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Streblidae (Diptera) on bats (Chiroptera) in an area of Atlantic Forest, state of Rio de Janeiro

Streblidae (Diptera) em morcegos (Chiroptera) numa área de Floresta Atlântica, Estado do Rio de Janeiro

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Abstract

Because of the few records of Streblidae on bats, despite extensive study on these mammals in the state of Rio de Janeiro, a survey was carried out in an area of Atlantic Forest, in the municipality of Nova Iguaçu, known as the Tinguá region. Thirteen species were added to the list of Streblidae in the state of Rio de Janeiro, of which two were new records for Brazil. Thirty-one species have now been reported this state.

Keywords: Bat flies, ectoparasites, new reports, Phyllostomidae, Tinguá Biological Reserve.

Resumo

Devido aos poucos registros de Streblidae em morcegos, apesar do amplo estudo com esses mamíferos no Estado do Rio de Janeiro, foi realizado um levantamento numa área de Floresta Atlântica, no Município de Nova Iguaçu, conhecida como região do Tinguá. Foram adicionadas 13 espécies na lista de Streblidae do Estado do Rio de Janeiro, sendo dois novos registros para o Brasil, totalizando 31 espécies relatadas para o estado.

Palavras-chave: Moscas de morcegos, ectoparasitos, novos registros, Phyllostomidae, Reserva Biológica do Tinguá.

Introduction

Although the bat fauna of the state of Rio de Janeiro has been widely studied, this is not true for their ectoparasites. Streblidae is one of the better studied bat ectoparasite taxa in Brazil and, until now, only sixteen species had been recorded in this state (MIRANDA-RIBEIRO, 1907; LIMA, 1921; JOBLING, 1939; WENZEL et al., 1966; WENZEL, 1970; ESBÉRARD; BERGALLO, 2004; ESBÉRARD; FARIA, 2006; LOURENÇO; ESBÉRARD, 2011; ALMEIDA et al., 2011).

One of the main remaining areas of Atlantic Forest in the state of Rio de Janeiro is the Tinguá Biological Reserve. Although this reserve harbors several species of bats (DIAS; PERACCHI, 2008), there is no information about bat flies. This paper provides an update on the number of Streblidae in the state of Rio de Janeiro, Brazil, with reports on bat flies in the Tinguá region.

Methodology

One area in the Tinguá Biological Reserve (22° 34' 57.4" S; 043° 26' 15.9" W) and two areas surrounding it (22° 35' 16.53" S; 043° 24' 13.86" W and 22° 36' 50.69" S; 043° 24' 47.17" W) were sampled for bats. All of these areas are located in the far northeast of the municipality of Nova Iguaçu, state of Rio de Janeiro. The bats were captured using mist nets (12 × 3 m and mesh of 20 mm) between May 2011 and April 2012, over a total of 36 sampling nights. Flies on the bats were removed with the aid of forceps and were stored in microtubes containing 70% ethanol. The samples were collected under license from SISBIO/ICMBio, under number 28064-2. The bats were identified based on Gardner (2007) and Dias and Peracchi (2008). The bat flies were identified with the aid of a stereoscopic microscope, using dichotomous keys and descriptions (WENZEL et al., 1966; WENZEL, 1976; GUERRERO, 1994, 1995, 1996, 1998; GRACIOLLI; CARVALHO, 2001; MILLER; TSCHAPKA, 2001). The nomenclature followed Dick and Graciolli (2006) for Streblidae and Gardner (2007) for bats, except for *Dermanura* which has been elevated to generic status (REDONDO et al., 2008; SOLARI et al., 2009). The vouchers were confirmed by Dr. Gustavo Graciolli and were deposited in the zoological reference collection of the Federal University of Mato Grosso do Sul in the city of Campo Grande, Brazil. Parasite prevalence, mean intensity and mean abundance were determined in accordance with Bush et al. (1997).

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Results and Discussion

A total of 22 species of Phyllostomidae bats were caught, which were all parasitized by bat flies except for *Chiroderma doriae* Thomas, 1891, *Chiroderma villosum* Peters, 1860, *Micronycteris hirsuta* (Peters, 1869) and *Pygoderma bilabiatum* (Wagner, 1843). Of 744 captures, 371 (49.83%) presented 1124 specimens of bat fly, belonging to 24 species of 9 genera (Table 1).

