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Article

Occurrence and infestation rates of Streblidae (Diptera, Hippoboscoidea) on bats (Mammalia, Chiroptera) in a semideciduous seasonal forest fragment in western Paraná, Brazil

Mateus R. Ribas, Sara C. Batista & José M. R. Aranha

Laboratório de Ecologia de Vertebrados, Departamento de Biodiversidade, Universidade Federal do Paraná, Setor Palotina, Rua Pioneiro, 2153, 85950-000 Palotina, PR, Brazil. (mateusribas07@gmail.com; bsaracristina@gmail.com; jmaranha@ufpr.br).

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ABSTRACT. The objective of this work was to evaluate the occurrence and infestation rates of Streblidae species on bats in a semideciduous seasonal forest fragment in western Paraná, South of Brazil. A total of 289 specimens of eight Streblidae species were collected from six species of bats belonging to the family Phyllostomidae. The most frequent Streblidae species were *Megistopoda proxima* (Séguy, 1926), *Aspidoptera falcata* Wenzel, 1976 and *Paratrichobius longicrus* (Miranda Ribeiro, 1907). The highest prevalence found was *Megistopoda aranea* (Coquillet, 1899) on *Artibeus planirostris* (Spinx, 1823). The highest intensity found was *M. aranea* on *Artibeus lituratus* (Olfers, 1818). The highest abundance found was *M. proxima* on *Sturnira lilium* (E. Geoffroy, 1810). All recorded species were highly specific to their hosts, except *M. aranea*. Two infracommunities were recorded: *M. aranea* and *Metelasmus pseudopterus* (Coquillett, 1907) on *A. planirostris*, and *M. proxima* and *A. falcata* on *S. lilium*. The results showed a trend of occurrence of ectoparasites on females, considering the most frequently captured bats, the seasons had no pattern in the prevalence and intensity factors in this sampling area to them. Studies evaluating the life cycle of these parasites, and the behavior and morpho-physiology of these hosts are necessary since the parasitism rate can be affected by other factors that were not evaluated in this study.

KEYWORDS. Ectoparasites' ecology; ectoparasitic flies; infracommunities; parasitological indexes; Phyllostomidae.

RESUMO. Ocorrência e taxas de infestação de Streblidae (Diptera, Hippoboscoidea) em morcegos (Mammalia, Chiroptera) em um fragmento de floresta estacional semidecidual no oeste do Paraná, Brasil. O objetivo deste trabalho foi analisar a ocorrência e taxas de infestação de estreblídeos em morcegos de um fragmento de floresta estacional semidecidual no oeste do Paraná, sul do Brasil. Foram coletados 289 dípteros de oito espécies de Streblidae em seis espécies de morcegos filostomídeos. Os estreblídeos mais frequentes foram *Megistopoda proxima* (Séguy, 1926), *Aspidoptera falcata* Wenzel, 1976 e *Paratrichobius longicrus* (Miranda Ribeiro, 1907). A maior prevalência ocorreu em *Megistopoda aranea* (Coquillet, 1899) sobre *Artibeus planirostris* (Spinx, 1823), enquanto a maior intensidade média efetuou-se em *M. aranea* sobre *Artibeus lituratus* (Olfers, 1818). A maior abundância média aconteceu em *M. proxima* sobre *Sturnira lilium* (E. Geoffroy, 1810) e, com exceção *de M. aranea*, todas as demais espécies foram específicas a um hospedeiro. Duas infracomunidades foram registradas: *M. aranea* e *Metelasmus pseudopterus* (Coquillett, 1907) em *A. planirostris* e *M. proxima* e *A. falcata* em *S. lilium*. Nos morcegos mais frequentemente capturados os resultados apresentaram maior tendência de ocorrência de ectoparasitas em fêmeas; não foi encontrado um padrão quanto à prevalência e intensidade média para as estações do ano a eles. Conclui-se que a taxa de parasitismo é influenciada por outros fatores na área de estudo não avaliados, e destaca-se a necessidade de analisar o ciclo de vida do parasita, e o comportamento e morfofisiologia do hospedeiro.

