1944: 405, 1945b: 69, Hoffman 1975: 250, Krabbe 1982: 320.

Spirostreptus (Eumekius) perfidelis:-- Schubart 1958: 247.

Records from Atlantic Forest: ***São Paulo*:** Pirassununga [22°00'05.6"S; 47°24'50.6"W] (Schubart 1944).

***Gymnostreptus perfidus* (Brölemann, 1902)**

(Fig. 2d)

Spirostreptus (Gymnostreptus) perfidus Brölemann 1902a: 153, Camargo-Andrade 1938: 698.

Spirostreptus perfidus:-- Attems 1914: 67.

Gymnostreptus perfidus:-- Schubart 1945b: 69, Hoffman 1975: 250, Krabbe 1982: 321.

Spirostreptus (Spirostreptus) perfidus Attems 1950: 194, Schubart 1958: 247.

Records from Atlantic Forest: ***São Paulo*:** Santo André, Alto da Serra (= Paranapiacaba) [23°46'39.3"S; 46°17'59.3"W]; São Paulo, Belém [23°32'49.5"S; 46°35'28.7"W]; Santos [23°57'08.7"S; 46°19'35.9"W]; Juqueri (= Mairiporã) [23°18'56.8"S; 46°34'55.6"W] (Brölemann 1902a, Schubart 1945).

***Gymnostreptus porati* Hoffman, 1997**

(Fig. 2d)

Spirostreptus ventralis Porat 1888: 228 (nec *Spirostreptus ventralis* Porat, 1876), Hoffman 1997: 72, Golovatch 1997: 96.

Spirostreptus (Gymnostreptus) ventralis:-- Brölemann 1902a: 157.

Gymnostreptus (Kochliogonus) ventralis:-- Verhoeff 1941: 296.

Gymnostreptus (Cochliogonus) ventralis:-- Verhoeff 1943: 255.

Cochliogonus ventralis:-- Schubart 1945b: 82.

Kochliogonus ventralis:-- Attems 1950: 246.

Gymnostreptus ventralis:-- Hoffman 1975: 250.

Gymnostreptus ?ventralis:-- Krabbe 1982: 327.

Gymnostreptus porati Hoffman 1997: 74 (description of specimens identified as *Spirostreptus ventralis* Porat, 1888 by Brölemann 1902).

Remarks. All the citations published after 1902 referring to *Spirostreptus ventralis* Porat,

1888 correspond to the material identified by Brölemann (1902a: 157), therefore, should be associated with *Gymnostreptus porati* (for more details, see Hoffman 1997: 72).

Records from Atlantic Forest: ***Rio de Janeiro*:** Teresópolis[22°26'11.8"S;42°58'26.3"W](Schubart, 1945b); ***São Paulo*:** Santo André, Alto da Serra (= Paranapiacaba) [23°46'39.3"S; 46°17'59.3"W]; Piquete [22°36'46.9"S; 45°10'44.9"W]; São Paulo, Perus [23°23'51.2"S; 46°45'05.2"W], Cerqueira César [23°33'46.0"S; 46°39'55.2"W]; Cubatão [23°53'27.3"S; 46°25'15.9"W] (Pocock 1894, Schubart, 1945b); Santos [23°57'08.7"S; 46°19'35.9"W] (Schubart 1945b).

Gymnostreptus vulgatus (Porat, 1888)

(Fig. 3a)
Spirostreptus vulgatus Porat 1888: 231-232, Attems 1914: 179.
Cochliogonus vulgatus:-- Schubart 1950: 368.
Pseudotibiozus vulgatus:-- Demange 1970: 377.
Gymnostreptus vulgatus:-- Hoffman 1975: 250, Krabbe 1982: 324.

Records from Atlantic Forest: ***Rio de Janeiro*:** Teresópolis [22°26'11.8"S; 42°58'26.3"W] (Porat 1888), Serra dos Órgãos [22°24'03.3"S; 42°49'45.1"W] (Hoffman 1975); Petrópolis, Morro do Açu [22°29'01.4"S; 43°03'45.9"W] (Schubart 1950); Mendes [22°31'30.6"S; 43°43'13.1"W] (Krabbe 1982); ***Santa Catarina:*** Major Gercino, Boiteuxburgo [27°25'25.5"S; 49°11'27.1"W] (Krabbe 1982).

Gymnostreptus vagabundus (Schubart, 1945)

(Fig. 3a)
Pseudogymnostreptus vababundus Schubart 1945b: 70.
Mardonius brasilianus Attems 1950: 212, Krabbe 1982: 325 (syn.).
Spirostreptus (Spirostreptus) vababundus:-- Schubart 1958: 247.
Gymnostreptus vababundus:-- Krabbe 1982: 325.

Records from Atlantic Forest: ***São Paulo*:** São Paulo, Alto de Santana [23°29'18.5"S; 46°37'31.2"W] (Schubart 1945); ***Rio de Janeiro*:** Teresópolis [22°26'11.8"S; 42°58'26.3"W] (Attems 1950); ***Santa Catarina:*** Jaraguá, Itapocú [26°25'51.4"S; 49°13'39.6"W] (Krabbe 1982).

Gymnostreptus (Caicarostreptus) flavipes (Schubart, 1950)

(Fig. 3a)
Caicarostreptus flavipes Schubart 1950: 155.
Gymnostreptus flavipes:-- Hoffman 1975: 250.
Gymnostreptus (Caicarostreptus) flavipes:-- Krabbe 1982: 318.

Records from Atlantic Forest: ***São Paulo*:** Itanhaém [24°10'16.0"S; 46°47'17.6"W] (Schubart 1950).

Gymnostreptus (Caicarostretptus) roseopygidialis (Schubart, 1969)

(Fig. 3a)
Caicarostreptus reseopygidialis Schubart 1969: 11.
Gymnostreptus reseopygidialis:-- Hoffman 1975: 251.
Gymnostreptus (Caicarostreptus) reseopygidialis:-- Krabbe 1982: 323.

Records from Atlantic Forest: ***São Paulo*:** Ilhabela [23°48'58.6"S; 45°21'57.6"W] (Schubart 1969).

Gymnostreptus (Caicarostretptus) subsericeus (Brölemann, 1902)

(Fig. 3a)
Spirostreptus (Gymnostreptus) subsericeus Brölemann 1902a: 195, Camargo-Andrade 1938: 699.
Gymnostreptus (Gymnostreptus) subsericeus:-- Attems 1914: 132.
Cochliogonus subsericeus:-- Schubart 1945b: 82.
Epistreptus (Microtrullius) subsericeus:-- Attems 1950: 189.

Caicarostreptus subsericeus:-- Schubart 1958: 252.
Cladostreptus subsericeus:-- Demange 1970: 382.
Gymnostreptus subsericeus:-- Hoffman 1975: 250.
Gymnostreptus (Caicarostreptus) subsericeus:-- Krabbe 1982: 323.

