

SHORT COMMUNICATION

The Phlebotominae Sand Fly (Diptera: Psychodidae) Fauna of Two Atlantic Rain Forest Reserves in the State of Rio de Janeiro, Brazil

Nataly A Souza⁺, Claudia A Andrade-Coêlho, Maurício L Vilela, Elizabeth F Rangel

Departamento de Entomologia, Instituto Oswaldo Cruz-Fiocruz, Av. Brasil 4365, 21045-900
Rio de Janeiro, RJ, Brasil

During two consecutive years, studies on the sand fly fauna in Poço das Antas and Fazenda Bom Retiro, two Atlantic Rain Forest Reserves from the State of Rio de Janeiro, were performed using Shannon traps, CDC light traps and human bait collections. Eleven species were identified; Lutzomyia longipalpis, L. migonei, L. edwardsi, L. intermedia, L. whitmani, L. fischeri, L. shannoni, L. ayrozai, L. hirsuta, L. monticola and L. misionensis (first occurrence in the State of Rio de Janeiro). L. intermedia and L. whitmani were the predominant anthropophilic species around houses, while L. hirsuta predominated in the forest.

Key words: Phlebotominae - ecology - Atlantic Rain Forest - preserved areas - Rio de Janeiro - Brazil

The Atlantic Forest of Brazil presents considerable biodiversity and is important in the epidemiology of American cutaneous leishmaniasis (ACL). Although Atlantic Forest once covered 12% of Brazilian territory, only about 7% of its original area remains. Human activities have almost completely destroyed this habitat and are now affecting large areas of the Amazon and Cerrado (<http://www.wwf.org.br>). Although mainly associated with primary forest in the past, ACL now occurs in areas affected by human colonization, agriculture, land development and mining. It is possible that some sand fly species are modifying their biting behaviour, affecting their role in *Leishmania* transmission. In recent years, several studies of ACL epidemiology have been made in the State of Rio de Janeiro, Brazil, where most of the endemic area is periurban or rural.

The aim of this study was to increase knowledge of the sand fly fauna in two municipalities of the State of Rio de Janeiro (where remnants of

Atlantic Forest occur, i.e., Silva Jardim and Casimiro de Abreu, located 110 and 140 km respectively from the city of Rio de Janeiro (Fig. 1). In the past this region was entirely covered by the Atlantic Forest, and presented a humid climate throughout the year with two somewhat drier months in certain years, when humidity was kept concentrated in the mountains. The Atlantic Forest biome occupies an area that lies principally between the states of Rio Grande do Norte and Espírito Santo, with a branch extending further south to the Osório Mountains in Rio Grande do Sul. It is characterized by trees of the genera *Cariniana*, *Araucaria*, *Cedrela*, *Ficus*, *Tabebuia*, *Melanoxylon* and *Cesalpinia* (<http://www.wwf.org.br>). Following the construction of the BR101 highway the vegetation cover has been significantly changed by human activities and only two preserved areas remain: the Poço das Antas Biological Reserve and the Reserva Particular de Patrimônio Natural on the Fazenda Bom Retiro. Both reserves have been mapped for the reintroduction, management and monitoring of the golden tamarin (*Leontopithecus rosalia* L.).

Sand fly collections were carried out on four consecutive days each month from July 1996 to June 1998 at the following sites: Area I - "Rodolfo Norte" and "Rodolfo Sul", two stations with the same kind of vegetation cover located in mature secondary forest on the Poço das Antas Reserve. The São João river is the main watercourse in this

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⁺Corresponding author. Fax: +55-21-290.9339

E-mail: souzana@gene.dbbm.fiocruz.br

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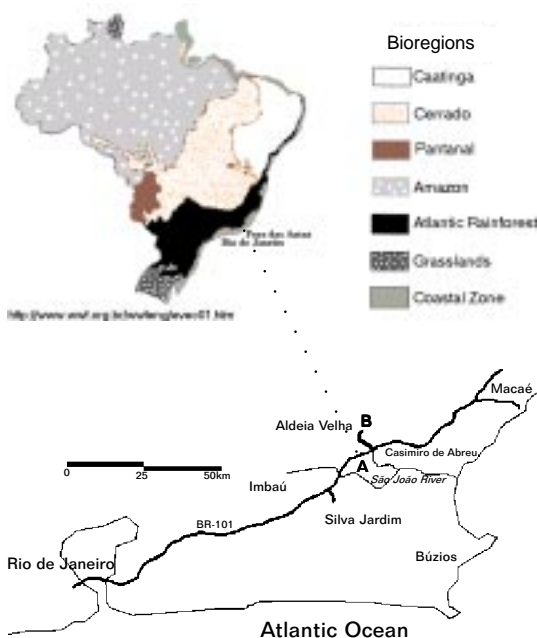