PALAVRAS-CHAVE. Ecologia de ectoparasitas; moscas ectoparasitas; infracomunidades; índices parasitológicos; Phyllostomidae

Bat flies are highly specialized hematophagous ectoparasites connected exclusively with bats; these species are divided into two families, Streblidae and Nycteribiidae (Dick & Patterson, 2006). They present cosmopolitan distribution, but the Streblidae family is more diverse in the Americas; and 96 Streblidae (Diptera) species and 23 genera were found in Brazil (Graciolli, 2020).

Different extrinsic factors may affect the rate of ectoparasites on the host, such as bat body size, gregarious habit and geographical distribution, and the abundance of these parasites may vary depending on the bat sex, reproductive condition, age, and sanity within a same species (Marshall, 1982; Rui & Graciolli, 2005). Few studies on these factors are found in Brazil (Linhares & Komeno 2000; Rui & Graciolli, 2005; Santos *et al.*, 2009) and are mainly focused on taxonomic inventories and descriptive analyzes (Torres *et al.*, 2019).

The state of Paraná presents the greatest richness of bat species (64) and Streblidae species (33) in the South of Brazil (Passos *et al.*, 2010; Lourenço *et al.*, 2016; Graciolli, 2020). Moreover, Paraná is one of the Brazilian states with the highest number of records and studies of bat's

ectoparasites (Lourenço *et al*., 2016; Graciolli *et al.*, 2017); however, it lacks surveys of these species in several regions (Prevedello *et al.*, 2005).

Studies of ectoparasites on bats is incipient; thus, studies in new regions can assist in the understanding of the geographic distribution of these parasites and their relations with their hosts, in addition, ectoparasitological analyzes provide us with a better understanding of evolutionary and ecological mechanism of this parasite-host relationship (Prevedello *et al*., 2005; Barbier *et al*., 2016; Vasconcelos *et al*., 2016; Torres *et al.*, 2019).

In this context, the objectives of this work were to evaluate (i) the occurrence and infestation rates of Streblidae species on bats in a semideciduous seasonal forest fragment in western Paraná, South of Brazil, (ii) the main parasitological indexes, and (iii) the effect of the sex of the host and the seasons on the parasitism rate.

MATERIAL AND METHODS

Study area. The work was carried out at the São Camilo State Park (SCSP), in Palotina, western Paraná, south of Brazil (24°08'57"S; 53°54'38"W). This park covers 0.57% of the Palotina territory; it has an area of 385.34 hectares of semideciduous seasonal forest — a phytophysiognomy of the Atlantic Forest. This area is one of the few forest remnants in the region, which had most of its original vegetation removed for agricultural crops; the surroundings of the SCSP consists of soybean and maize crops.

According to the Köppen classification, the climate of the region is subtropical humid (Cfa), with average temperature lower than 18°C in the coldest months and above 22°C in the warmest (Fig. 1). The regions annual precipitation varies from 1600 mm to 2000 mm, with concentrated rainfall in the summer, and no defined dry season (IAP, 2006).

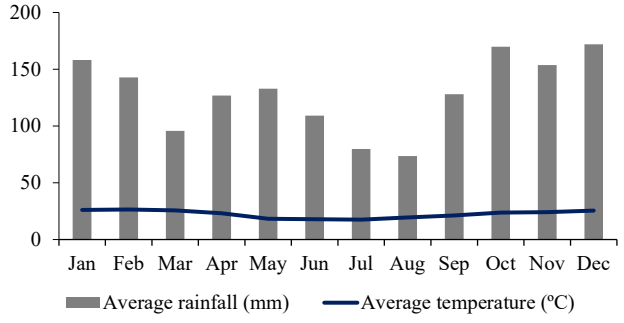

Fig. 1. Monthly average precipitation and temperature in Palotina, PR, Brazil, from 1997 to 2016.
Source: SIMEPAR, 2018.

