

## Bat flies (Diptera: Streblidae) ectoparasites of bats at an Atlantic Rainforest site in northeastern Brazil

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**Abstract:** Bat flies were surveyed between March, 2007 and February, 2008, in the Carnijó Private Natural Heritage Reserve (08° 07' S and 35° 05' W), an area of Atlantic Rainforest in the municipality of Moreno, in the Brazilian state of Pernambuco. Bats were captured biweekly using mist nets set during six hours each night. The ectoparasites were collected with tweezers and/or a brush wet in ethanol and stored in 70% ethanol. The specimens are deposited in the zoological reference collection of the Federal University of Mato Grosso do Sul. Sixteen species of streblid bat flies were collected from 10 bat species of the family Phyllostomidae. Thirteen of these streblid species were recorded for the first time in Pernambuco.

**Keywords:** *Chiroptera, ectoparasites, Atlantic Rainforest, Phyllostomidae, Streblidae.*

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**Resumo:** O presente estudo ocorreu entre Março de 2007 e Fevereiro de 2008 na Reserva Particular do Patrimônio Natural Carnijó (08° 07' S e 35° 05' W), área de Mata Atlântica, localizada no município de Moreno, Pernambuco, Brasil. Os morcegos foram capturados quinzenalmente com redes de neblina por um intervalo de seis horas por noite. A coleta dos ectoparasitos foi realizada com auxílio de pinça e/ou um pincel umedecido com álcool, sendo mantidos em etanol 70%. Os espécimens estão depositados na Coleção Zoológica de Referência da Fundação Universidade Federal de Mato Grosso do Sul. Dezesesseis espécies de moscas estreblídeas foram capturadas sobre 10 espécies de morcegos da família Phyllostomidae. Treze espécies de estreblídeas encontradas no presente trabalho foram registradas pela primeira vez para o estado de Pernambuco.

**Palavras-chave:** *Chiroptera, ectoparasitos, Mata Atlântica, Phyllostomidae, Streblidae.*

## Introduction

The bat flies (Diptera, Streblidae) are ectoparasites hematophagous exclusive of bats, with a worldwide distribution (Wenzel et al. 1966). A total of 237 streblid species have been described to date, distributed in 33 genera and five subfamilies. Two of these subfamilies, the Brachytarsiniinae (four genera and 60 species) and the Ascodipterinae (three genera and 21 species) are restricted to the Old World, while the Nycterophiliinae (two genera and six species), Trichobiinae (20 genera and 115 species), and Streblinae (four genera and 35 species) are endemic to the New World (Dick & Graciolli 2008).

In the Americas, streblids mainly parasitize bats of the Phyllostomidae family (Prevedello et al. 2005), although relatively few data are available on the distribution of the different taxa or the host-parasite relationship, despite considerable advances in recent years (e.g. Graciolli et al. 2008, Graciolli & Rui, 2001). A total of 70 streblid species have been recorded in Brazil, although the vast majority of the data are from the southern and central regions of the country (Graciolli & Carvalho 2001, Aguiar et al. 2006, Graciolli et al. 2008, Dias et al. 2009), whereas few faunistic surveys have been conducted in the Northeast, where only 26 streblid species have been reported. Most of these species (22) were recorded during a long-term survey in Maranhão state (Dias et al. 2009), while Rios et al. (2008) registered two other species in Bahia state.

In the specific case the state of Pernambuco, the only published data available are those of Guimarães (1938), who recorded five species, although the host of only one species was known. While approximately 42% (n = 67) of the bat species found in Brazil are known to occur in Pernambuco, virtually nothing is known of their ectoparasites. The present study provides the first data on the occurrence of streblid ectoparasites on phyllostomid bats captured in a fragment of Atlantic Rainforest in the Brazilian state of Pernambuco.

## Material and Methods

Specimens were collected at the Carnijó Private Natural Heritage Reserve (RPPN Carnijó), located in the municipality of Moreno (08°

07' S and 35° 05' W), about 30 km from Recife, the capital of the Pernambuco state. The reserve covers an area of 25.5 ha of secondary Atlantic Rainforest, in which plant species of the Cecropiaceae, Moraceae, Piperaceae, Cucurbitaceae, and Solanaceae families predominate. The climate is characterized by two distinct seasons, a rainy season, between April and August, and a dry season during the remaining months of the year (Andrade-Lima 1960). The historical mean annual rainfall in the region is 1025 mm.