Fig.1: study areas. A: “Poço das Antas” Biological Reserve; B: Fazenda Bom Retiro (Natural Heritage Reserve)

reserve and inundates certain areas, causing the growth of characteristic species such as “pau de tamanco” (*Tabebuia cassinoides*), *Callophyllum brasiliense* and “guanandi” (*Symphonia globulifera*) (<http://www.jbrj.gov.br>); Area II - station located in secondary forest on the Bom Retiro Reserve. The vegetation consists of large trees (25-30m high), bushes, woody climbing plants, palms and epiphytes. It has been relatively little disturbed by human action but banana trees have been planted in the forest; Area III - station located in and around houses on the Bom Retiro Reserve. This area has been largely deforested and is now occupied by

human dwellings, animal shelters and plantations of manioc, palm heart, coconut, mango, papaya and other fruit trees. Illuminated Shannon trap (Alexander 2000) and human bait collections were used in peridomestic and forested sites while CDC light traps (Sudia & Chamberlain 1962) were used in domestic animal shelters and close to the burrows of wild animals. Area I was 22 km distant from Areas II and III, which were 483 m apart.

A total of 12 CDC light traps were distributed in the three study areas and remained at the collection stations for four consecutive days, being switched on from 6 p.m. to 6 a.m. every night. The traps were distributed as follows: Area I - two each at the Rodolfo Norte and Rodolfo Sul stations. CDC traps were placed close (~1m) to the burrows of wild animals, as well as 1m above the buttress roots of large trees; Area II - two each next to rock crevices on a mountainside and in a banana plantation; Area III - one trap placed in a manioc plantation, one in a chicken house and two in a stable containing horses and cattle.

Shannon traps manned by two human volunteers were used each night in different parts of Areas I and II. In Area III sand flies were collected simultaneously off human bait and the walls of houses. All these collections were made between 6 and 10 p.m.

During the two years of sampling daily temperature varied from 10-26°C during the period from June-August to 30-34°C in January-March. Relative humidity was 80-90% and annual rainfall approximately 2,400 mm.

An overall total of 24,234 sand flies were collected in 2,688 h of sampling. The total number of sand flies collected from Areas I, II and III and identified to species according to Young and Duncan (1994) are shown in Tables I, II and III, respectively. Seasonal changes in the number of sand flies collected are presented for the most common species in Fig. 2.

TABLE I

Sand fly fauna of Poço das Antas Biological Reserve (mature secondary forest), Silva Jardim, RJ, Brazil; July 1996 - June 1998

Sand fly species	CDC light trap		Shannon trap		Human bait	Total	%
	F	M	F	M	F		
<i>Lutzomyia edwardsi</i> (Mangabeira, 1941)	22	16	12	8	0	58	1,1
<i>L. shannoni</i> (Dyar, 1929)	15	23	14	17	1	70	1,3
<i>L. barrettoii</i> (Mangabeira, 1942)	16	9	9	28	0	62	1,2
<i>L. intermedia</i> (Lutz & Neiva, 1912)	32	19	28	23	2	104	1,9
<i>L. whitmani</i> (Antunes & Coutinho, 1939)	76	47	38	32	7	200	3,7
<i>L. ayrozai</i> (Barreto & Coutinho, 1940)	985	579	386	180	26	2,156	40,1
<i>L. hirsuta</i> (Mangabeira, 1942)	863	663	406	339	347	2,618	48,7
<i>L. monticola</i> (Costa Lima, 1932)	24	30	22	24	8	108	2,0
Total	3,419		1,566		391	5,376	100

The predominant species in Area I (mature secondary forest) were *Lutzomyia ayrozai* (Barretto & Coutinho) and *L. hirsuta* (Mangabeira), which accounted for 89% of all sand flies collected. The former was more abundant in the months with high temperature and humidity while the latter predominated during the cooler, drier months (Fig. 2). This species showed diurnal activity on cloudy days, although only small numbers of flies were collected during daylight hours (three females in August 1997, eight females in November 1997 and two females and six males in March 1998). Daytime activity of these species was previously observed by Aguiar and Soucaux (1984) and Aguiar et al. (1985) in the Serra dos Órgãos National Park, in the State of Rio de Janeiro. They made up 92% of all sand flies collected in the park and *L. hirsuta* was particularly anthropophilic in wooded areas, as observed during the present study (Tables I and II). This species was found infected by *Leishmania (Viannia)* sp. in Além Paraíba in the neighbouring State of Minas Gerais (Rangel et al. 1985).