Records from Atlantic Forest: ***São Paulo*:** Cubatão [23°53'27.3"S; 46°25'15.9"W], Estação Raiz da Serra [23°49'36.1"S; 46°21'39.9"W] (Brölemann 1902a, Schubart 1945b); Santo André, Alto da Serra (= Paranapiacaba) [23°46'39.3"S; 46°17'59.3"W]; Tremembé, Poço Grande [22°57'47.2"S; 45°37'32.4"W] (Brölemann 1902a); São Paulo, Belém [23°32'49.5"S; 46°35'28.7"W] (Schubart1945b).

Gymnostreptus (Caicarostretptus) subsericeus nitidior (Brölemann, 1902)

(Fig. 3b)
Spirostreptus (Gymnostreptus) subsericeus nitidior Brölemann 1902a: 165, Camargo-Andrade 1938:698.
Gymnostreptus (Gymnostreptus) subsericeus nitidior:-- Attems 1914: 132.
Cochliogonus subsericeus nitidior:-- Schubart 1945b: 82.
Gymnostreptus (Caicarostreptus) subsericeus nitidior:-- Krabbe 1982: 324.

Records from Atlantic Forest: ***São Paulo*:** Cubatão [23°53'27.3"S; 46°25'15.9"W] (Brölemann 1902a).

Genus *Helicogonus* Verhoeff, 1943

Helicogonus Verhoeff 1943: 257. Type-species: *Helicogonus generalensis* Verhoeff, 1943 by monotypy.

Remarks. The genus occurs in the Atlantic and Paraná Forest provinces from states of Espírito Santo, Minas Gerais, and São Paulo.

Helicogonus generalensis Verhoeff, 1943

(Fig. 3b)
Helicogonus generalensis Verhoeff 1943: 258, Krabbe 1982: 328.
Elicogonus generalensis:-- Schubart 1945b: 74.

Records from Atlantic Forest: ***Minas Gerais*:** Viçosa [20°45'27.8"S; 42°53'03.1"W] (Verhoeff 1943); ***Espírito Santo*:** Santa Teresa [19°56'20.7"S; 40°35'36.2"W] (Verhoeff 1943).

Helicogonus princeps (Brölemann, 1902)

(Fig. 3b)
Spirostreptus (Alloporus) princeps Brölemann 1902a: 143, Camargo-Andrade 1938: 698.

Alloporus princeps:-- Attems 1914: 115, 1928: 347, Schubart 1944: 58, 1945b: 56, 1950: 349, 1952: 416, Hoffman 1955: 93.

Alloporus (Hessonoporus) princeps:-- Attems 1950: 206.

Cladostreptus princeps:-- Demange 1970: 375.

Helicogonus princeps:-- Krabbe 1982: 329.

Records from Atlantic Forest: ***São Paulo*:** Santa Rita do Passa Quatro [21°41'42.1"S; 47°29'17.2"W] (Brölemann 1902a); Pirassununga [22°00'05.6"S; 47°24'50.6"W]; Analândia [22°07'45.3"S; 47°39'44.4"W] (Schubart 1952).

Genus Hemigymnostreptus Schubart, 1950

Hemigymnostreptus Schubart 1950: 87. Type-species: *Spirostreptus pygidialis* Schubart, 1944 by original designation.

Remarks. The genus occurs in the Paraná Forest and Cerrado provinces in the state of São Paulo.

Hemigymnostreptus iheringi (Brölemann, 1902)

(Fig. 3b)
Spirostreptus (Gymnostreptus) iheringi Brölemann 1902a: 160, 1903: 180, Camargo-Andrade 1938: 698.

Gymnostreptus (Gymnostreptus) iheringi:-- Attems 1914: 132.

Gymnostreptus iheringi:-- Schubart, 1945b: 68, Hoffman 1975: 250.

Epistreptus (Microtrullis) iheringii [sic!]:-- Attems 1950: 189.

Microtrullis iheringi:-- Schubart 1958: 248.

Hemigymnostreptus ? iheringi:-- Demange 1970: 404.

Hemigymnostreptus iheringii [sic!] Krabbe 1982: 330.

Records from Atlantic Forest: ***São Paulo*:** Santa Rita do Passa Quatro [21°41'42.1"S; 47°29'17.2"W](Brölemann 1902a); Pirassununga, Cachoeira das Emas [21°56'40.6"S; 47°21'54.9"W]; Analândia [22°07'45.3"S; 47°39'44.4"W] (Schubart 1952).

Hemigymnostreptus laevigatus Schubart, 1950

(Fig. 3b)

Hemigymnostreptus laevigatus Schubart 1950: 92, Krabbe 1982: 330.

Records from Atlantic Forest: ***São Paulo*:** Pitangueiras [21°00'52.5"S; 48°13'19.8"W] (Schubart 1950); Orlândia [20°42'47.2"S; 47°53'04.7"W] (Krabbe 1982).

Hemigymnostreptus nitens Schubart, 1950

(Fig. 3c)

Hemigymnostreptus nitens Schubart 1950: 91, Krabbe 1982: 331.

Records from Atlantic Forest: ***São Paulo*:** Pitangueiras [21°00'52.5"S; 48°13'19.8"W] (Schubart 1950).

Hemigymnostreptus pygidialis (Schubart, 1944)

(Fig. 3c)

Spirostreptus pygidialis Schubart 1944: 408.

Hemigymnostreptus pygidialis:-- Schubart 1950: 89, 1952: 418, Krabbe 1982: 331.

Records from Atlantic Forest: ***São Paulo*:** Santa Rita do Passa Quatro [21°41'42.1"S; 47°29'17.2"W](Schubart 1944); Jaú, Morais Barros [20°37'55.9"S; 49°55'31.4"W]; Bariri [22°04'38.0"S; 48°44'29.4"W]; Araraquara, Bueno de Andrade [21°40'09.2"S; 48°14'45.3"W] (Schubart 1950); Pirassununga [22°00'05.6"S; 47°24'50.6"W] (Schubart 1952).

Genus Heteropyge Silvestri, 1897

Heteropyge Silvestri 1897b: 651. Type-species: *Odontopyge paraguayensis* Silvestri, 1895 by original designation.

Remarks. The genus is recorded in the Atlantic Forest by the species *Heteropyge bidens*, which is distributed in the states of Pernambuco, Rio de Janeiro, and São Paulo.

Heteropyge bidens (Schubart, 1945)

(Fig. 3c)

Orthoporus bidens Schubart 1945b: 84, Demange 1964: 200, Krabbe 1982: 339-340.

Heteropyge bidens:-- Hoffman 1960: 113, Mauriès 1975: 1272, Iniesta et al. 2019: 8.