The most parasitized host was *Carollia perspicillata* (Linnaeus, 1758), with seven species of bat flies, and the bat flies found in the greatest numbers of hosts were *Aspidoptera phyllostomatis* (Perty, 1833) and *Paratrichobius longicrus* (Miranda-Ribeiro, 1907), in five hosts each. The most abundant species was *Trichobius joblingi* Wenzel, 1966 (n = 241), which was found to mainly parasitize its primary host, *C. perspicillata* (97.1%), which was also one of the most commonly caught species (n = 187), thus showing that this fly had high prevalence (51.87%). Thirteen new species were added to the records for the state of Rio de Janeiro, and two of them were new records for Brazil (Table 2). There was also one new species of *Strebla* (determined by Dr. Graciolli), which was

Table 1. Species of Streblidae on bats captured in the Atlantic Forest, Tinguá region, municipality of Nova Iguaçu, Rio de Janeiro, between May 2011 and April 2012. NF: number of bat flies; IH: number of infested host individuals; P: prevalence (%); MI: mean intensity of infestation; MA: mean abundance.

Taxa	NF	IH	P	MI	MA
Anastrebla caudiferae Wenzel, 1976					
Anoura caudifer (É. Geoffroy, 1818)	1	1	14.29	1.00	0.143
Anastrebla modestini Wenzel, 1966					
Lonchophylla peracchii Dias et al., 2013	1	1	100.00	1.00	1.000
Aspidoptera falcata Wenzel, 1976					
Artibeus fimbriatus Gray, 1838	3	3	5.17	1.00	0.052
Artibeus planirostris (Spix, 1823)	2	2	8.70	1.00	0.087
Carollia perspicillata (Linnaeus, 1758)	13	4	2.14	3.25	0.070
Sturnira lilium (É. Geoffroy, 1810)	176	51	36.17	3.45	1.248
Aspidoptera phyllostomatis (Perty, 1833)					
A. fimbriatus	27	17	29.31	1.59	0.466
Artibeus lituratus (Olfers, 1818)	3	2	0.97	1.50	0.015
Artibeus obscurus (Schinz, 1821)	2	2	5.88	1.00	0.059
A. planirostris	8	4	17.39	2.00	0.348
S. lilium	1	1	0.71	1.00	0.007
Megistopoda aranea (Coquillett, 1899)					
A. fimbriatus	28	17	29.31	1.65	0.483
A. lituratus	1	1	0.49	1.00	0.005
A. obscurus	3	1	2.94	3.00	0.088
A. planirostris	6	5	21.74	1.20	0.261
Megistopoda proxima (Séguy, 1926)					
A. lituratus	1	1	0.49	1.00	0.005
C. perspicillata	16	4	2.14	4.00	0.086
Platyrrhinus lineatus (É. Geoffroy, 1810)	1	1	14.29	1.00	0.143
S. lilium	129	63	44.68	2.05	0.915
Metelasmus pseudopterus Coquillet, 1907					
A. fimbriatus	3	3	5.17	1.00	0.052
A. lituratus	1	1	0.49	1.00	0.005
Neotrichobius delicatus Machado-Allison, 1966					
Dermanura cinerea (Gervais, 1855)	1	1	33.33	1.00	0.333
Vampyressa pusilla (Wagner, 1843)	2	2	100.00	1.00	1.000
Paraeuctenodes similis Wenzel, 1976					
C. perspicillata	27	22	11.76	1.23	0.144
Paratrichobius longicrus (Miranda Ribeiro, 1907)					
A. fimbriatus	1	1	1.72	1.00	0.017
A. lituratus	147	74	36.00	1.99	0.714
A. planirostris	3	1	4.35	3.00	0.130
C. perspicillata	2	2	1.07	1.00	0.011
Platyrrhinus recifinus (Thomas, 1901)	1	1	4.35	1.00	0.043

[1]Damaged material that did not allow identification of the lowest taxonomic level.

Table 1. Continuation...