As shown in Table II, the most abundant species in Area II were *L. hirsuta*, which comprised 38.8% of all sand flies collected, *L. fischeri* (Pinto) (15.4%) and *L. whitmani* (Antunes & Coutinho) (14.4%). These three species were collected throughout the year, albeit in greater number during the cooler, drier months. Samples from this area also included the first specimens of *L. misionensis* (Castro) to be collected in Rio de Janeiro. This species was described from a female collected in Argentina (Castro 1959). The male was described,

together with a redescription of the female, from specimens collected in Minas Gerais (Martins et al. 1977) and this species was subsequently collected in the Brazilian states of Bahia (Azevedo et al. 1996) and Rio Grande do Sul. Specimens from Rio Grande do Sul were found to be infected with *Le. (V.) braziliensis* (Silva & Grunewald 1999).

The predominant anthropophilic species in intra/peridomiciliary collections in Area III (Table III) was *L. intermedia* (Lutz & Neiva), as has been observed in other studies in Rio de Janeiro. Large numbers of *L. whitmani* and *L. migonei* (França) were also collected. These two species were abundant in the stable containing horses and cattle. *L. intermedia* predominated in both the manioc plantation and the chicken house. The differences in the relative frequencies of the three species collected by CDC light trap in the three stations are highly significant ($\chi^2 = 2,848.85$; $df = 11$; $p < 0.0001$) and consistent across collections (data not shown).

Both *L. whitmani* and *L. intermedia* have been considered as important vectors of ACL in Brazil (Aragão 1922, Forattini 1960, Mayrink et al. 1979, Rangel et al. 1984, 1990, Taniguchi et al. 1991, Falqueto 1995) and were both collected in all the study areas, *L. intermedia* was frequently collected around houses and *L. whitmani* was the third most abundant species in domestic animal shelters. Both species are abundant in the ACL focus of Posse, Rio de Janeiro, with *L. whitmani* being the more aggressive man-biter (Souza et al. 2000).

Further studies comparing the sand fly fauna of well-preserved and deforested areas are impor-

TABLE II

Sand fly fauna of Fazenda Bom Retiro Natural Heritage Reserve (secondary forest), Casimiro de Abreu, RJ, Brazil; July 1996 - June 1998

Sand fly species	Banana plantation					Total	%
	CDC light trap		Shannon trap		Human bait		
	F	M	F	M	F		
<i>Brumptomyia guimaraesi</i> (Coutinho & Barretto, 1941)	11	12	1	5	0	29	0,6
<i>Lutzomyia longipalpis</i> (Lutz & Neiva, 1912)	11	39	0	3	1	54	1,2
<i>L. fischeri</i> (Pinto, 1926)	183	193	143	163	6	688	15,4
<i>L. shannoni</i> (Dyar, 1929)	53	54	62	104	30	303	6,8
<i>L. barrettoi</i> (Mangabeira, 1942)	19	20	20	17	0	76	1,7
<i>L. intermedia</i> (Lutz & Neiva, 1912)	104	89	89	109	5	396	8,9
<i>L. whitmani</i> (Antunes & Coutinho, 1939)	182	130	134	125	72	643	14,4
<i>L. hirsuta</i> (Mangabeira, 1942)	484	526	299	349	75	1.733	38,8
<i>L. monticola</i> (Costa Lima, 1932)	76	60	62	48	15	261	5,8
<i>L. misionensis</i> (Castro, 1959)	81	75	60	72	0	288	6,4
Total	2,402		1,865		204	4,471	100

tant to our understanding of how environmental changes might affect the transmission of *Leishmania* in Rio de Janeiro and other parts of Brazil. The results of such studies could also help to explain the increasing urbanization of ACL and how this might be related to changes in sand fly fauna composition and behaviour.