Records from Atlantic Forest: ***Pernambuco*:** Igarassu, Reserva Ecológica Charles Darwin [7°49'43.0"S; 34°52'27.0"W] (Iniesta et al. 2019); ***Rio de Janeiro*:** Carmo, Ilha dos Pombos [21°50'36.7"S; 42°34'48.1"W] (Schubart 1945); São Gonçalo [22°48'46.0"S; 42°59'54.7"W]; Paraty [23°12'56.3"S; 44°43'40.3"W]; Rio de Janeiro, Tijuca [22°55'50.3"S; 43°14'01.9"W], Jacarepaguá [22°58'09.6"S; 43°22'09.4"W] (Iniesta et al. 2019); ***São Paulo*:** Santos [23°57'08.7"S; 46°19'35.9"W] (Iniesta et al. 2019).

Genus Megagymnostreptus Schubart, 1950

Megagymnostreptus Schubart 1950: 365. Type-species: *Megagymnostreptus niger* Schubart, 1950 by monotypy.

Remarks. The genus is restricted only to the Atlantic province in the state of Rio de Janeiro.

Megagymnostreptus niger Schubart, 1950

(Fig. 3c)

Megagymnostreptus niger Schubart 1950: 366, Krabbe 1982: 339.

Records from Atlantic Forest: ***Rio de Janeiro*:** Petrópolis, Morro do Açu [22°29'01.4"S; 43°03'45.9"W] (Schubart 1950).

Megagymnostreptus tristis (Porat, 1888)

(Fig. 3c)

Spirostreptus tristis Porat 1888: 218, Krabbe 1982: 340, Hoffman & Fechter 1983: 260, Golovatch 1997: 96.

Records from Atlantic Forest: ***Rio de Janeiro*:** Magé, Pedra do Açu [22°29'09.5"S; 43°03'44.1"W] (Porat 1888).

Genus *Microtrullius* Attems, 1950

Microtrullius Attems 1950: 218. Type-species: *Epistreptus (Microtrullius) uncinatus* Attems, 1950 by original designation.

Remarks. The genus is restricted only to the Atlantic province in the state of Rio de Janeiro.

Microtrullius biramus Attems, 1943

(Fig. 3d)

Microtrullius biramus Attems 1943: 445, Krabbe 1982: 433.

Epistreptus (Dicranostreptus) biramus:-- Attems 1950: 200.

Remarks. The species was considered *incertae sedis* by Krabbe (1982).

Records from Atlantic Forest: ***Rio de Janeiro*:** Teresópolis [22°26'11.8"S; 42°58'26.3"W] (Attems 1943).

Genus *Orthoporus* Silvestri, 1897

Orthoporus Silvestri 1897c: 7. Type-species: *Orthoporus diaporoides* Silvestri, 1897 by monotypy.

Remarks. The genus *Orthoporus* is distributed in the Atlantic and Paraná Forest provinces from states of Bahia, Minas Gerais, Rio de Janeiro, and São Paulo.

Orthoporus americanus (Silvestri, 1895)

(Fig. 3d)

Alloporus americanus Silvestri 1895a: 780, 1895b: 11.

Diaporus americanus:-- Silvestri 1897c: 8, 1902: 15, Schubart 1945b: 60, 1952: 405, Demange 1970: 403.

Gymnostreptus (Diaporus) americanus:-- Attems 1914: 136.

Scaphiostreptus (Diaporus) americanus:-- Attems 1950: 244.

Alloporus sp.:-- Schubart 1950: 339.

Diaporus cf. *americanus*:-- Schubart 1958: 233.

Orthoporus americanus:-- Mauriès 1975: 1267, Krabbe 1982: 374.

Records from Atlantic Forest: ***São Paulo*:** Pirassununga [22°00'05.6"S; 47°24'50.6"W] (Schubart 1952).

Orthoporus anthracinus (Schubart, 1969)

(Fig. 3d)

Scaphiostreptus anthracinus Schubart 1969: 13.

Orthoporus anthracinus:-- Krabbe 1982: 375.

Records from Atlantic Forest: ***Bahia*:** Barreiras [12°08'49.2"S; 44°59'05.8"W] (Schubart 1969).

Orthoporus fuscipes (Porat, 1888)

(Fig. 3d)

Spirostreptus fuscipes Porat 1888: 214, Golovatch 1997: 96.

Spirostreptus (Scaphiostreptus) fuscipes:-- Brölemann 1902a: 150, 1902b: 677.

Scaphiostreptus fuscipes:-- Attems 1914: 94, Schubart 1945b: 84, 1950: 347, Attems 1950: 228,

Schubart, 1959: 19, Mauriès 1969: 42.

Orthoporus fuscipes:-- Krabbe 1982: 380.

Records from Atlantic Forest: ***Minas Gerais*:** Pandeiros River [15°24'38.8"S; 44°51'18.3"W] (Schubart 1950); ***Rio de Janeiro*:** Campos dos

Goytacazes [21°46'08.3"S; 41°19'02.3"W] (Porat 1888).

Orthoporus ligulifer (Verhoeff, 1938)

(Fig. 3d)

Minasgonus ligulifer Verhoeff 1938: 28, 1942: 93

Minigonus [sic!] *ligulifer*:-- Verhoeff 1943: 253, Schubart 1945b: 83.

Orthoporus ligulifer:-- Krabbe 1982: 382.

Records from Atlantic Forest: ***Minas Gerais:*** Viçosa [20°45'27.8"S; 42°53'03.1"W] (Verhoeff 1943).

Genus *Plusioporus* Silvestri, 1895

Plusioporus Silvestri 1895b: 10. Type-species: *Plusioporus salvadorii* Silvestri, 1895 by subsequent designation of Silvestri 1896: 172.

Remarks. The genus *Plusioporus* is widely distributed in the Cerrado, Atlantic, and Paraná Forest provinces from states of Espírito Santo, Pernambuco, and São Paulo.

Plusioporus cristatus Schubart, 1945

(Fig. 4a)

Plusioporus cristatus Schubart 1945b: 58, Krabbe 1982: 391.

non *Plusioporus cristatus*:-- Hoffman 1955: 92.

Records from Atlantic Forest: **São *Paulo***: São Paulo, Ipiranga [23°35'37.0"S; 46°36'12.6"W], Vila Mariana [23°35'23.2"S; 46°38'15.5"W] (Schubart 1945b); Barretos [20°32'29.1"S; 48°32'45.8"W]; São José do Barreiro, Cachoeira da Onça [22°50'31.1"S; 44°32'41.8"W], Colômbia [20°10'42.1"S;48°41'13.7"W] (Schubart 1945b).

Plusioporus recifensis (Schubart, 1950)

(Fig. 4a)

Alloporus recifensis Schubart 1950: 333.

Nesostreptus recifensis-- Jeekel 1952: 74.

Plusioporus recifensis:-- Hoffman 1955: 93.

