ARTIGO ORIGINAL

THE OCCURRENCE OF PHLEBOTOMINES (*Diptera psychodidae)* IN A LEISHMANIASIS-ENDEMIC AREA[1]

OCORRÊNCIA DE FLEBOTOMÍNEOS (*Diptera psychodidae*) EM ÁREA ENDÊMICA DE LEISHMANIOSES

Antonia S GUIMARÃES-E-SILVA[2]; Francisco S LEONARDO[3]; Erlen R e Silva COSTA[4]; Sérgio H de ALCÂNTARA[5]; Valéria C Soares PINHEIRO[6] e José M Macário REBÊLO[7]

SUMMARY

Objective: we describe the occurrence of phlebotomines in urban areas of Caxias, Maranhão state, where autochthonous cases of visceral leishmaniasis (kala azar) and tegumentary leishmaniasis were reported. **Method**: The phlebotomines were captured in 40 districts in the periods January to December 2001, May to November 2004, and January to November 2005 using CDC light traps installed from 6 pm to 6 am in the houses and peridomiciles. **Results**: a total of 28,336 specimens (21,006 males and 7,330 females) from 11 species were collected. Ten of the species belonged to the genus *Lutzomyia* and one to the genus *Brumptomyia*. The most abundant species was *Lutzomyia longipalpis* (93.7%), which was also the most widely distributed in the city, followed by *L. whitmani* (5.2%). **Conclusions**: this pattern of abundance indicates that these were the two species best adapted to the urban environment, and they were thus incriminated in the transmission of the cases of kala azar (*Lutzomyia longipalpis*) and tegumentary leishmaniasis (*L. whitmani*) reported in Caxias. The other species were considered occasional or rare visitors to the areas.

KEY WORDS: *Lutzomyia*, Phlebotomines, Survey, Leishmaniasis

INTRODUCTION

Phlebotomines (order Diptera, suborder Nematocera, family Psychodidae) have been systematically targeted in studies in various parts of Brazil because of their role as a vector of protozoa from the genus *Leishmania* (Kinetoplastida, Trypanosomatidae), etiologic agents of visceral leishmaniasis (VL) and tegumentary leishmaniasis (TL).

Many studies report an association between phlebotomines and both peridomiciles and houses in the Northeastern (Brandão-Filho *et al.* 1994), Southeastern (Mayo *et al*. 1998, Rangel *et al*. 1990), Midwestern (Santos *et al*. 2003) and Southern (Aguiar *et al*. 1989) regions of Brazil. However, reports of these insects in urban environments in medium to large cities appear to be limited to the vector of VL, *L. longipalpis* (Costa *et al*. 1990).

In the state of Maranhão, species of epidemiologic importance such as *L. umbratilis, L. flaviscutellata* and *L. wellcomei* have been found to be associated to a greater or lesser extent with peridomiciles in small rural communities (Araújo *et al*. 2000, Carvalho *et al*. 2000). More recently, Leonardo & Rebêlo (2004) reported the presence of *L. whitmani* in small urban areas.

Urban transmission of TL and VL is suspected to be occurring in the municipality of Caxias. Of a total of 1,198 cases of TL reported from 1993 to 1998, 65.9% (790

[1] Trabalho realizado no Centro de Zoonoses de Cidade de Caxias, Maranhão.
[2] Bióloga, formada pela Universidade Estadual do Maranhão.
[3] Ensino Médio, pela Escola São José.
[4]Zootecnista, pelo Instituto de Ensino Superior Múltiplo.
[5] Ensino Médio, pelo Centro Educacional Cenecista Codoense.
[6]Bióloga, formada pela Universidade Estadual do Maranhão.
[7] Biólogo, formado pela Universidade Federal do Maranhão.

cases) were registered in urban areas, while 34.1% (408 cases) occurred in rural areas. There was a proportional increase in the number of urban cases in the period from 2000 to 2007, as 98.7% of the 388 cases notified (Sinan, 2007) were considered autochthonous to this area. These were distributed as follows: 2000 (4 cases); 2001 (40); 2002 (114); 2003 (85); 2004 (49); 2005 (64); 2006 (15); and 2007 (12). Only 1.28% (5 cases) were registered in rural areas; these were distributed as follows 2002 (3 cases), 2005 (1) and 2007 (1).

