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STUDIES ON SANDFLY FAUNA (DIPTERA: PSYCHODIDAE) IN A FOCI OF CUTANEOUS LEISHMANIASIS IN MESQUITA, RIO DE JANEIRO STATE, BRAZIL

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In a study on vectors of cutaneous leishmaniasis in Mesquita, Rio de Janeiro State, Brazil, eleven species of sandflies were found: Lutzomyia longipalpis, L. fischeri, L. quinquefer, L. intermedia, L. whitmani, L. shannoni, L. cortelezzii, L. edwardsi, L. migonei, L. lanei *and* L. firmatoi.

Lutzomyia intermedia *was the predominant species. It was collected indoors but in much higher numbers outdoors, in the close vicinity of houses. In comparative captures it was found to feed more frequently on equines, and less frequently on man and dogs. Studies, using man and animals as baits, showed that blood-feeding started in the evening, and remained stable during the night, until early morning. June, August and October were the months of highest density.*

Key words: ecology – sandfly fauna – cutaneous leishmaniasis – Rio de Janeiro State

An outbreak of cutaneous leishmaniasis focus in Mesquita, Nova Iguaçu Municipality, Rio de Janeiro State (Oliveira-Neto et al., 1985, 1988), prompted us to carry out an epidemiological study on domestic hosts and vectors. Some observations were made on the frequency of infection in dogs and equines and its distribution in relation to the human population (Aguilar & Rangel, 1986; Aguilar et al., 1986, 1987a). The parasites isolated from humans and domestic animals were isolated and characterized (Aguilar et al., 1987b).

Work on the local sandflies was initiated in October 1984, at the time of the outbreak, and was interrupted in April 1985 due to the DDT compaign undertaken by SUCAM in the area; work was recommenced in November 1986. The aim of this work was to gain knowledge on local sandfly species and some aspects of their biology, as well as to indicate the presence of vectors in connection with the occurrence of human cases and infected domestic animals.

MATERIALS AND METHODS

Study area – The Mesquita neighbourhood, in Nova Iguaçu Municipality, is located in the peri-urban area of Rio de Janeiro city on the Atlantic border of Maciço de Gericinó at 23°10' latitude South and 43°34' longitude West.

Meteorological information is indicated in Table I.

Stations for sandly capture – In the years 1984 and 1985 we chose a house located in Alba Street (Station I) as our place of work. In it there were both patients and dogs with leishmaniasis. When recommencing our research work at the end of 1986, we established two collecting stations in Rua da Serra: II, a house with patients and positive dogs, and III, another house with infected patients, dogs and equines.

The captures were carried out weekly between 6 p.m. and 9 p.m. and consisted of simultaneous collections, in dwelling-places, from human bait and from walls; in the peri-domestic areas from human bait and animal bait (dogs and equines); and collections with CDC light traps indoors and in the surrounding areas (chicken houses), and in a banana plantation next to a secondary forest.

For the study of biting-frequency, captures during 12 consecutive hours were undertaken in the peri-domiciliary areas (Station III): 3 on human bait and 1 on a mule.

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TABLE I

Yearly meteorological data, Mesquita, Rio de Janeiro State, 1984 to 1987

Years	Average temperature (°C)	Relative humidity (%)	Rainfall (mm)
1984	17,3 – 28,8	79	1454,4
1985	16,4 – 27,7	80	2582,9
1986	16,6 – 28,5	80	1902,3
1987	16,4 – 28,0	81	2179,1

RESULTS

Sandfly fauna – During 354 hours of collection in the 3 stations, we captured a total of 7664 sandflies belong to the following species, based on the taxonomic features given by Martins et al. (1978):

Lutzomyia (Lutzomyia) longipalpis (Lutz & Neiva, 1912)

Lutzomyia (Pintomyia) fischeri (Pinto, 1926)

Lutzomyia (Helcocyrtomyia) quinquefer (Dyar, 1929)

Lutzomyia (Nyssomyia) intermedia (Lutz & Neiva, 1912)

Lutzomyia (Nyssomyia) whitmani (Antunes & Coutinho, 1939)

Lutzomyia (Psathyromyia) shannoni (Dyar, 1929)

Lutzomyia cortelezzii (Brèthes, 1923)

Lutzomyia edwardsi (Mangabeira, 1941)

Lutzomyia migonei (França, 1920)

Lutzomyia lanei (Barreto & Coutinho, 1941)

Lutzomyia firmatoi (Barreto, Martins & Pellegrino, 1956)

The predominance of *L. intermedia* (83%) over the other collected species was very evident. *L. migonei* (15.8%) was the next most predominant, the other species appearing in much lower percentages (Table II).