Samples were collected biweekly between March 2007 and February 2008, comprising a total of 24 nights of collection. The bats were captured in four 12 m × 3 m mist-nets, which were set along established trails and within natural glades. The individuals were identified in the field using the taxonomic keys of Vizotto & Taddei (1973), and Gardner (2007), and were then released back into the wild. The nets were set for 6 hours each night and checked at intervals of 20-30 minutes. The fur of the captured bats was inspected by the naked eye or using a hand lens, and the ectoparasites observed were collected with tweezers and/or brushes wet in ethanol. The specimens were stored in vials – one for each host captured on a given night – with 70% ethanol. All the specimens were deposited in the zoological reference collection of the Federal University of Mato Grosso do Sul in Campo Grande, Brazil.

## Results and Discussion

A total of 331 bats were captured and examined, representing the families Phyllostomidae (n = 327), Mollosidae (n = 1), and Emballonuridae (n = 3). Of these, 99 specimens (all phyllostomids) were parasitized by streblid bat flies. A total of 353 streblid specimens were collected from 10 phyllostomid species (Table 1). Thirteen of the streblid species were recorded for the first time in Pernambuco (Table 2), increasing the number of species known to occur in this state to 19. Comments on the parasites and their hosts are provided below.

*Aspidoptera falcata* Wenzel, 1976

Material examined: 1 female; ex *Sturnira lilium* (E. Geoffroy 1810).

**Table 1.** List of bat species (Chiroptera, Phyllostomidae) and their respective ectoparasite species (Diptera: Streblidae) recorded in the RPPN Carnijó in the municipality of Moreno, Pernambuco state, Brazil.

Bat species (total number of specimens collected)	Parasite species	Number of ectoparasites collected
<i>Artibeus lituratus</i> (N = 15)	<i>Paratrachobius longicrus</i>	22
<i>Carollia perspicillata</i> (N = 220)	<i>Trichobius joblingi</i>	144
	<i>Speiseria ambigua</i>	47
	<i>Strebla guajiro</i>	2
	<i>Trichobius parasiticus</i>	1
<i>Desmodus rotundus</i> (N = 5)	<i>Strebla altmani</i>	4
<i>Lonchorhina aurita</i> (N = 1)	<i>Trichobius affinis</i>	1
<i>Lophostoma silvicolium</i> (N = 1)	<i>Mastoptera minuta</i>	6
	<i>Strebla tonatia</i>	2
	<i>Mastoptera minuta</i>	15
<i>L. brasiliense</i> (N = 1)	<i>Trichobius longipes</i>	2
	<i>Trichobius costalimai</i>	42
	<i>Trichobioides perspicillatus</i>	4
<i>Phyllostomus discolor</i> (N = 13)	<i>Trichobius longipes</i>	13
	<i>Trichobius sp. (dugesii complex)</i>	2
	<i>Paratrachobius longicrus</i>	6
<i>Platyrrhinus lineatus</i> (N = 18)	<i>Megistopoda proxima</i>	7
	<i>Aspidoptera falcata</i>	1
	<i>T. dugesioides dugesioides</i>	32
<i>Sturnira lilium</i> (N = 4)		
<i>Trachops cirrhosus</i> (N = 3)		
Total		353

**Table 2.** Streblid bat flies and their respective host species of bats recorded in the Brazilian state of Pernambuco. Sources: 1 - Guimarães (1938), 2 - present study. <sup>a</sup> - New geographical record for Pernambuco state, <sup>b</sup> - New host record.