Plusioporus reciferens [sic!]:-- Krabbe 1982: 394.

Plusioporus (Pemptoporus) recifensis:-- Demange 1970: 375.

Records from Atlantic Forest: ***Pernambuco:*** Recife, Afogados [8°04'29.8"S; 34°54'32.5"W] (Schubart 1950).

Plusioporus setiger (Brölemann, 1902)

(Fig. 4a)

Spirostreptus (Alloporus) setiger Brölemann 1902a: 146, 1903: 178: 1904: 80, Camargo-Andrade 1938: 699.

Spirostreptus setiger:-- Brölemann 1902b: 677.

Alloporus setiger:-- Attems 1914: 115, 1928: 347, Schubart 1944: 395, 1945a: 57, 1945b: 292, 1950: 349, 1952: 417.

Alloporus (Hessonoporus) setiger:-- Attems 1950: 206.

Nesostreptus setiger:-- Jeekel 1952: 74.

Plusioporus setiger:-- Hoffman 1955: 93, Krabbe 1982: 395.

Plusioporus (Pemptoporus) setiger:-- Demange 1970: 375.

Records from Atlantic Forest: ***São Paulo:*** Santo André, Alto da Serra (= Paranapiacaba) [23°46'39.3"S; 46°17'59.3"W]; Itapetininga [23°35'24.6"S; 48°01'47.8"W]; São Paulo, Belém [23°32'49.5"S; 46°35'28.7"W], Cerqueira César [23°33'46.0"S; 46°39'55.2"W] (Brölemann 1902a; Attems 1914); Monte Alegre do Sul [22°41'25.1"S; 46°40'56.5"W] (Schubart 1945b); Santos [23°57'08.7"S; 46°19'35.9"W]; Pirassununga [22°00'05.6"S; 47°24'50.6"W]; Rio Claro [22°24'55.2"S; 47°33'55.7"W]; Brotas [22°14'57.7"S; 48°03'09.2"W]; Santa Rita do Passa Quatro [21°41'42.1"S; 47°29'17.2"W]; Porto Ferreira [21°50'32.2"S; 47°28'16.4"W]; Mogi Guaçu [22°14'48.3"S; 46°56'13.2"W]; Amparo [22°42'31.8"S; 46°44'02.5"W]; Piracicaba [22°43'55.3"S; 47°37'54.5"W] (Schubart 1945a); Analândia [22°07'45.3"S; 47°39'44.4"W] (Schubart 1945a, 1952); Leme [22°10'56.1"S; 47°23'18.3"W];

Descalvado [21°54'37.3"S; 47°37'09.5"W]; Santa Cruz das Palmeiras [21°49'35.6"S; 47°14'59.7"W]; Tambaú [21°41'36.9"S; 47°16'10.2"W]; São Carlos [22°00'42.7"S; 47°53'36.5"W] (Schubart 1952).

Plusioporus unciger (Schubart, 1960)

(Fig. 4a)

Alloporus (Nesostreptus) unciger Schubart 1960: 75, Hoffman & Knight 1970: 2.

Alloporus unciger:-- Demange 1964: 198.

Plusioporus unciger:-- Krabbe 1982: 397.

Records from Atlantic Forest: ***Espírito Santo*:** Domingos Martins, close to Jacu River [20°21'56.2"S; 40°39'32.1"W] (Schubart 1960).

Genus *Rhamphostreptus* Schubart, 1969

Rhamphostreptus Schubart 1969: 6. Type-species: *Rhamphostreptus arenarius* Schubart, 1969by monotypy.

Remarks. The occurrence of this genus is restricted only to the Atlantic province in the state of Sergipe.

Rhamphostreptus arenarius Schubart, 1969

(Fig. 4a)

Rhamphostreptus arenarius Schubart 1969: 8, Krabbe 1982: 398.

Records from Atlantic Forest: ***Sergipe*:** Aracajú, Morro do Urubu [10°53'01.4"S; 37°04'02.2"W](Schubart 1969).

Genus *Sooretama* Schubart, 1945

Sooretama Schubart 1945b: 71. Type-species: *Sooretama aguirrei* Schubart, 1945 by monotypy.

Remarks. The occurrence of this genus is restricted only to the Atlantic province in the state of Espírito Santo.

Sooretama aguirrei Schubart, 1945

(Fig. 4b)

Sooretama aguirrei Schubart 1945b: 72, Krabbe 1982: 399.

Records from Atlantic Forest: ***Espírito Santo*:** São Mateus [18°43'26.0"S; 39°50'43.7"W]; Linhares [19°24'45.1"S; 39°58'41.2"W] (Schubart 1945b).

Genus *Spirostreptus* Brandt, 1833

Spirostreptus Brandt 1833: 203. Type-species: *Spirstreptus sebae* Brandt, 1833 by subsequent designation of Pocock 1894: 388.

Remarks. The genus is widely distributed in the Atlantic province from states of Rio de Janeiro, São Paulo, and Sergipe.

Spirostreptus cinctus Humbert & Saussure, 1870

(Fig. 4b)

Spirostreptus cinctus Humbert & Saussure 1870: 174, Brölemann 1909: 47, Hollier et al. 2017: 207.

Remarks. The description was based on an adult female and its identity requires further taxonomic studies (Hollier et al. 2017: 207).

Records from Atlantic Forest: ***Rio de Janeiro*:** Rio de Janeiro [22°55'30.7"S; 43°13'26.9"W] (Humbert & Saussure 1870).

Spirostreptus dorsostriatus Brölemann, 1902

(Fig. 4b)

Spirostreptus (Cladostreptus ?) dorsostriatus Brölemann 1902a: 177.

Spirostreptus dorsostriatus:-- Attems 1914: 178, Camargo-Andrade 1938: 698, Krabbe 1982: 443.

Remarks. The species was considered *nomen dubium* by Krabbe (1982).

Records from Atlantic Forest: ***São Paulo*:** Santo André, Alto da Serra (= Paranapiacaba) [23°46'39.3"S; 46°17'59.3"W] (Brölemann 1902a).

Spirostreptus filum Brölemann, 1902

(Fig. 4b)

Spirostreptus (Cladostreptus) filum Brölemann 1902a: 175, Camargo-Andrade 1938: 698.

Cladostreptus filum:-- Schubart 1945b: 68.

Spirostreptus filum:-- Krabbe 1982: 444.

Remarks. The species was considered *nomen dubium* by Krabbe (1982).

Records from Atlantic Forest: ***São Paulo*:** Santo André, Alto da Serra (= Paranapiacaba) [23°46'39.3"S; 46°17'59.3"W] (Brölemann 1902a).

Spirostreptus ochrurus Porat, 1876

(Fig. 4b)

Spirostreptus ochrurus Porat 1876: 42, Brölemann 1909: 51.