Distribution of species according to the site and type of capture – Table III shows the distribution of species collected indoors and in peri-domiciliary areas, with the use of different baits and methods of capture: 560 specimens (7.3%) were collected from indoors and 7098 (92.6%) from peri-domiciliary areas.

Sandflies collected inside dwellings were restricted to *L. intermedia, L. migonei, L. longipalpis, L. fischeri, L. quinquefer,* and *L. lanei. L. intermedia* was predominant with 458 specimens collected off the walls; a number which far surpassed the number (61) caught feeding on people (Table III).

The other species appeared in much lower numbers: 5.7%, 0.9%, 0.2%, 0.3%, and 0.2% respectively.

TABLE II

Sandfly fauna of Mesquita, Rio de Janeiro State. Number and percentage of species. Periods: October/1984 to March/1985; January to December/1987

Species	Number			
	Females	Males	Total	%
L. longipalpis	13	50	63	0.8
L. fischeri	7	1	8	0.1
L. quinquefer	11	9	20	0.3
L. intermedia	4457	1900	6357	83.0
L. whitmani	1	–	1	0.0
L. shannoni	1	–	1	0.0
L. cortelezzii	3	–	3	0.0
L. edwardsi	2	–	2	0.0
L. migonei	188	1019	1207	15.8
L. lanei	1	–	1	0.0
L. firmatoi	1	–	1	0.0
Total	4685	2979	7664	100.0

