



Revista Brasileira de Parasitologia
Veterinária

ISSN: 0103-846X

zacariascbpv@fcav.unesp.br

Colégio Brasileiro de Parasitologia
Veterinária
Brasil

Captivo Lourenço, Elizabete; Peixoto Patrício, Priscilla Maria; da Costa Pinheiro, Michele;
Medeiros Dias, Renan; Famadas, Kátia Maria

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Janeiro

Revista Brasileira de Parasitologia Veterinária, vol. 23, núm. 2, abril-junio, 2014, pp. 164-
170

Colégio Brasileiro de Parasitologia Veterinária
Jaboticabal, Brasil

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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

Elizabete Captivo Lourenço^{1*}; Priscilla Maria Peixoto Patrício¹; Michele da Costa Pinheiro¹;
Renan Medeiros Dias¹; Kátia Maria Famadas¹

¹Laboratório de Artrópodes Parasitas, Departamento de Parasitologia Animal, Instituto de Veterinária, Universidade Federal Rural do Rio de Janeiro – UFRRJ, Seropédica, RJ, Brasil

Received November 19, 2013

Accepted February 26, 2014

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).

*Corresponding author: Elizabete Captivo Lourenço

Laboratório de Artrópodes Parasitas, Departamento de Parasitologia Animal, Instituto de Veterinária, Universidade Federal Rural do Rio de Janeiro – UFRRJ, Rod. BR 465, km 7, CEP 23890-000, Seropédica, RJ, Brasil
e-mail: beteclouren1205@yahoo.com.br

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

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

Table 1. Continuation...

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

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

Acknowledgements

To Tinguá Biological Reserve, Entidade Ambientalista Onda Verde, Sindipetro Caxias and FAPERJ (E-26/111.364/2011), CNPq, Capes. To Dr. Gustavo Graciolli for confirmation of vouchers.

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