Taxa	NF	IH	P	MI	MA
Strebla diphyllae Wenzel, 1966					
Diphylla ecaudata Spix, 1823	2	2	66.67	1.00	0.667
Strebla guajiro (García & Casal, 1965)					
A. caudifer	3	2	28.57	1.50	0.429
C. perspicillata	94	54	28.88	1.74	0.503
S. lilium	1	1	0.71	1.00	0.007
Strebla machadoi Wenzel ,1966					
Micronycteris minuta (Gervais, 1856)	5	1	100.00	5.00	5.000
Strebla wiedemanni Kolenati, 1856					
Desmodus rotundus (É. Geoffroy, 1810)	28	13	43.33	2.15	0.933
Strebla sp. nov.					
L. peracchii	1	1	100.00	1.00	1.000
Trichobius anducei Guerrero, 1998					
C. perspicillata	49	30	16.04	1.63	0.262
Trichobius diphyllae Wenzel, 1966					
D. ecaudata	1	1	33.33	1.00	0.333
Trichobius dugesioides dugesioides Wenzel, 1966					
Chrotopterus auritus (Peters, 1856)	1	1	100.00	1.00	1.000
S. lilium	1	1	0.71	1.00	0.007
Trichobius furmani Wenzel, 1966					
D. ecaudata	12	2	66.67	6.00	4.000
D. rotundus	32	8	26.67	4.00	1.067
Trichobius handleyi Wenzel, 1976					
M. minuta	3	1	100.00	3.00	3.000
Trichobius joblingi Wenzel, 1966					
C. perspicillata	234	97	51.87	2.41	1.251
S. lilium	7	3	2.13	2.33	0.050
Trichobius lonchophyllae Wenzel, 1966					
Glossophaga soricina (Pallas, 1766)	3	2	28.57	1.50	0.429
L. peracchii	3	1	100.00	3.00	3.000
Trichobius longipes (Rudow, 1871)					
Phyllostomus hastatus (Pallas, 1767)	11	3	50.00	3.67	1.833
Trichobius tiptoni Wenzel, 1976					
A. caudifer	6	4	57.14	1.50	0.857
Trichobius spp.[1]					
A. lituratus	3	2	0.97	1.50	0.015
C. perspicillata	10	9	4.81	1.11	0.053
S. lilium	4	3	2.13	1.33	0.028
Total	1124	371	49.86	3.03	1,58

[1]Damaged material that did not allow identification of the lowest taxonomic level.

found on *Lonchophylla peracchii* Dias, Esbérard & Moratelli, 2013. Additional comments have been made for the new occurrences in Brazil and in the state of Rio de Janeiro.

STREBLINAE

Anastrebla caudiferae Wenzel, 1976

Material examined: 1 female; ex *Anoura caudifer* (É. Geoffroy, 1818)

Comments: *Anoura caudifer* is its primary host (WENZEL, 1976), although Bertola et al. (2005) have found it in other hosts. Its occurrences in Brazil were previously restricted to the South (KESSEL, 1925; GRACIOLLI; CARVALHO, 2001; GRACIOLLI; RUI, 2001; RUI; GRACIOLLI, 2005) and, in the Southeast, only the states of São Paulo (BERTOLA et al., 2005) and Minas Gerais (MORAS et al., 2013).

Anastrebla modestini Wenzel, 1966

Material examined: 1 female; ex *L. peracchii*.

Comments: Its primary host is *Anoura geoffroyi* Gray, 1838 (WENZEL, 1976; GRACIOLLI; CARVALHO, 2001), with records from the Cerrado and Atlantic Forest for this host and *A. caudifer* (GRACIOLLI; CARVALHO, 2001; GRACIOLLI; COELHO, 2001; GRACIOLLI; RUI, 2001; BERTOLA et al., 2005; GRACIOLLI et al., 2010; MORAS et al., 2013). This is the first occurrence of this bat fly on species of *Lonchophylla* Thomas,

Table 2. Species of Streblidae on bats captured in the Atlantic Forest, Tinguá region, municipality of Nova Iguaçu, Rio de Janeiro, and records for the state.

Taxa	References
Anastrebla caudiferae Wenzel, 1976	This study
Anastrebla modestini Wenzel, 1966	This study
Metelasmus pseudopterus Coquillet, 1907	This study
Paraeuctenodes similis Wenzel, 1976	This study
Strebla alvarezi Wenzel, 1966	8
Strebla cristinae Wenzel, 1966	7
Strebla diphyllae Wenzel, 1966	This study
Strebla guajiro (García & Casal, 1965)	This study, 9
Strebla hertigi Wenzel, 1966	8
Strebla machadoi Wenzel, 1966	This study
Strebla mirabilis (Waterhouse, 1879)	6, 8
Strebla wiedemanni Kolenati, 1856	This study, 5
Aspidoptera falcata Wenzel, 1976	This study
Aspidoptera phyllostomatis (Perty, 1833)	This study
Mastoptera minuta (Costa Lima, 1921)	2
Megistopoda aranea (Coquillett, 1899)	This study, 4
Megistopoda proxima (Séguy, 1926)	This study, 4
Neotrichobius delicatus (Machado-Allison, 1966)	This study
Noctiliostrebla aitkeni Wenzel, 1966	8
Paratrichobius longicrus (Miranda-Ribeiro, 1907)	This study, 1, 8
Stizostrebla longirostris Jobling, 1939	3
Trichobius lonchophyllae Wenzel, 1966	This study
Trichobius longipes (Rudow, 1871)	This study, 8
Trichobius handleyi Wenzel, 1976	This study
Trichobius joblingi Wenzel, 1966	This study, 8, 9
Trichobius tiptoni Wenzel, 1976	This study, 8
Trichobius anducei Guerrero, 1998	This study
Trichobius diphyllae Wenzel, 1966	This study
Trichobius dugesioides Wenzel, 1966	This study, 6, 8
Trichobius furmani Wenzel, 1966	This study, 8