With regard to VL, 86 cases were registered from 1993 to 1998, 70.9% (61) of which were in urban areas and 29.1% (25) in rural areas. The incidence of VL increased noticeably at the turn of the century, with 608 cases notified from 2000 to 2007, of which 94.4% (574) were in urban areas — 2000 (144 cases), 2001 (98), 2002 (71), 2003 (91), 2004 (45), 2005 (61), 2006 (47) and 2007 (14) — and 5.59% (34 cases) in rural areas — 2003 (15 cases), 2004 (05), 2005(04), 2006 (09) and 2007 (only 01 case) (Sinan, 2007).

This study was carried out because of the very high number of leishmaniasis cases notified to Caxias Town Hall and had as its objective to investigate the phlebotomine species found in peridomiciliary and domiciliary areas in urban foci of TL and VL.

MATERIALS AND METHODS

Area description - The municipality of Caxias covers an area of 5,313.2 km^2 and is located in the northeast of the state of Maranhão on the river Itapecuru. To the north it has borders with the municipal districts of Codó, Aldeias Altas and Coelho Neto; to the south with the districts of São João do Sóter, Parnarama and Matões; to the east with the district of Timon and the state of Piauí; and to the west with the municipal district of Gonçalves Dias (IBGE, 2000).

It has a population of 143,682, of whom 108,250 live in urban areas and only 35,432 in rural areas. The annual population growth rate is 1.06%, and the population density 25 inhabitants/km^2.

The main economic activities of the population are based on agriculture, commerce and plant extractivism, and the babassu nut is the region's main product. The predominant plant cover is typical of the Zona dos Cocais, which is a transition area between the Amazon forest and the caatinga (Rios 2001). Because of its location near the equator, the area has a climate characterized by high temperatures that vary little throughout the year; annual rainfall exceeds 1,200 mm and occurs mainly between December and July.

The study area itself was the town of Caxias, the center of which is located at 4°51'32" SL and 43°21'2" WL at an average altitude of 67 meters above sea level. The study focused on the city center and all the districts in which leishmaniasis cases had or had not been previously registered. However, autochthonous cases of TL and VL were reported both prior to and during the study in most of the locations.

Phlebotomine captures - The study was carried out from January to May 2001, from May to November 2004 and from January to November 2005. The phlebotomines were collected with CDC light traps installed from 6 pm to 6 am in peridomiciles and inside dwellings.

In 2001 an entomological survey was carried out in seven districts in which there were reports of autochthonous cases of VL and TL: Mutirão, Conjunto Cohab, Pai Geraldo, Residencial Dinir Silva, Nova Caxias, Refinaria and João Viana. In each district eight dwellings with domestic animals were chosen, giving a total of 56 homes. Two traps were installed in each home: one inside the dwelling and another in the peridomicile (animal shelter), giving a total of 112 traps. Fifty-six of these were inside homes and 56 in animal shelters in peridomiciles: 3 kennels, 6 stables, 2 hamster cages, 12 pigsties and 33 chicken coops. The distance from the shelters to the dwellings varied from five to ten meters, and each trap was in operation for 60 hours (12 hours x 5 nights). The total effort calculated on the basis of 112 traps used for

12 hours for each of 5 nights was 6,720 hours, of which 3,360 were inside dwellings and 3,360 inside animal shelters, broken down as follows: kennels (180 hours), stables (360), hamster cages (120), pigsties (720) and chicken coops (1,980).