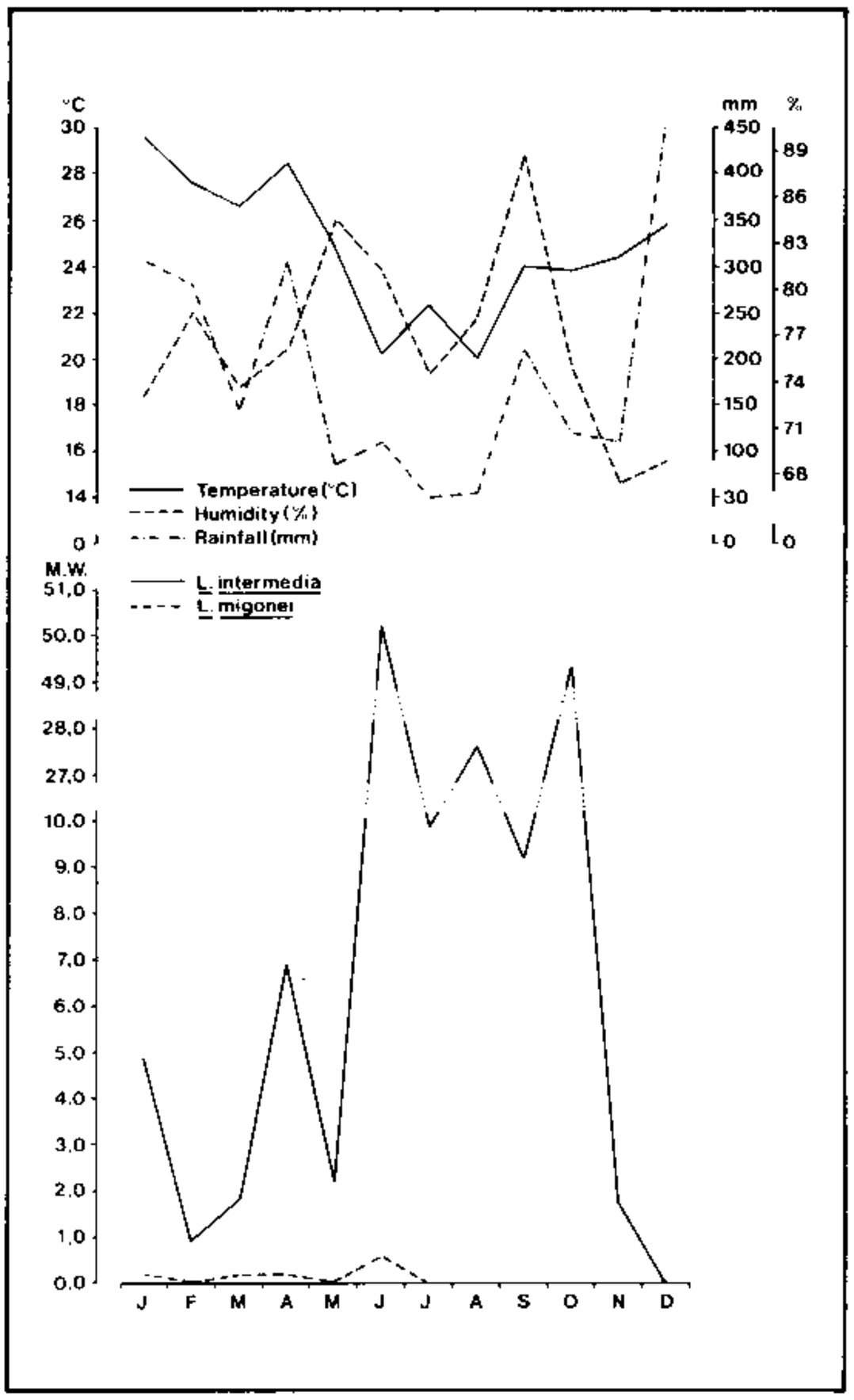
Ten out of the 11 species collected in the region were present in peri-domestic areas, using the different trapping methods. *L. intermedia* was predominant (82.2%), the next most abundant being *L. migonei* (16.5%) and *L. longipalpis* (0.8%). Higher catches (44.1%) of *L. intermedia* resulted from the use of animal baits and the indices were 18.8% and 18.9% for light traps and human baits respectively. *L. migonei* was more frequent in captures utilizing animal baits (57.8%), but this was not the case for *L. longipalpis;* 50.0% of which were caught off human baits. Four other species were caught from human baits, namely *L. fischeri, L. whitmani, L. shannoni* and *L. cortelezzii.*

In Station I, light traps were set about 800 m away from the house and near to the secondary forest. Captures were very poor, with only 5 specimens of *L. intermedia* and 1 of *L. migonei.*

TABLE III

Sandfly fauna of Mesquita, Rio de Janeiro State. Frequency of species caught in different sites and with different baits. Periods: October/1984 to March /1985; January to December/1987

	Indoors				Outdoors										In plantation CDC light trap		Total	
	Wall		Man		Wall		Man		Equine		Dog		Chicken house					
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
L. longipalpis	1	4	–	–	5	3	7	22	–	18	–	1	–	2	–	–	13	50
L. fischeri	1	–	–	–	–	–	4	–	1	1	–	–	1	–	–	–	7	1
L. quinquefer	2	–	–	–	7	9	–	–	2	–	–	–	–	–	–	–	11	9
L. intermedia	351	107	49	12	374	683	1079	24	1825	413	274	60	502	599	3	2	4457	1900
L. whitmani	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	1	–
L. shannoni	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	1	–
L. cortelezzii	–	–	–	–	2	–	1	–	–	–	–	–	–	–	–	–	3	–
L. edwardsi	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	2	–
L. migonei	19	13	–	–	2	2	4	13	78	600	–	1	85	389	–	1	188	1019
L. lanei	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
L. firmatoi	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–
Total	375	124	49	12	390	697	1097	59	1907	1032	276	62	588	990	3	3	4685	2979
	499		61		1087		1156		2939		338		1578		6		7664	



Monthly frequency of *Lutzomyia intermedia* and *L. migonei;* temperature, humidity and rainfall.

Feeding preferences – Table IV gives the frequency of different sandfly species comming to different baits in Stations I and III.