Procedures. Bat specimens were collected monthly in four nights of third quarter or new moon between September 2016 and August 2017. Eight mist nets (12 x 2.5 m) were distributed in tracks inside the forest, in the forest fragment edges, and near water bodies. The nets were opened after sunset and checked every 20 minutes for six hours. The sampling effort of this study was 69,120 m^2 h^{-1} (Straube & Bianconi, 2002).

The captured bats were removed from the net, placed in cotton bags, and taken to the field base, where they were identified regarding species and sex. The bats were identified based on the keys developed by Gardner (2008), Gregorin & Taddei (2002) and Miranda *et al*. (2011). The ectoparasites found were collected manually or with tweezers and fixed in 70% ethyl alcohol in individual containers. The bats were tagged with numbered metal rings (code: PESC) in order to identify the recaptured individuals. After the screening they were released at the same spot where they were captured.

At least one specimen of each bat species was selected as material testimony, under the licence of the *Instituto Chico Mendes de Conservação da Biodiversidade* (ICMBio Licence #43560-2). The procedures were approved by the Ethical Committee on the Use of Animals of *Universidade Federal do Paraná*, Palotina Sector (CEUA n° 39/2014). The specimens were deposited in the *Museu de História Natural Capão da Imbuia*, in Curitiba PR, Brazil (Appendix 1).

The Streblidae species were identified according to the pictorial key developed by Graciolli & Carvalho (2001) and deposited in the Padre Jesus Santiago Moure Collection of the Department of Zoology of the *Universidade Federal do Paraná*, Curitiba, PR, Brazil.

Data analysis. The prevalence rates of species of captured bats and ectoparasites found on them (infested bats/examined bats), mean infestation intensity (amount of bat flies/infested bats), mean infestation abundance (amount of bat flies/examined bats) and parasite-host specificity index (percentage of total bat flies of a single species found on the primary host) were evaluated (Bush *et al*., 1997; Dick & Gettinger, 2005).

Statistical tests were performed for the three most frequent bat species in the study area with Streblidae infestation of higher specificity for these species. The effect of the sex of the host, and seasons on the prevalence was evaluated using the chi-square test. The differences in intensity due to host sex was evaluated using the Bootstrap-T Test with randomization with 2000 replications (Rózca *et al.*, 2000) and the differences in intensity due to the seasons was evaluated using the Kruskal-Wallis test. The Spearman's correlation test was used to analyze the abundance of parasites in the most frequent infracommunities. The analyses were performed in the Quantitative Parasitology 3.0 (Rózca *et al.*, 2000) and BioEstat 5.3 (Ayres *et al.*, 2007) programs.

The season analyzed in this study were: Summer (December, January and February), Autumn (March, April and May), Winter (June, July and August) and Spring (September, October and November).

The parasites collected on recaptured bats throughout the study were not statistically evaluated; they were discussed separately in order to understand possible patterns of infestation or reinfestation of the bat flies on the hosts.

RESULTS

A total of 380 bat specimens were captured, which consisted of 12 species of three families — Molossidae: *Eumops glaucinus* (Wagner, 1843); Vespertilionidae: *Eptesicus furinalis* (d'Orbigny, 1847), *Lasiurus blossevillii* (Lesson & Garnot, 1826) and *Myotis nigricans* (Schinz, 1821); and Phyllostomidae: *Artibeus fimbriatus* (Gray, 1838), *Artibeus lituratus* (Olfers, 1818), *Artibeus planirostris* (Spix, 1823), *Carollia perspicillata* (Linnaeus, 1758), *Chrotopterus auritus* (Peters, 1856), *Phyllostomus hastatus* (Pallas, 1767), *Platyrrhinus lineatus* (E. Geoffroy, 1810) and *Sturnira lilium* (E. Geoffroy, 1810). Females presented higher proportion (≅60%) than males (≅40%). *Artibeus lituratus* (40%), *S. lilium* (33.2%) and *A. fimbriatus* (10.5%) were the most frequent bat species captured; the other species had frequencies lower than 5%.