In 2004 and 2005, 40 districts located in the five areas of the town of Caxias were studied: Central (Pequizeiro, Vila Alecrim, Cangalheiro, Centro, Castelo Branco, Refinaria, Baixinha, Galeana and Matadouro Velho); North (Teso Duro, Cajueiro, Alto Seriema, São Francisco, Antenor Viana and Bacuri); South (Fumo Verde, Veneza, Itapecuruzinho, Residencial Constantino Castro, Residencial Pampulha, Vila São José, Volta Redonda and Vila Lobão); East (Pai Geraldo, Residencial José Castro, Mutirão, João Viana, Cohab, Nova Caxias, Residencial Hélio Queiroz and Residencial Dinir Silva); West (Tamarineiro, Salobro, Campo de Belém, Ponte, Trezidela, Vila São João, Fazendinha, Pirajá and Caldeirões).

A total of 497 houses were investigated, and in each one a single trap was installed, either inside the dwelling (11 homes) or in the peridomicile (486 homes). In the latter category, 427 had domestic animals as bait, made up as follows: pigs (185 homes), chickens (197), horses (19), dogs (11), cattle (8), rabbits (4), monkey (1), goat (1) and duck (1); in 59 homes there was no bait in the peridomicile. Each trap was used continuously for 12 hours (6 pm to 6 am), giving a total capture time of 5,964 hours.

The phlebotomine specimens collected were identified taxonomically in the FUNASA Entomology Laboratory in Codó, Maranhão, (2001) and in the Entomology Laboratory at the Center for Zoonoses Control in Caxias, Maranhão, (2004 to 2005) with the aid of the identification key proposed by Young and Duncan (1994).

RESULTS

Eleven phlebotomine species distributed between two genera - *Brumptomyia* França and Parrot, 1921, and *Lutzomyia* França, 1924 - were found: *B. avellari* (Costa Lima, 1932), *L. longipalpis* (Lutz & Neiva, 1912); *L. whitmani* (Antunes & Coutinho, 1939); *L. evandroi* (Costa Lima & Antunes, 1936); *L. lenti* Mangabeira, 1938; *L. termitophila* Martins, Falcão & Silva, 1964; *L. trinidadensis* (Newstead, 1922); *L. sordellii* (Shannon & Del Ponte, 1927); *L. flaviscutellata* (Mangabeira, 1942); *L. cortelezii* (Brethes, 1924); and *L. sallesi* (Galvão & Coutinho, 1939).

A total of 28,336 phlebotomine specimens were collected, made up of 21,006 males (74.1%) and 7,330 females (25.9%). The predominant species was *L. longipalpis* (93.7%), followed by *L. whitmani* (5.2%). The remaining species all had frequencies of less than 1% (Tab. I).

In 2001 the frequencies were higher in the animal shelters (88%) than in the dwellings (22%). The average numbers of species captured per trap-hour were as follows: chicken coops (3.1), pigsties (1.2), stables (0.9), hamster cages (0.9), kennels (0.2) and dwellings (0.3) (Tab. II).

Because the number of traps in the dwellings and peridomiciles was different in 2004 and 2005, these two environments were not compared. Nevertheless, analysis of the average number of specimens captured per trap-hour showed that the highest values were for the peridomicile without bait (5.6), followed by chicken coops (4.0); stables (3.8); kennels (2.7); pigsties, goat pens and dwellings (2.5 each); cattle pens (2.2); and monkey shelters (0.3) (Tab. III).

Table IV shows the phlebotomine capture rate in each area of the town. In 2001 the eastern area of the town accounted for 91.2% of the specimens captured (a value that can be attributed to the greater number of homes investigated) and also had a greater capture rate (1.3 specimens per trap-hour) than that observed in the central area (0.8). In 2004 and 2005, the western and central areas of the town accounted for the greatest percentage of specimens captured (29.9% and 22.9%, respectively), but the capture rate was higher in the western and southern areas (4.2 and 3.7, respectively), followed by the central area (3.2)

DISCUSSION

The abundance of phlebotomine species observed in urban areas of Caxias was similar to that observed in rural and semi-rural areas of northeastern Maranhão state, such as Raposa, on the island of São Luís, and the municipality of Codó, beside Caxias, where eleven and ten species, respectively, were found (Rebêlo *et al*., 1999; Araújo *et al*., 2000).