Remarks. The description was based on an adult female and its identity requires further taxonomic studies.

Records from Atlantic Forest: ***Rio de Janeiro*:** Rio de Janeiro, Corcovado [22°57'09.1"S; 43°12'42.1"W] (Porat 1876).

Spirostreptus patruelis Porat, 1888

(Fig. 4c)

Spirostreptus patruelis Porat 1888: 222, Attems 1914: 178, Krabbe 1982: 446, Golovatch 1997: 102.

Spirostreptus (Cladostreptus) patruelis:-- Brölemann 1902a: 167.

Cladostreptus patruelis:-- Schubart 1945b: 68.

Remarks. The species was considered *nomen dubium* by Krabbe (1982).

Records from Atlantic Forest: ***Rio de Janeiro*:** Teresópolis [22°26'11.8"S; 42°58'26.3"W] (Porat 1888); ***São Paulo*:** Piquete [22°36'46.9"S; 45°10'44.9"W] (Brölemann 1902a).

Spirostreptus rotundanus Karsch, 1881

(Fig. 4c)

Spirostreptus (Nodopyge) rotundanus Karsch 1881: 35.

Spirostreptus rotundanus:-- Brölemann 1909: 53, Attems 1914: 178, Moritz & Fischer 1974: 371.

Remarks. The species was considered *incertae sedis* by Attems (1914).

Records from Atlantic Forest: ***Rio de Janeiro*:** Rio de Janeiro [22°55'30.7"S; 43°13'26.9"W] (Karsch 1881).

Spirostreptus sergipeanus Schubart, 1969

(Fig. 4c)

Spirostreptus (Macrolenostreptus) sergipeanus Schubart 1969: 4.

Spirostreptus sergipeanus:-- Krabbe 1982: 446.

Remarks. The species was considered *nomen dubium* by Krabbe (1982).

Records from Atlantic Forest: ***Sergipe*:** Aracajú, Morro do Urubu [10°53'01.4"S; 37°04'02.2"W](Schubart 1969).

Spirostreptus torifer Porat, 1888

(Fig. 4c)

Spirostreptus torifer Porat 1888: 221, Brölemann 1909: 55, Golovatch 1997: 99.

Remarks. The gonopods of the male lectotype are missing and the identity of the species requires further taxonomic studies (Golovatch 1997: 99).

Records from Atlantic Forest: ***Rio de Janeiro*:** Teresópolis [22°26'11.8"S; 42°58'26.3"W] (Porat1888).

Spirostreptus volxemi Porat, 1888

(Fig. 4c)

Spirostreptus volxemi Porat 1888: 216, Brölemann 1909: 55, Golovatch 1997: 103.

Remarks. The species was described based on four adult females and its identity requires further taxonomic studies (Golovatch 1997: 103).

Records from Atlantic Forest: ***Rio de Janeiro*:** Teresópolis [22°26'11.8"S; 42°58'26.3"W] (Porat 1888).

Genus *Trichogonostreptus* Carl, 1918

Trichogonostreptus Carl 1918: 427. Type-species: *Trichogonostreptus ternetzi* Carl, 1918 by monotypy.

Remarks. The genus is restricted only to the Atlantic province in the state of São Paulo.

Trichogonostreptus (Ptenogonostreptus) fallax (Schubart, 1950)

(Fig. 4d)

Ptenogonostreptus fallax Schubart 1950: 342, Hoffman 1956: 108, Schubart 1958: 248.

Trichogonostreptus (Ptenogonostreptus) fallax:-- Krabbe 1982: 406.

Records from Atlantic Forest: ***São Paulo*:** São Paulo [23°32'50.4"S; 46°38'03.5"W] (Schubart 1950).

Genus *Tubostreptus* Schubart, 1950

Tubostreptus Schubart 1950: 369. Type-species: *Tubostreptus teres* Schubart, 1950 by monotypy.

Remarks. The genus is restricted only to the Atlantic province in the state of Rio de Janeiro.

Tubostreptus teres Schubart, 1950

(Fig. 4d)

Tubostreptus teres Schubart 1950: 370, Krabbe 1982: 407.

Records from Atlantic Forest: ***Rio de Janeiro*:** Petrópolis, Morro do Açu [22°29'01.4"S; 43°03'45.9"W] (Schubart 1950).

Genus *Urostreptus* Silvestri, 1897

Urostreptus Silvestri 1897b: 651. Type-species: *Archispirostreptus camerani* Silvestri, 1897 by monotypy.

Remarks. The occurrence of this genus is restricted only to the Paraná Forest province in the stateof São Paulo.

Urostreptus atrobrunneus Pierozzi & Fontanetti, 2006

(Fig. 4d)

Urostreptus atrobrunneus Pierrozi & Fontanetti 2006: 209.

Records from Atlantic Forest: ***São Paulo*:** Rio Claro [22°24'55.2"S; 47°33'55.7"W] (Pierozzi &Fontanetti 2006).

DISCUSSION

The Atlantic Forest represents one of the most important regions regarding the richness of Spirostreptidae in Brazil, with 59 species and subspecies recorded to date. Nonetheless, the distribution pattern of these species is strongly influenced by urban areas, with at least 11 species reported in the metropolitan region of the municipalities of São Paulo and Rio de Janeiro, for instance (Figs 2–4). This result may be explained by the taxonomic works conducted by Brölemann and Schubart from the Southeast region, where extensive efforts of collecting invertebrates were made due to the development of railroads in the 20th century. The older records are from the late 19th century for *Gymnostreptus microps*, *G. porati*, *G. vulgatus*, *Megagymnostreptus tristis*, *Orthoporus fuscipes*, and species of *Spirostreptus* from areas of Rio de Janeiro (former capital of Brazil until 1960). Furthermore, the western region of São Paulo state has a great diversity of species (Fig. 2a-b), mainly from areas between the rivers Tietê and Grande and collected from the middle 19th century.

The coastal region of the Atlantic Forest has the highest number of endemic Spirostreptidae species and records by grid (Fig. 5). The climate in the region is moist, with slopes and hills largely forested and surrounded by streams. The region partially covers the mountain ranges of Serra de Paranapiacaba (1000 m a.s.l.), Serra do Mar

(2200 m a.s.l.), and Serra da Mantiqueira (2800 m a.s.l.), which correspond to important areas of endemism and diversity for vertebrates and invertebrates in the Atlantic province (Silva et al. 2004, Sigrist & Carvalho 2008, Bispo & Lecci 2011, Mendes & Sebastiani 2012, Trevine et al. 2014, DaSilva et al. 2017, Tonetti & Cavarzere 2017).

Although taxonomic treatments have been made in the last century for some genera of Spirostreptidae, our survey has revealed that almost 50% of millipedes from the Atlantic Forest have not been sampled and/or identified since the species were described. Some groups, such as the widely distributed genera *Cladostreptus*, *Gymnostreptus,* and *Plusioporus*, lack taxonomic revisions and phylogenetic analyses. In addition, the species listed for the genera *Microtrullius* and *Spirostreptus* still require an accurate revision to confirm their taxonomic position.