(1) Miranda-Ribeiro (1907), (2) Lima (1921), (3) Jobling (1939), (4) Wenzel et al. (1966), (5) Wenzel (1970), (6) Esbérard and Bergallo (2004), (7) Esbérard and Faria (2006), (8) Almeida et al. (2011), (9) Lourenço and Esbérard (2011).

1903, in Brazil, though it has been registered on *Lonchophylla robusta* Miller, 1912, in Costa Rica (MILLER; TSCHAPKA, 2001).

Metelasmus pseudopterus Coquillet, 1907

Material examined: 1 male, 2 females; ex *Artibeus fimbriatus* Gray, 1838; 1 female; ex *Artibeus lituratus* (Olfers, 1818).

Comments: In Brazil, it seems to be more associated with *A. fimbriatus* (GRACIOLLI; CARVALHO, 2001; BERTOLA et al., 2005; ANDERSON; ORTÊNCIO FILHO, 2006), like in the present study, although one individual was found on *A. lituratus.* This relationship was previously reported in Santa Catarina by Wenzel et al. (1966).

Paraeuctenodes similis Wenzel, 1976

Material examined: 19 males, 8 females; ex *C. perspicillata.*

Comments: In Brazil, this was only previously recorded in the Atlantic Forest of the states of Paraná (GRACIOLLI; CARVALHO, 2001) and São Paulo (BERTOLA et al., 2005), on its primary host.

Strebla diphyllae Wenzel, 1966

Material examined: 2 females; ex *Diphylla ecaudata* Spix, 1823.

Comments: In Brazil, there were two previous recorded of this species: one to the North (WENZEL, 1976) and another to the South (PREVEDELLO et al., 2005). Wenzel et al. (1966) described this species in Guatemala, having also recorded its occurrence in Mexico. Recently, it was reported in Honduras (DICK, 2013).

Strebla machadoi Wenzel, 1966

Material examined: 3 males, 1 female, 1 undetermined; ex *Micronycteris minuta* (Gervais, 1856).

Comments: *Strebla machadoi* was previously registered in the state of Pará on *Micronycteris megalotis* (Gray, 1842) (GUERRERO, 1997). Another few records were reported in Peru (GUERRERO, 1996), Venezuela (WENZEL, 1976; GUERRERO, 1996) and Panama (WENZEL et al., 1966), all on *M. minuta*.

TRICHOBIINAE

Aspidoptera falcata Wenzel, 1976

Material examined: 3 females; ex *A. fimbriatus*; 1 male, 1 female; ex *C. perspicillata*; 8 males, 5 females; ex *Sturnira lilium* (É. Geoffroy, 1810).

Comments: This bat fly presents widespread distribution including almost all Brazilian biomes (GRACIOLLI; LINARDI, 2002; DIAS et al., 2009; ERIKSSON et al., 2011). Despite being a common species on the lists of bat flies in the Atlantic Forest (AZEVEDO; LINARDI, 2002; BERTOLA et al., 2005; SOARES et al., 2013), it was not previously reported in the study by Almeida et al. (2011) in the state of Rio de Janeiro, mainly due to not catching *S. lilium*, which is its primary host (WENZEL, 1976).

Aspidoptera phyllostomatis (Perty, 1833)

Material examined: 12 males, 14 females; ex *A. fimbriatus*; 4 females; ex *A. lituratus*; 2 females; ex *Artibeus obscurus* (Schinz, 1821); 1 male, 7 females; ex *Artibeus planirostris* (Spix, 1823); 1 male; ex *S. lilium.*

Comments: This was recorded on four species of *Artibeus* Leach, 1821, and the greatest abundance (n = 27) and prevalence (29.31%) were on *A. fimbriatus*. Data for the Atlantic Forest are scarce (WENZEL, 1970; GRACIOLLI et al., 2006); however, Graciolli and Carvalho (2001) also recorded this species on the same host. Almeida et al. (2011) did not register this bat fly, despite the high numbers of *A. lituratus* that were caught (n = 106). Likewise, it was not registered by Bertola et al. (2005) on *A. lituratus* (n = 102) and *A. fimbriatus* (n = 37). Its presence on *S. lilium*, reported by Graciolli et al. (2006), was considered to be accidental. In the Cerrado, it was found on *A. planirostris* (GRACIOLLI et al., 2010; ERIKSSON et al., 2011; SANTOS et al., 2013), and in the Caatinga-Amazon ecotone of the state of Maranhão, on *A. lituratus* and *A. obscurus* (DIAS et al., 2009; SANTOS et al., 2009).