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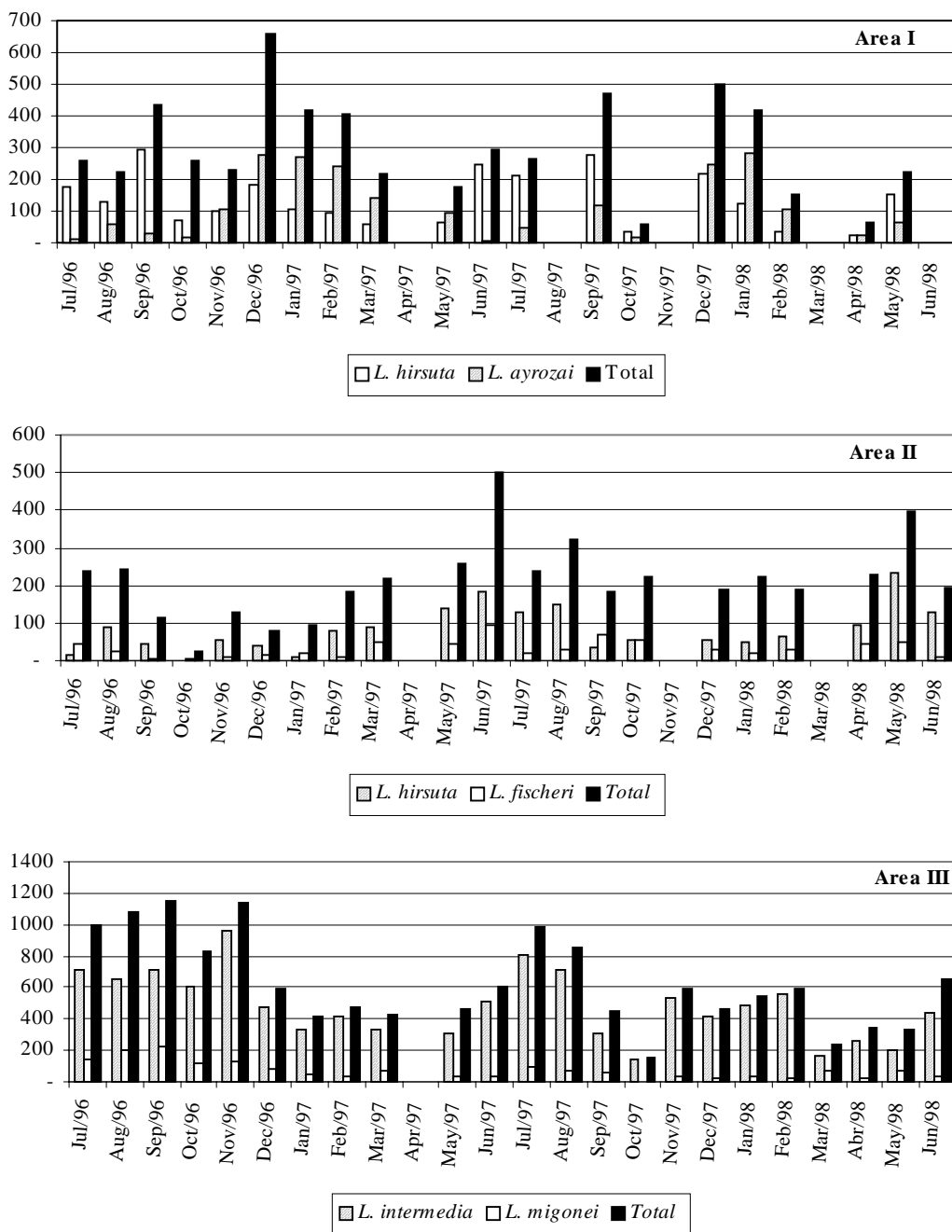


Fig. 2: seasonal variation in the numbers of the most common species collected in each of the three study areas: Area I: mature secondary forest; Area II: secondary forest; Area III: in and around houses

TABLE III
Sand fly fauna of Fazenda Bom Retiro Natural Heritage Reserve (peridomestic area), Casimiro de Abreu, RJ, Brazil; July 1996 - June 1998

Sand fly species	Cattle/Equine stable				Chicken house				Mantoc plantation				Total	%
	CDC light trap		Walls of houses		Human bait		CDC light trap		Shannon trap		Human bait			
	F	M	F	M	F	M	F	M	F	M	F	M		
<i>Lutzomyia longipalpis</i> (Lutz & Neiva, 1912)	64	110	3	23	0	0	0	37	33	30	43	7	350	2.4
<i>L. migonei</i> (França, 1920)	552	680	132	121	4	3	0	37	21	50	36	13	1,649	11.5
<i>L. intermedia</i> (Lutz & Neiva, 1912)	778	936	1,783	1,958	45	82	14	1,609	1,732	680	942	493	11,052	76.8
<i>L. whitmani</i> (Antunes & Coutinho, 1939)	227	268	49	53	4	6	0	55	82	200	217	29	1,190	8.3
<i>L. monticola</i> (Costa Lima, 1932)	0	0	0	0	0	0	0	3	37	40	46	20	146	1.0
Total	3,615	4,122	144	14	3,646	2,284	562	14,387	100					

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