Considering all the threats to the Atlantic Forest such as habitat fragmentation, urban expansion, climate change, and the possible sampling bias in the region, this paper is important for our understanding of the Brazilian millipede fauna. Moreover, it is expected that the distributional data presented here inform future biodiversity research and help guide conservation efforts in the diverse and increasingly imperiled Atlantic Forest of Brazil, mainly to determine places that deserve stronger collecting efforts and those that still require valuations and reasonable conditions for conservation policies.

Acknowledgments

The authors are grateful to the team from MZSP library for all assistance. Special thanks to the anonymous reviewers for their substantial and constructive comments to improve this manuscript. This study was financially supported by grant to LFMI (2016/24248-0) from São Paulo Research Foundation (FAPESP), and from Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) by grant (n° 162977/2020-4). RSB was supported by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brazil (CAPES) grants (88887.510007/2020-00) and Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) (n° 2018/00103-8). ADB was supported by the grant CNPq (303903/20019-8). This study was financed in part by the (CAPES) - Finance Code 001.

REFERENCES

ATTEMS CMTG. 1901. Neue, durch den Schiffsverkehr in Hamburg eingeschlepte Myriopoden. Mitteilungen aus dem Naturhistorischen Museum in Hamburg 18: 109-116.

ATTEMS CMTG. 1914. Afrikanische Spirostreptiden, nebst Überlick über die Spirostreptiden orbis terrarum. Zoologica Stuttg 25 (65/66): 1-233.

ATTEMS CMTG. 1928. The Myriapoda of South Africa. Annals of the South African Museum 26: 1-431.

ATTEMS CMTG. 1950. Über Spirostreptiden (Diplopoda). Annalen des Naturhistorischen Museums in Wien 57: 179-257.

BISPO PC & LECCI LS. 2011. Gripopterygidae (Plecoptera) from Paranapiacaba mountains, southeastern Brazil. Ann Limnol 47: 373-385.

BOUZAN RS, INIESTA LFM, PENA-BARBOSA JPP & BRESCOVIT AD. 2018. Annotated checklist of the millipede family Chelodesmidae Cook, 1895 from São Paulo state, Brazil (Diplopoda: Polydesmida). Papeis Avulsos de Zoologia 58: 1-19.

BRANDT JF. 1833. Tentaminum quorundam monographicorum Insecta Myriapoda Chilognathi Latreillii spectantium prodromus. Bulletin de la Societé Impériale des Naturalistes de Moscou 6: 194-209.

BRÖLEMANN HW. 1902a. Myriapodes du Musée de Sao Paulo. Revista do Museu Paulista 5: 35- 237.

BRÖLEMANN HW. 1902b. Myriapodes recueillis par M. E. Gounelle au Brésil. Annales de la Societe Entomologique de France 71: 649-694.

BRÖLEMANN HW. 1903. Myriapodes récueillis au Pará par Monsieur le Prof. E. A. Goeldi, Directeur du Musée. Zool. Anz. 26 (691): 177-191.

BRÖLEMANN HW. 1904. Myriapodes du Museu Paulista, IIe mémorie: Manaos. Revista do Museu Paulista 6: 63-96.

BRÖLEMANN HW. 1909. Os Myriapodos do Brazil. Catalogos da Fauna Brazileira. Museu Paulista, São Paulo, Brasil: 94 p.

CAMARGO-ANDRADE CA. 1938. Indice das formas novas e novos nomes technicos vindos a lume na “Revista” e

nas outras publicações do Museu Paulista desde sua fundação até Junho de 1936. Revista do Museu Paulista 21: 675-838.

COLOMBO AF & JOLY CA. 2010. Brazilian Atlantic Forest lato sensu: The most ancient Brazilian forest, and a biodiversity hotspot, is highly threatened by climate change. Braz J Biol 70: 697-708.

DASILVA MB, PINTO-DA-ROCHA R & MORRONE JJ. 2017. Historical relationships of areas of endemism of the Brazilian Atlantic rain forest: A cladistics biogeographic analysis of harvestman taxa (Arachnida: Opiliones). Current Zoology 63(5): 525-535.

DEMANGE JM. 1964. Les appendices postériqueurs (9e paire) du diplopsegment gonopodial (VIIe) des Spirostreptoidea (Myriapodes Diplopodes). Bulletin du Muséum national d'histoire naturelle 2e série 36: 191-210.

DEMANGE JM. 1967. Recherches sur la segmentation du tronc des Chilopodes et des Diplopodes Chilognathes (Myriapodes). Memoires du Museum National d'Histoire Naturelle série A Zoologie 44: 1-188.

DEMANGE JM. 1970. Éléments d'une révision des Spirostreptidae. I. Étude de quelques caractères taxonomiques des Spirostreptinae. Bulletin de l'Institut Fondamental d'Afrique Noire, Série A 32: 366-411.

ENGHOFF H, GOLOVATCH SI, SHORT M, STOEV P & WESENER T. 2015. Diplopoda - taxonomic overview. In: Minelli A (Ed), Treatise on Zoology - Anatomy, Taxonomy, Biology. The Myriapoda (Vol. 2). Brill, Boston, p. 363-453.

FONSECA GAB. 1985. The Vanishing Brazilian Atlantic Forest. Biological Conservation 34: 17- 34.

GOLOVATCH SI. 1997. On the identity of some millipede species described by C. O. von Porat in 1888 (Diplopoda: Spirostreptida, Spirobolida). Bulletin de l'institut royal des sciences naturelles de Belgique, Entomologie 67: 95-106.

HOFFMAN RL. 1955. Studies on spirostreptoid millipeds. II. The genus *Plusioporus* Silvestri. Lloydia 18(2): 88-94.

HOFFMAN RL. 1956. Studies on Spirostreptoid millipeds. III. The genera *Ptenogonostreptus*, *Trichogonostreptus*, and *Oreastreptus*. Lloydia 19 (2): 99-108.

HOFFMAN RL. 1960. Studies on Spirostreptoid millipeds. V. A Synopsis of the genus *Heteropyge*, with some notes on the status of the names *Alloporus* and *Plusioporus*. Lloydia 23(4): 109- 114.

HOFFMAN RL. 1975. Studies on spirostreptoid millipeds. XII: A new species of *Gymnostreptus* from Sao Paulo, with notes on the composition of the genus. Papéis Avulsos de Zoologia 28 (14): 245-253.

HOFFMAN RL. 1997. Studies on spirostreptoid millipeds. XX. The taxonomic status of three poorly-known species of *Gymnostreptus* from Brasil and Paraguay (Spirostreptidae). Myriapodologica 4(9): 69-83.