Streblid species	Host	Source
1. <i>Aspidoptera falcata</i> <sup>a</sup>	<i>Sturnira lilium</i>	2
2. <i>Mastoptera minuta</i> <sup>a</sup>	<i>Lophostoma silvicolum</i>	2
	<i>L. brasiliense</i>	2
3. <i>Megistopoda proxima</i> <sup>a</sup>	<i>Sturnira lilium</i>	2
4. <i>Paratrachobius longicrus</i> <sup>a</sup>	<i>Platyrrhinus lineatus</i>	2
	<i>Artibeus lituratus</i>	2
5. <i>Speiseria ambigua</i> <sup>a</sup>	<i>Carollia perspicillata</i>	2
6. <i>Strebla altmani</i> <sup>a</sup>	<i>Lonchorhina aurita</i>	2
7. <i>S. guajiro</i> <sup>a</sup>	<i>Carollia perspicillata</i>	2
8. <i>S. tonatae</i> <sup>a</sup>	<i>Lophostoma silvicolum</i>	2
9. <i>Trichobioides perspicillatus</i> <sup>a</sup>	<i>Phyllostomus discolor</i>	2
10. <i>Trichobius affinis</i> <sup>a</sup>	<i>Lophostoma silvicolum</i> <sup>b</sup>	2
11. <i>Trichobius</i> sp. ( <i>dugesii</i> complex)	<i>Platyrrhinus lineatus</i>	2
12. <i>T. costalimai</i>	Indeterminado	1
	<i>Phyllostomus discolor</i>	2
13. <i>T. dugesii</i>	Indeterminado	1
14. <i>T. dugesioides dugesioides</i> <sup>a</sup>	<i>Trachops cirrhosus</i>	2
15. <i>T. joblingi</i> <sup>a</sup>	<i>Carollia perspicillata</i>	2
16. <i>T. parasiticus</i>	Indeterminado, <i>Desmodus rotundus</i>	1,2
17. <i>T. uniformis</i>	Indeterminado	1

Comments: New occurrence for the state of Pernambuco. *Aspidoptera falcata* occurs primarily on *S. lilium*, and has been recorded in the Brazilian states of Roraima (Graciolli & Linardi 2002), Pará (Graciolli & Aguiar 2002), Maranhão (Dias et al. 2009), Distrito Federal (Guerrero 1997, Graciolli & Aguiar 2002), Minas Gerais (Whitaker Junior & Mumford 1997, Komeno & Linhares 1999, Azevedo & Linardi 2002), São Paulo (Bertola et al. 2005), Paraná (Graciolli & Carvalho 2001), and Santa Catarina (Graciolli et al. 2008).

*Mastoptera minuta* (Costa Lima 1921)

Material examined: 2 males, 4 females; ex *Lophostoma silvicolum* D'Orbygny 1836. 7 males, 8 females; ex *Lophostoma brasiliense* Peters 1866.

Comments: New occurrence for the state of Pernambuco. *Mastoptera minuta* represents a complex of species found on bats of the genera *Lophostoma* d'Orbygny 1836 and *Tonatia* Gray, 1827 (Guerrero 1995b).

*Megistopoda proxima* (Séguy 1926)

Material examined: 4 males, 3 females; ex *Sturnira lilium*.

Comments: New occurrence for the state of Pernambuco. *Megistopoda proxima* is a complex of species that parasitizes exclusively bats of the genus *Sturnira* Gray, 1842 (Wenzel 1976).

*Paratrachobius longicrus* (Miranda Ribeiro 1907)

Material examined: 4 males, 2 females; ex *Platyrrhinus lineatus* (E. Geoffroy 1810). 9 males, 13 females; ex *Artibeus lituratus* (Olfers 1818).

Comments: New occurrence for the state of Pernambuco. *Paratrachobius longicrus* is considered to be a complex of species (Wenzel et al. 1966). While the specimens collected from *A. lituratus* were identified as *P. longicrus*, those captured on *P. lineatus* may represent an undescribed species.

*Speiseria ambigua* Kessel 1925

Material examined: 24 males, 16 females; ex *Carollia perspicillata* (Linnaeus 1758).

Comments: The type locality of *S. ambigua* is in Pernambuco (Guerrero 1994). The species ranges from Mexico to southern Brazil

(Guerrero 1994, Graciolli & Carvalho 2001), and is an exclusive parasite of *C. perspicillata* (Wenzel 1976, Guerrero 1994).

*Strebla altmani* Wenzel 1966

Material examined: 2 males, 2 females; ex *Lonchorhina aurita* Tomes 1863.

Comments: New occurrence for the state of Pernambuco. In Brazil, this species had been recorded previously only in the states of Roraima (Graciolli & Linardi 2002) and Distrito Federal (Coimbra Junior et al. 1984).

*Strebla guajiro* (García & Casal 1965)

Material examined: 1 male; ex *Carollia perspicillata*.