A total of 289 bat flies of eight Streblidae species were found on six bat species from the Phyllostomidae family. Seven Streblidae species were found on specific hosts — *Aspidoptera falcata* Wenzel, 1976 and *Megistopoda proxima* (Séguy, 1926) on *S. lilium*; *Metelasmus pseudopterus* (Coquillett, 1907) on *A. planirostris*; *Paratrichobius longicrus* (Miranda Ribeiro, 1907) on *A. lituratus*; *Strebla guajiro* (Garcia & Casal, 1965) and *Trichobius joblingi* Wenzel, 1966 on *C. perspicillata*; and *Trichobius longipes* (Rudow, 1871) on *P. hastatus*. *Megistopoda aranea* (Coquillett, 1899) was found on three bat species: *A. fimbriatus*, *A. lituratus*, and *A. planirostris*.

Twenty-six bats were recaptured in different months, 50% of them were not infested with Streblidae species neither in the capture nor in the recapture, 34% were infested only at recapture, 8% only at capture, and 8% were sampled with bat flies in both capture and recapture. One individual of *A. lituratus* was parasitized with one specimen of *P. longicrus* and was recaptured three days later with two specimens of *P. longicrus*, even though the Streblidae specimen was removed after the first capture. The host-parasite combinations found at recapture were: *M. aranea* on *A. fimbriatus*; *M. proxima* and *A. falcata* on *S. lilium*; *T. longipes* on *P. hastatus*; and *P. longicrus*, *M. aranea* and *M. proxima* on *A. lituratus*.

Artibeus planirostris and *S. lilium* presented infracommunities of parasites. With parasitism on about 55% (69 specimens) of the 126 specimens of *S. lilium* captured, the association of *A. falcata* with *M. proxima* on the same hosts were found on about 20% (25 specimens) of captured bats; while the association of *M. aranea* with *M. pseudopterus* on *A. planirostris* was found on only one host of the three examined corresponding to 33% of the total. The Spearman's correlation test showed that there was no significant correlation between the infracommunity of *A. falcata* and *M. proxima* on *S. lilium* (R_s = 0.1708; p= 0.4143).

The most abundant Streblidae species were *M. proxima* (36.3%), *A. falcata* (23.5%), *P. longicrus* (18.7%), and *M. aranea* (13.5%); the other species reached frequencies lower than 10%. The bat species with the highest frequency of ectoparasites were *A. planirostris* (66.67%), *S. lilium* (54.76%), and *C. perspicillata* (38.89%) (Tab. I).

The highest prevalence of ectoparasites found were *M. aranea* on *A. planirostris* (66.7%), *M. proxima* on *S. lillium* (43.6%), and *T. longipes* on *P. hastatus* (35.3%). The mean intensity varied from 3.00 to 1.00 and was higher for *M. aranea* on *A. lituratus*. The specificity index of *M. aranea* was similar on *A. fimbriatus* and *A. lituratus*, lower on *A. planirostris*, and specific on the other species. The mean abundance ranged from 0.83 to 0.05, with two extremes: *M. proxima* on *S. lilium*, and *S. guajiro* on *C. perspicillata* (Tab. II).

Statistical tests were performed for the *M. aranea* on *A. fimbriatus*; *P. longicrus* on *A. lituratus*; *A. falcata* on *S. lilium*; and *M. proxima* on *S. lilium*.

The prevalence of ectoparasites on *A. fimbriatus*, *A. lituratus*, and *S. lilium* was higher on females. Significant differences were found for *M. aranea* on *A. fimbriatus* (x^2= 5.560, df=1, p=0.018), and *P. longicrus* on *A. lituratus* (x^2= 5.258, df=1, p=0.022). The mean intensity of *M. aranea* on *A. fimbriatus*, and *M. proxima* on *S. lilium* was higher on males, but with no statistical differences. Higher mean intensity on females and significant differences were found for *P. longicrus* on *A. lituratus* (t= 3,766, p=0.004), and *A. falcata* on *S. lilium* (t=2,761, p=0.010) (Tab. III).