Neotrichobius delicatus Machado-Allison, 1966

Material examined: 1 female; ex *Dermanura cinerea* (Gervais, 1855); 2 females; ex *Vampyressa pusilla* (Wagner, 1843).

Comments: This bat fly presents previous records only in Pará (WENZEL, 1970) and the Federal District, on *D. cinerea* (GRACIOLLI; AGUIAR, 2002). Thus, its presence in the Tinguá region expands its geographical distribution and adds one new biome. The association of *N. delicatus* and *V. pusilla* is the first time that this has been recorded in Brazil. In Bolivia, it was previously found in association with *D. cinereus* (DICK et al., 2007), in

Costa Rica with *V. pusilla* (MILLER; TSCHAPKA, 2001) and in Venezuela with both hosts (WENZEL, 1976).

Trichobius anducei Guerrero, 1998

Material examined: 28 males, 21 females; ex *C. perspicillata.*

Comments: Its occurrence in the state of Rio de Janeiro has increased its distribution in the Neotropics, given that previously, it had only been reported in Venezuela (GUERRERO, 1998). While it is very common for its host to be caught (LOURENÇO; ESBÉRARD, 2011), no records had been reported in addition to its description. In the Tinguá region, *T. anducei* showed high prevalence (16%) and abundance (n = 49), and was the third most abundant bat fly on *C. perspicillata*.

Trichobius diphyllae Wenzel, 1966

Material examined: 1 female; ex *D. ecaudata.*

Comments: This is the first record in Brazil. Previously, occurrences in Guatemala, Mexico, Venezuela and Peru on the same host have been reported (WENZEL et al., 1966; WENZEL, 1970; GUERRERO, 1995).

Trichobius handleyi Wenzel, 1976

Material examined: 3 males; ex *M. minuta*.

Comments: This is the first record in Brazil. There have previously been records in Costa Rica parasitizing *Lophostoma brasiliense* Peters, 1867, and *Lophostoma silvicolum* d'Orbigny, 1836 (MILLER; TSCHAPKA, 2001); in Venezuela on *G. soricina, Phyllostomus elongatus* (É. Geoffroy, 1810) and *M. hirsuta*; and in Peru on *M. minuta* and *M. megalotis* (WENZEL, 1976; GUERRERO, 1995).

Trichobius lonchophyllae Wenzel, 1966

Material examined: 2 males, 1 female; ex *Glossophaga soricina* (Pallas, 1766); 3 females; ex *L. peracchii*.

Comments: There have previously been records on *Lonchophylla dekeyseri* Taddei, Vizotto & Sazima, 1983, in the Federal District, in the Cerrado (GRACIOLLI; COELHO, 2001; GRACIOLLI; AGUIAR, 2002) and on *G. soricina* in the state of Minas Gerais, in the Atlantic Forest (AZEVEDO; LINARDI, 2002). *Lonchophylla peracchii* is a new host of *T. lonchophyllae.* Other records of this parasite were made in Costa Rica (TIMM et al., 1989; MILLER; TSCHAPKA, 2001), Venezuela (WENZEL, 1976), Colombia (MARINKELLE; GROSE, 1981) and Panama (WENZEL et al., 1966), on *L. robusta.*

Some streblids, such as *Megistopoda* Macquart, 1852, and *Aspidoptera* Coquillett, 1899, were expected to occur in the state of Rio de Janeiro because of their association with hosts already listed for this state and for the Atlantic Forest, such as *Artibeus* and *Sturnira* Gray, 1842 (KOMENO; LINHARES, 1999; AZEVEDO; LINARDI, 2002; BERTOLA et al., 2005; GRACIOLLI et al., 2006). Other species cited here have seldom been reported in Brazil, probably due to the low numbers of their hosts that have been caught, such as the bat flies found on *M. minuta, L. peracchii, V. pusilla* and *D. ecaudata*. In contrast, the presence of *T. anducei* on *C. perspicillata*, which is a new report for Brazil, shows that little is known about the relationships of these bat flies with bats. It is noteworthy that *C. perspicillata* is one of the most commonly caught bats and also one of the most parasitized (LOURENÇO; ESBÉRARD, 2011). Through this study it was possible expand the geographical distribution of Streblidae, thereby contributing to the state list, which now contains 31 species.

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