HOFFMAN RL. 1976. Chelodesmid studies IX. A synopsis of the new Brazilian tribe Arthrosolaenomeridini (Diplopoda; Polydesmida). Papéis Avulsos de Zoologia 30: 171-183.

HOFFMAN RL. 1980. Classification of the Diplopoda. Múseum d'histoire naturelle, Genève, 237 p.

HOFFMAN RL. 1981. Chelodesmid studies. XIII. A synopsis of the Brasilian tribe Strongylomorphini. Studies on the Neotropical Fauna 16: 169-184.

HOFFMAN RL. 1990. Chelodesmid studies XX. Millipeds of the new Brasilian tribe Cornalatini (Polydesmida: Chelodesmidae). Papéis Avulsos do Departamento de Zoologia 37: 23-37.

HOFFMAN RL & FECHTER H. 1983. Die von J. B. v. Spix in Brasilien gesammelten und von M. Perty beschriebenen Diplopoda. Spixiana 9: 257-260.

HOFFMAN RL & KNIGHT LS. 1970. Studies on spirostreptoid millipeds. VIII. Supplementary notes on some Brazilian species described by Otto Schubart. Papéis Avulsos de Zoologia 23(1): 1-12.

HOLLIER J, SCHILLER E & AKKARI N. 2017. An annotated list of the Diplopoda described by Aloïs Humbert alone and with Henri de Saussure, and the Diplopoda from Saussure's Mexico expedition. Revue suisse de Zoologie 124(2): 203-224.

INIESTA LFM, BOUZAN RS & BRESCOVIT AD. 2019. On the millipede genus *Heteropyge*: description of the adults of *H. araguayensis* and revalidation of *H. bidens* (Diplopoda: Spirostreptida: Spirostreptidae). Iheringia, Série Zoologia 109: 1-13.

INIESTA LFM, BOUZAN RS, BATTIROLA LD & BRESCOVIT AD. 2022. New records for the poorly-known monotypic genera *Exallostreptus* and *Guaporeptus*, and a list of species from Mato Grosso state, Brazil (Diplopoda: Spirostreptida: Spirostreptidae). Papéis Avulsos de Zoologia 62: 1-12.

JEEKEL CAW. 1952. Milliped miscellany. Entomologische Berichten 14(323): 71-77.

JEEKEL CAW. 1985. The distribution of the Diplochaeta and the "lost" continent Pacifica (Diplopoda). Bijdragen tot de Dierkunde 55(1): 100-112.

JOLY CA, METZGER JP & TABARELLI M. 2014. Experiences from the Brazilian Atlantic Forest: Ecological findings and conservation initiatives. New Phytologist 204: 459-473.

KARSCH F. 1881. Neue Juliden des Berliner Museums, als Prodromus einer Juliden-Monographie. Zeitschrift für die gesammten Naturwissenschaften 54: 1-79.

KRABBE E. 1982. Systematik der Spirostreptidae (Diplopoda, Spirostreptomorpha). Abhandlungen und Verhandlungen des Naturwissenschaftlichen Vereins in Hamburg 24: 1-476.

LEMBI RC, CRONEMBERGER C, PICHARILLO C, KOFFLER S, SENA PHA, FELAPPI JF, MORAES AR, ARSHAD A, SANTOS JP & MANSUR AV. 2020. Urban expansion in the Atlantic Forest: applying the Nature Futures Framework to develop a conceptual model and future scenarios. Biota Neotropica 20(suppl. 1): 1-13.

MAURIÈS JP. 1969. Diplopodos de la Cueva del Guácharo, Caripe, Venezuela (recolectado por O. Linares & P. Strinati). Boletín de la Sociedad Venezolana de Espeleología 1(1): 35-43.

MAURIÈS JP. 1975. Spirostreptides (Myriapodes-Diplopoda) de Guyane française. Description de deux genres nouveaux. Compléments aux diagnoses des types d'espèces sud-américaines. Bulletin du Muséum national d'histoire naturelle 3e série Zoologie 235: 1257-1275.

MENDES ZR & SEBASTIANI R. 2012. Cactaceae from Reserva Biológica do Alto da Serra de Paranapiacaba, Santo André, São Paulo State, Brazil. Hoehnea 39(3): 409-419.

MORITZ M & FISCHER SC. 1974. Die Typen der Myriapoden-Sammlung des Zoologischen Museums Berlin. I. Diplopoda. Teil 2: Craspedosomatida, Stemmiulida, Spirostreptida. Mitteilungen aus dem Zoologischen Museum in Berlin 50(2): 323-375.

MORRONE JJ. 2014. Biogeographical regionalisation of the Neotropical region. Zootaxa 3782(1): 1-110.

MYERS N, MITTERMEIER RA, MITTERMEIER CG, FONSECA GAB & KENT J. 2000. Biodiversity hotspots for conservation priorities. Nature 403: 853-858.

PIEROZZI PHB & FONTANETTI CS. 2006. A new species of *Urostreptus* (Diplopoda, Spirostreptidae): description and chromossome number. Iheringia. Série Zoologia 96: 209-212.

PINTO-DA-ROCHA R, SILVA MB & BRAGAGNOLO C. 2005. Faunistic similarities and historical biogeography of the Harvestman of southern and southwestern Atlantic Forest of Brazil. J Arachnol 33(2): 290-299.

POCOCK RI. 1910. Chilopoda and Diplopoda. In: Godman FD & Salvin O (Eds), Biologia Centrali-Americana. Taylor & Francis, London, 217 p.

PORAT CO. 1876. Om några exotiska Myriopoder. Kongl. Svenska Vetenskaps-Akademiens handlingar Bihang 4(7): 3-48.

PORAT CO. 1888. Über einige exotische Iuliden des Brüsseler-Museums. Annales de la Société Entomologique de Belgique 32: 205-256.

REZENDE CL, SCARANO FR, ASSAD ED, JOLY CA, METZGER J-P, STRASSBURG BBN, TABARELLI M, FONSECA GA & MITTERMEIER RA. 2018. From hotspot to hopespot: An opportunity for the Brazilian Atlantic Forest. Perspectives in Ecology and Conservation 16: 208-214.

SCHUBART O. 1944. Os Diplopodos de Pirassununga. Acta Zoologica Lilloana 2: 321-440.

SCHUBART O. 1945a. Diplópodos de Monte Alegre. Papéis Avulsos do Departamento de Zoologia 6 (23): 283-320.

SCHUBART O. 1945b. Sobre os representantes Brasileiros da familia Spirostreptidae. An Acad Bras Cienc 17: 51-87.

SCHUBART O. 1949. Os diplopoda de algumas ilhas do litoral paulista. Memórias do Instituto Butantan 21: 203-254.

SCHUBART O. 1950. Ameisen und Diplopoden in ihren gegenseitigen Beziehungen. Revista de Entomologia 21(3): 615-622.