It was shown that equines attracted the greatest number of sandflies in general, with a predominance of *L. intermedia.*

In Station I, collections from human and equine bait included *L. intermedia, L. migonei, L. longipalpis,* and *L. fischeri. L. cortelezzii,* however, was only obtained from human bait. Whether from man or horse, *L. intermedia* was the predominant species although the catching-rate was much higher from the animal bait. Larger numbers of *L. migonei* were also attracted to animals compared with those coming to man. *L. longipalpis* was caught in relatively small numbers and showed a slight preference for animal bait.

In Station III, we confirmed that *L. intermedia* and *L. migonei* were attracted by all 3 baits in the collections from man, dog and equines. *L. intermedia* was predominant and was more attracted by equines, from which the catching-rate was high compared with that from other baits.

With regard to man and dogs as bait, *L. intermedia* formed the bulk of the catch, while the catching rate for *L. migonei* was highest from equines. *L. longipalpis* was only present in collections from human baits and dogs, chiefly from the former. *L. whitmani* and *L. shannoni* were only attracted by man whereas *L. edwardsi* and *L. quinquefer* were collected only from dogs and equines, respectively.

Catching-rates – We found that *L. intermedia* started feeding on man at 6 p.m., the attack-rate intensifying at 7 p.m., remaining at significant levels until 12.0 at night. The number caught then decreased but increased again during the period between 3 a.m. and 6 a.m. From animals was obtained a low density of *L. intermedia* during the first period, after which the numbers increased to a higher level until 3 a.m. The number diminished after this time. The number of female specimens of *L. intermedia* taken from both baits was much higher than that of males.

Lutzomyia migonei was constantly present and attracted by both baits, although the largest catch was between 9 p.m. and 12.0 at night, on animal bait. Contrary to *L. intermedia* species the number of male *L. migonei* specimens caught was higher than that of females.

During the 6 months of these studies, no flies were captured between 9 a.m. and 5 p.m.

Monthly frequency of sandfly species – We only took into account the captures made with human bait in the peri-domestic areas (Table V). No collection was possible in December.

Out of the 5 species collected, *L. intermedia* is considered as being predominant, it being present all the year round, with a total of 983 specimens. The highest catching rates were in June (50.2), August (27.6) and October (49.3). Analysis of the meteorological data during the time of capture suggests an inverted correlation between the monthly species frequency and the

TABLE IV

Sandfly fauna of Mesquita, Rio de Janeiro State. Frequency of species coming to different baits.
Periods: October/1984 to March/1985; January to December/1987

	Station I								Station III											
	Man				Equine				Man				Dog				Equine			
	F	M	T	HM	F	M	T	HM	F	M	T	HM	F	M	T	HM	F	M	T	HM
L. longipalpis	1	16	17	0.5	–	18	18	0.6	6	6	12	0.2	–	1	1	0.0	–	–	–	–
L. fischeri	4	–	4	0.1	1	1	2	0.1	–	–	–	–	–	–	–	–	–	–	–	–
L. quinquefer	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	2	0.2
L. intermedia	107	13	120	3.4	808	357	1165	35.8	972	11	983	14.9	274	60	334	8.0	1017	56	1073	33.1
L. whitmani	–	–	–	–	–	–	–	–	1	–	1	0.0	–	–	–	–	–	–	–	–
L. shannoni	–	–	–	–	–	–	–	–	1	–	1	0.0	–	–	–	–	–	–	–	–
L. cortelezzii	–	1	1	0.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
L. edwardsi	–	–	–	–	–	–	–	–	–	–	–	–	2	–	2	0.1	–	–	–	–
L. migonei	2	6	8	0.2	49	415	464	14.3	2	7	9	0.1	–	1	1	0.0	29	185	214	6.6
L. lanei	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
L. firmatoi	–	–	–	–	1	–	1	0.0	–	–	–	–	–	–	–	–	–	–	–	–
Total	115	35	150	4.2	859	791	1650	50.8	982	24	1006	15.2	276	62	338	8.1	1048	241	1289	39.7
Trapping-hours	35:30				32:30				66:05				41:40				32:30			

TABLE V

Sandfly fauna of Mesquita, Rio de Janeiro State. Monthly catches of *Lutzomyia intermedia* and *L. migonei* with human bait. (Station III). Period: January to December/1987