Tab. I. Frequency of parasitized bats captured in São Camilo State Park, Palotina, PR, South Brazil (TNB, total number of bats examined; NPH, number of parasitized hosts; FPH (%), frequency of parasitized hosts).

Host	TNB	NPH	FPH (%)
Phyllostomidae			
Artibeus fimbriatus Gray, 1838	40	12	30.00
Artibeus lituratus (Olfers, 1818)	152	42	27.63
Artibeus planirostris Spix, 1823	3	2	66.67
Carollia perspicillata (Linnaeus, 1758)	18	7	38.89
Phyllostomus hastatus (Pallas, 1767)	17	6	35.29
Sturnira lilium (E. Geoffroy, 1810)	126	69	54.76

Tab. II. Species of parasitized bats and their ectoparasites in the São Camilo State Park, Palotina, PR, Brazil, sampled between September 2016 and August 2017 (TNP, total number of parasites; PE (%), prevalence of ectoparasites; MI, mean intensity; SI (%), specificity index; MA, mean abundance).

Host	Parasite	TNP	PE (%)	MI	SI (%)	MA
Phyllostomidae	Streblidae					
Artibeus fimbriatus Gray, 1838	*Megistopoda aranea* (Coquillett, 1899)	19	30	1.58	48.72	0.47
Artibeus lituratus (Olfers, 1818)	*Megistopoda aranea* (Coquillett, 1899)	18	3.95	3.00	46.15	0.12
	Paratrichobius longicrus (Miranda Ribeiro, 1907)	54	23.68	1.50	100.00	0.35
Artibeus planirostris Spix, 1823	*Megistopoda aranea* (Coquillett, 1899)	2	66.67	1.00	5.13	0.67
	Metelasmus pseudopterus Coquillett, 1907	2	33.33	2.00	100.00	0.67
Carollia perspicillata (Linnaeus, 1758)	*Strebla guajiro* (García & Casal, 1965)	1	5.56	1.00	100.00	0.06
	Trichobius joblingi Wenzel, 1966	11	33.33	1.83	100.00	0.61
Phyllostomus hastatus (Pallas, 1767)	*Trichobius longipes* (Rudow, 1871)	9	35.29	1.50	100.00	0.53
Sturnira lilium (E. Geoffroy, 1810)	*Aspidoptera falcata* Wenzel, 1976	68	30.95	1.74	100.00	0.54
	Megistopoda proxima (Séguy, 1926)	105	43.65	1.91	100.00	0.83

Tab. III. Prevalence (P%) and mean intensity (MI) indices of *M. aranea* on *A. fimbriatus* (*MA*x*AF*), *P. longicrus* on *A. lituratus* (*PL*x*AL*), and *A. falcata* and *M. proxima* on *S. lilium* (*AF*x*SL* and *MP*x*SL*, respectively) as a function of the sex of the host (NE, number of ectoparasites collected; EH, number of examined hosts).

Index	MAxAF		PLxAL		AFxSL		MPxSL	
	Female	Male	Female	Male	Female	Male	Female	Male
P%	45.5	11.1	30.3	14.3	36.6	19.4	45.6	38.9
MI	1.4	2.5	1.67	1	1.88	1.14	1.73	2.43
NE	14	5	45	9	60	8	71	34
EH	22	18	89	63	90	36	90	36

Higher prevalence of *P. longicrus* on *A. lituratus* (x^2=13,602, df=3, p= 0.003) was found in the winter. Higher prevalence of *A. falcata* on *S. lilium* (x^2= 1,046, df= 3, p= 0.790), and *M. proxima* on *S. lilium* (x^2= 7,434, df= 3, p= 0.059) was found in the summer, but with no statistical differences. *Megistopoda aranea* on *A. fimbriatus* had higher prevalence in the autumn and presented no significant differences (x^2= 2,638, df= 3, p= 0.451). The mean intensities due to the seasons had no significant differences for any host-parasite combination (Tab. IV).