Comments: New occurrence for the state of Pernambuco. *Strebla guajiro* typically parasitizes bats of the genus *Carollia* Gray 1838 (Wenzel 1976).

*Strebla tonatae* (Kessel 1924)

Material examined: 1 male, 1 female; ex *Lophostoma silvicolum*.

Comments: New occurrence for the state of Pernambuco. First record of *S. tonatae* parasitizing *L. silvicolum*. In Maranhão state, *S. tonatae* was recorded on *L. brasiliense* (Dias et al. 2009), which was so far the typical host of this parasite (Wenzel 1976, Guerrero 1996).

*Trichobius parasiticus* Gervais 1844

Material examined: 1 male; ex *Desmodus rotundus* (E. Geoffroy 1810).

Comments: Previously recorded in the state of Pernambuco by Guimarães (1938).

*Trichobius affinis* Wenzel 1976

Material examined: 1 male; ex *Lophostoma silvicolum*.

Comments: New occurrence for the state of Pernambuco. Recorded in the state of Pará on its type host, *Lophostoma brasiliense* Graciolli & Bernard (2002).

*Trichobius costalimai* Guimarães 1938

Material examined: 24 males, 18 females; ex *Phyllostomus discolor* Wagner 1843.

Comments: Species described by Guimarães (1938) from a specimen captured in Recife, the capital of Pernambuco state,

although the host was not reported. According to Wenzel et al. (1966) and Wenzel (1976), *T. costalimai* is a primary parasite of *P. discolor*.

*Trichobius* sp. (*dugesii* complex)

Material examined: 2 males; ex *Platyrrhinus lineatus*.

Comments: Most species of this complex are morphologically very similar, which impedes reliable identification without adequate reference material (Wenzel 1976).

*Trichobius dugesioides dugesioides* Wenzel 1966

Material examined: 24 males, 7 females; ex *Trachops cirrhosus* (Spix 1823).

Comments: New occurrence for the state of Pernambuco. The association between these species was reported in Brazil by Graciolli & Linardi (2002) in Roraima state.

*Trichobius joblingi* Wenzel 1966

Material examined: 84 males, 38 females; ex *Carollia perspicillata*.

Comments: New occurrence for the state of Pernambuco. *Trichobius joblingi* was the most abundant species in the present study, and it appears to be the most common streblid parasite in the Neotropics (Guerrero 1995a). This parasite is common in Central and South America, where *C. perspicillata* is also its typical host (Wenzel 1976).

*Trichobius longipes* (Rudow 1871)

Material examined: 1 male, 1 female; ex *Lophostoma brasiliense*. 8 males, 5 females; ex *Phyllostomus discolor*.

Comments: Species previously documented in Pernambuco by Guimarães (1938) as *Trichobius mixtus* Curran 1935. While *T. longipes* has been captured on *L. brasiliense* and *P. discolor*, its primary host is *Phyllostomus hastatus* Pallas 1767 (Wenzel et al. 1966).

*Trichobioides perspicillatus* (Pessoa & Galvão 1937)

Material examined: 2 males, 2 females; ex *Phyllostomus discolor*.

Comments: New occurrence for the state of Pernambuco. This bat species was the host for 97% of the *T. perspicillatus* specimens from 30 locations examined by Wenzel (1976), which indicates that it is the primary host for this parasite.

## Conclusion

With the exception of the observation of *Trichobius affinis* on *Lophostoma silvicolium*, the host-parasite associations recorded in the present study were expected due to previous reports from other localities. Thirteen streblid species were recorded for the first time in Pernambuco, increasing to 18 the number of species known to occur in this Brazilian state. This number of species is still lower than found in other Brazilian states, such as Paraná (31), Pará (28), São Paulo (25), Maranhão (22), and in Federal District (37), where at least 53, 116, 69, 37, and 47 species of bats are known to occur, respectively. As at least 67 bat species are known to occur in Pernambuco (45 in the Atlantic Rainforest alone), it seems likely that the relatively reduced streblid species richness recorded in this state is a sampling effect resulting from the relatively small number of studies available. In this case, the number of streblid species occurring in that state will probably grow considerably as new sites, and new environments, such as the Caatinga, scrublands and the coastal mangrove forests, are surveyed.

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