	Jan.		Fev.		Mar.		Apr.		May.		Jun.		Jul.		Ago.		Sept.		Oct.		Nov.		Dec.		Total	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
L. intermedia	24	3	4	1	8	–	59	1	10	–	392	1	77	1	152	–	46	–	193	4	7	–	–	–	972	11
L. migonei	–	1	–	–	1	–	–	2	–	–	1	4	–	–	–	–	–	–	–	–	–	–	–	–	2	7
Total	24	4	4	1	9	–	59	3	10	–	393	5	77	1	152	–	46	–	193	4	7	–	–	–	974	18
Catching-hours	5:30		5:30		4:30		8:45		4:30		7:50		8:00		5:30		5:00		4:00		4:00		3:00		66:05	

temperature, since the lowest temperatures were observed during the months when there was the highest density of sandflies. In addition, during these months, the rainfall indices (109.1, 31.9 and 121.1 mm respectively) were lower than average (181.6 mm).

The lowest species densities were obtained during the months of January, February and April, when the highiest pluviometric indices were registered.

Lutzomyia migonei only appeared in the first semester in January, March, April and June, with insignificant catching-rates.

DISCUSSION

The above studies in the cutaneous leishmaniasis focus in Mesquita has indicated the presence of 11 species of sandflies, and show a great predominance of *L. intermedia.* Second in frequency was *L. migonei,* but the numbers caught were substantially less.

The data obtained from the several capture-methods used showed a significant percentage of sandflies within houses, but mainly in peridomiciliary areas. In both surroudings *L. intermedia* was predominant and it was present in every type of collection. Previous studies have already pointed out the occurrence of *L. intermedia* in domestic surroundings (Lutz & Neiva, 1912; Aragão, 1922; Guimarães, 1955; Araújo Fº, 1979; Rangel et al., 1986).

In spite of its high degree of antropophilia, *L. intermedia* appeared to be strongly attracted to dogs and equines. That man would be a good bait, in addition to dogs, was suggested by this species' tendency to seek domiciliary surroundings (Araújo Fº, 1979; Rangel et al., 1986).

Wild rodents were not tested as baits, but further studies suggest that the zoophilia of the referred species is more orientated towards domestic animals. Furthermore, with regard to feeding habits, we found a high density of *L. intermedia* in chicken houses next to dwellings, a fact that had already been observed by other authors (Araújo Fº, 1979; Rangel et al., 1986). According to Lane (1986), chicken houses can serve as shelters for female sandflies during blood digestion or even serve as a breeding place and could probably influence the mechanism of cutaneous leshmaniasis transmission.

Within the Mesquita focus, in some dwellings and in neighbouring areas, we observed the simultaneous presence of *L. intermedia* and dogs, equines, and man infected with *Leishmania (V.) braziliensis.* For this reason we think that a peri-domiciliary transmission involving domestic animals may be occuring. On the other hand, we cannot dismiss the likelihood of a primary silvatic cycle, although we have little knowledge about wild reservoirs in the region.

In spite of the fact that experimental transmission of *Leishmania (V.) braziliensis* by the bite of *L. intermedia* has not been experimentaly achieved, the epidemiological evidences suggest it to be the most likely vector of cutaneous leishmaniasis in Rio de Janeiro State (Aragão, 1922; Guimarães & Bustamante, 1954; Guimarães, 1955; FIOCRUZ, 1974; Araújo Fº, 1979; Rangel et al., 1984, 1986).

The seasonal variation of the species in the area of study does not agree with that of former studies (Araújo Fº, 1979), in which the highest sandfly density was observed in the months of June, August and October, which present the lowest temperaturres. Forattini (1973) remarks on the irregular behaviour of the species which present higher population densities in the coldest periods of the year.

Lutzomyia migonei has previously been indicated as a vector (Araújo Fº, 1979; Rangel et al., 1986), but in the present study area this sandfly appeared in low percentages. As in other studies *L. migonei* was present in dwellings, although its higher density, was found in peridomiciliary areas and mainly when using animal bait. Although it is anthropophilic, we think in the Mesquita area it is of no importance in the mechanism of transmission to man.

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