DISCUSSION

The results obtained in this paper demonstrate important descriptive data on the parasitic pattern of Streblidae on bats in a Semideciduous Seasonal Forest fragment in Western Paraná. The study evaluated the prevalence of parasitized bats and parasitological indexes founded over the course of a sample year and presented interesting findings regarding host sex and seasons. The data obtained were coincident in terms of host-ectoparasite associations, as well as regarding the bats sampled, corroborating with the scientific literature (Graciolli & Carvalho, 2001; Miretzki, 2003; Bianconi *et al*., 2004; Prevedello *et al*., 2005; Anderson & Ortêncio-Filho, 2006; Ortêncio-Filho & Reis, 2009).

Neotropical regions present positive correlation of richness of Phyllostomidae and Streblidae species (Dick & Gettinger, 2005; Patterson *et al*., 2008; Dornelles *et al*., 2017). Studies of semideciduous seasonal forest in the northwest of Paraná (Silva & Ortêncio-Filho, 2011), Rio de Janeiro (França *et al*., 2013) and in an area influenced by the Cerrado biome in the northwest of Paraná (Anderson & Ortêncio-Filho, 2006) found five, nine and six Streblidae species on five, seven and four Phyllostomidae species, respectively. Thus, the richness of Streblidae species found in São Camilo State Park (SCSP) can be explained by the richness and abundance of Phyllostomidae species found when compared to the other captured families (Molossidae and Vespertilionidae).

Megistopoda aranea presents a connection with *Artibeus* bats, especially *A. fimbriatus* (Graciolli & Carvalho, 2001). The occurrence of *M. aranea* on *A. lituratus* may be due to the proximity of this bat species with the *M. aranea* preferred host (Rui & Graciolli, 2005). A higher prevalence of *M. aranea* on *A. planirostris* and *A. fimbriatus* was found in the SCSP.

The recaptures showed 34% of infestation and 8% of reinfestation of bat specimens by ectoparasites. Several factors may explain the infestation or reinfestation of bats by ectoparasites, such as the gregarious habit of these hosts that allows the transference of ectoparasites, the number of hosts in their shelters and the infracommunities of parasites on other hosts that share the same shelters (Patterson *et al.*, 2007; McCoy, 2009). Bat recapture data from bat flies' studies are interesting, since it can demonstrate infestation and reinfestation patterns. Our data showed that even bats without parasites captured at first, or bats cleaned during the sampling, later presented Streblidae specimens on their body, corroborating the importance of gregarious habit and the shelter as a dispersing factor for these ectoparasites.

Tab. IV. Prevalence indices (P (%)), mean intensity (MI) and number of *M. aranea* on *A. fimbriatus*; *P. longicrus* on *A. lituratus*; *A. falcata* on *S. lilium*; and *M. proxima* on *S. lilium* as a function of the seasons during the sample period (NE, number of ectoparasites collected; EH, number of examined hosts).

Index	Spring	Summer	Autumn	Winter
	M. aranea on *A. fimbriatus*			
P (%)	28.6	11.1	42.9	30
MI	1	1	1.5	2.33
NE	2	1	9	7
EH	7	9	14	10
	P. longicrus on *A. lituratus*			
P (%)	9.1	15.4	16.1	38.7
MI	1.33	1.25	1	1.67
NE	4	5	5	40
EH	33	26	31	62
	A. falcata on *S. lilium*			
P (%)	25.9	35.9	33.3	27.3
MI	1.71	2.36	1.44	1.11
NE	12	33	13	10
EH	27	39	27	33
	M. proxima on *S. lilium*			
P (%)	33.3	61.5	37	36.4
MI	1.33	2.25	1.6	1.92
NE	12	54	16	23
EH	27	39	27	33

According to Lourenço & Esbérard (2011), reinfestation may occur rapidly in the first few hours of contact between hosts; this explains the rapid reinfestation of the recaptured *A. lituratus*, within three days.