SCHUBART O. 1951. Contribuição para a fauna do estado de São Paulo. II. Os Rhinocricidae (Opisthospermophora, Diplopoda). An Acad Bras Cienc 23: 221-275.

SCHUBART O. 1952. Diplopoda de Pirassununga IV. Adenda à fauna regional. Dusenia 3(6): 403-420.

SCHUBART O. 1958. Sôbre alguns Diplopoda de Mato Grosso e Goiás, Brasil e a família Spirostreptidae. Arquivos do Museu Nacional 46: 203-252.

SCHUBART O. 1959. Duas Novas Espécies da Familia Spirostreptidae dos Arredores do Rio de Janeiro (Diplopoda, Opisthospermophora). An Acad Bras Cienc 31: 479-485.

SCHUBART O. 1960. Novas especies brasileiras das familias Spirostreptidae e Pseudonannolenidae (Diplopoda, Opistospermophora). Actas da Sociedade de Biologia do Rio de Janeiro 4(6): 74-79.

SCHUBART O. 1962. Novas espécies brasileiras da Família Rhinocricidae (Diplopoda, Opisthospermophora). Anais da Academia Brasileira de Ciências 34: 69-87.

SCHUBART O. 1969. Spirostreptidae Brasileiras. II. Novas especies de diversos estados. Boletim do Museu Nacional do Rio de Janeiro Zoologia 267: 1-17.

SHEAR WA. 2011. Class Diplopoda de Blainville in Gervais, 1844. Animal biodiversity: An outline of higher-level

classification and survey of taxonomic richness. Zootaxa 3148: 159-164.

SHELLEY RM & GOLOVATCH SI. 2011. Atlas of Myriapod Biogeography. I. Indigenous Ordinal and Supra-Ordinal Distributions in the Diplopoda: Perspectives on Taxon Origins and Ages, and a Hypothesis on the Origin and Early Evolution of the Class. Insecta Mundi 158: 1-134.

SIGRIST MS & CARVALHO CJB. 2008. Detection of areas of endemism on two spatial scales using Parsimony Analysis of Endemicity (PAE): the Neotropical region and the Atlantic Forest. Biota Neotropica 8(4): 33-42.

SILVA JMC, SOUZA MC & CASTELLETI CHM. 2004. Areas of endemism for passerine birds in the Atlantic forest, South America. Global Ecol Biogeogr 13(1): 85-92.

SILVESTRI F. 1895a. Chilopodi e diplopodi raccolti dal capitano G. Bove e dal Prof. L. Balzan nell'America meridionale. Annali del Museo civico di storia naturale di Genova serie 2(14): 764-783.

SILVESTRI F. 1895b. Viaggio del dottor Alfredo Borelli nella Repubblica Argentina e nel Paraguay. XIV. Chilopodi e Diplopodi. Bollettino del musei di zoologia e di anatomia comparata della Reale Università di Torino 10(203): 1-12.

SILVESTRI F. 1897a. Description des especes nouvelles de Myriapodes du Musee royal d'Histoire naturelle de Bruxelles. Annls Soc ent Belg 41: 345-362.

SILVESTRI F. 1897b. Systema Diplopodum. Annali del Museo civico di storia naturale di Genova, serie 2(18): 644-651.

SILVESTRI F. 1897c. Neue Diplopoden. Abh. Ber. k. zool. anthrop. ethnogr. Mus. Dresden 6(9): 1-23.

SILVESTRI F. 1902. Viaggio del Dr. A. Borelli nel Matto Grosso. VII. Diplopodi. Bollettino del musei di zoologia e di anatomia comparata della Reale Università di Torino 17(432): 1-25.

TONETTI VR & CAVARZERE V. 2017. Beta-diversity analysis of a bird assemblage of a biodiversity hot-spot within the Atlantic Forest. Ornitología Neotropical 28: 281-290.

TREVINE V, FORLANI MC, HADDAD CFB & ZAHER H. 2014. Herpetofauna of Paranapiacaba: expanding our knowledge on a historical region in the Atlantic forest of southeastern Brazil. Zoologia 31(2): 126-146.

TUZET O & MANIER JF. 1957. Troisième contribution à la connaissance des Eccrinida commensaux de l'intestin postèrieur de Myriapodes Diplopodes du Brésil. Archs Zool Exp Gen 94(3): 121-147.

VERHOEFF KW. 1938. Über Diplopoden des Zoologischen Museums in München. Zoologische Jahrbücher - Abteilung für Systematik, Ökologie und Geographie der Tiere 71(1–2): 1-54.

VERHOEFF KW. 1941. Über Spirostreptiden Südamerikas, vergleichende Morphologie und Mechanik der Gonopoden und eine neue Rhinocriciden-Gattung. Archiv für Naturgeschichte N.F. 10(2): 278-302.

VERHOEFF KW. 1942. Myriapoden der Insel Fernando Po und über den Ankerapparat und die Spermaleitung der Spirostreptoideen. XVI. Beitrag zu den wissenschaftlichen Ergebnissen der Forschungsreise H. Eidmann nach Spanisch-Guinea, 1939/40. Zeitschrift für Morphologie und Ökologie der Tiere 39(1): 76-97.

VERHOEFF KW. 1943. Ueber einige Diplopoden aus Minas Gerais (Brasilien). Arq Mus Nac 37: 249-288.

How to cite

INIESTA LFM, BOUZAN RS & BRESCOVIT AD. 2023. Spatial distribution and faunal composition of millipedes of the family Spirostreptidae Brandt, 1833 in the Brazilian Atlantic Forest (Diplopoda, Juliformia, Spirostreptida). An Acad Bras Cienc 95: e20201937. DOI 10.1590/0001-3765202320201937.

Manuscript received on December 18, 2020;
accepted for publication on May 4, 2022

LUIZ F.M. INIESTA[1,2,3]
https://orcid.org/0000-0002-0529-4162.

RODRIGO S. BOUZAN[1,2,4]
https://orcid.org/0000-0002-5331-7031

ANTONIO D. BRESCOVIT[1,5]
https://orcid.org/0000-0002-1511-5324

[1]Instituto Butantan, Laboratório de Coleções Zoológicas, Av. Vital Brasil, 1500, Butantã, 05503-900 São Paulo, SP, Brazil

[2]Universidade de São Paulo, Pós-graduação em Zoologia, Instituto de Biociências, Matão Street, 277, Butantã, 05508-090 São Paulo, SP, Brazil

Correspondence to: **Luiz Felipe Moretti Iniesta**
E-mail: luiz-moretti@hotmail.com

Author contributions.

L.F.M.I, R.S.B, and A.D.B wrote the manuscript, L.F.M.I. and R.S.B. consulted the literature, L.F.M.I. performed the data analysis and prepared the figures.