The *M. proxima* found on a recaptured *A. lituratus* was probably an accidental infestation. According to Graciolli & Carvalho (2001), this ectoparasite commonly leaves the host at capturing, thus, when the primary host (*S. lilium*) falls in the net or at manipulation, they can infest other bats. As a suggestion for future studies, considering the specificity of Streblidae, we believe that is interesting to analyze the impact of the accidental dispersion on the host or to the ectoparasite.

The infracommunity of *A. falcata* and *M. proxima* on *S. lilium* is well documented, with high correlation between these two species of parasite and the genus *Sturnira* (Linhares & Komeno, 2000; Bertola *et al*., 2005; Dick & Gettinger, 2005; Anderson & Ortêncio-Filho, 2006; Dornelles *et al*., 2017). A higher frequency of *A. falcata* associated with *M. proxima* was found compared to the *A. falcata* found alone on the hosts.

Linhares & Komeno (2000) report a correlation between simultaneous parasitism of *A. falcata* and *M. proxima* on *S. lilium*, in which the high the abundance of one parasite the lower the abundance of the other. This pattern was not observed in the present study. The competition between parasite species does not seemed to affect the infracommunities of bat flies, but probably the ecology, behavior, and morphology of the host can affect the occurrence of these infracommunities (Tello *et al.*, 2008; Presley, 2011; Patrício *et al.*, 2016).

The higher prevalence of ectoparasites found on female bats can be explained both by the behavior of the host and the biological cycle of the parasite. Female bats tend to care for their progeny, staying longer in the shelters, where Streblidae species have their larviposition, and pupa and adult development (Graciolli *et al.*, 2008; Esbérard *et al.*, 2012).

Several studies confirm that humidity and temperature are abiotic factors that affect the biological cycle of Streblidae species, and a trend of mortality of ectoparasites due to the reduction of temperature and humidity (Marshall, 1982). Higher prevalence and mean intensity of *P. longicrus* on *A. lituratus*, and *M. proxima* on *S. lilium* during the warmer season were found in the Atlantic Forest in the state of Rio Grande do Sul, Brazil (Rui & Graciolli, 2005). Similar results were found in the Cinturão Verde Municipal Park in the northwest of Paraná (Anderson & Ortêncio-Filho, 2006). Different results were found in the SCSP, with higher prevalence of *P. longicrus* on *A. lituratus* in the winter. Although there is no dry season in the region, winter presents minimum temperatures of 11°C, thus, no higher rates of parasitism in this period was expected. This denotes that changes in temperature and precipitation are not affecting the parasitism rates in the SCSP.

Studies on the host behavior, body size, nesting, co-occurrences, health conditions, and the biological cycles of the parasites are necessary, since these factors may affect the ectoparasitic rates of the studied bats, and these studies can provide a better understanding of the relationship between these parasites and hosts.

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Appendix 1. Bats collected in São Camilo State Park, Palotina, state of Paraná, South Brazil, and deposited in the *Museu de História Natural Capão da Imbuia* in Curitiba.

Species	Nº CTX
Eptesicus furinalis (d'Orbigny & Gervais, 1847)	10239
Artibeus lituratus (Olfers, 1818)	10240
Myotis nigricans (Schinz, 1821)	10241
Phyllostomus hastatus (Pallas, 1767)	10242
Artibeus fimbriatus Gray, 1838	10243
Eptesicus furinalis (d'Orbigny & Gervais, 1847)	10244
Chrotopterus auritus (Peters, 1856)	10245
Myotis nigricans (Schinz, 1821)	10246
Artibeus planirostris (Spix, 1823)	10247
Lasiurus blossevillii (Lesson & Garnot, 1826)	10248
Carollia perspicillata (Linnaeus, 1758)	10249
Eumops glaucinus (Wagner, 1843)	10250
Sturnira lilium (E. Geoffroy, 1810)	10251
Artibeu slituratus (Olfers, 1818)	10252
Platyrrhinus lineatus (E. Geoffroy, 1810)	10253