TABLE I

Number of phlebotomines specimens collected in urban area of the town of Caxias, State of the Maranhão, from January to May 2001, May to November 2004 and January to November 2005

Species	Males	Females	Total	%
L longipalpis	19,645	6,916	26,561	93.700
L whitmani	1,194	300	1,494	5.200
L evandroi	48	66	114	0.400
L lenti	81	40	121	0.420
L termitophila	9	4	13	0.040
L trinidadensis	4	1	5	0.010
L sordellii	2	1	3	0.010
L flaviscutellata	-	1	1	0.003
L cortelezii	1	-	1	0.003
L sallesi	-	1	1	0.003
B avellari	22	-	22	0.070
Total	21,006	7,330	28,336	100.000
%	74.1	25.9	100.0	

fonte: Laboratório de Entomologia - CCZ, Caxias, MA.

TABLE II

Number of phlebotomines specimens collected in peridomiciles and inside dwellings of the town of Caxias, state of Maranhão, from January to May 2001

Dwellings	Peri					Intra	Total	
Species/animal shelters	Cc	Pg	St	Hc	Ke	Ho	Nº	%
L. longipalpis	5,904	774	285	105	41	989	8,098	96.2
L. whitmani	86	61	22	-	-	04	173	2.1
L. evandroi	47	05	02	-	-	14	68	0.8
L. lenti	58	-	-	-	-	-	58	0.7
L. termitophila	10	03	-	-	-	-	13	0.1
L. trinidadensis	-	-	-	-	-	02	02	0.0

L. sordelli	02	-	-	-	-	-	02	0.0
Specimen numbers	6,107	843	309	105	41	1,009	8,414	100.0
Capture time (Hours) workeds	1,980	720	360	120	180	3,360	6,728	
Average numbers	3.1	1.2	0.9	0.9	0.2	0.3	1.3	

Cc = Chicken coops; Pg = Pigsties; St = Stables; Hc = Hamster cages; Ke = Kennels; Ho = Homes.

Fonte: Laboratório de Entomologia - CCZ, Caxias, MA.

TABLE III

Number of phlebotomines specimens collected in peridomicile and inside dwellings in the town of Caxias, state of Maranhão, from May to November 2004 and January to November 2005

Environment	*Peridomicile*						*Intra*				
Species	Cc	Pg	St	Ke	Go	Mo	Ca	Nb	Re	Total	%
B. avellari	-	21	01	-	-	-	-	-	-	22	0,11
L. longipalpis	8,796	7,631	900	328	20	01	153	279	355	18,463	92.67
L. whitmani	233	1.013	12	23	10	02	12	15	01	1.321	6.63
L. evandroi	09	21	02	-	-	-	08	05	01	46	0.23
L. Lenti	20	23	01	-	-	-	14	05	-	63	0.31
L. flaviscutellata	-	-	-	-	-	-	01	-	-	01	0.005
L. sordellii	01	-	-	-	-	-	-	-	-	01	0.005
L. trinidadensis	-	-	-	-	-	-	-	-	03	03	0.015
L. cortelezzii	01	-	-	-	-	-	-	-	-	01	0.005
L. sallesi	01	-	-	-	-	-	-	-	-	01	0.005
Specimen numbers	9,060	8,709	916	351	30	03	188	304	360	19,922	100.0
Capture time (hours)	2,292	3,468	240	132	12	12	84	54	144	7,092	
Average numbers	4.0	2.5	3.8	2.7	2.5	0.3	2.2	5.6	2.5	2.8	

Cc = chicken coops; Su = pigsties; St = stables; Ke = kennels; Go = goat; Mo = monkey; Ca = cattle; Nb = no bait; Ho = Homes.

Fonte: Laboratório de Entomologia - CCZ, Caxias, MA.

TABLE IV

Average number of phlebotomines specimens collected in urban zones of Caxias, state of Maranhão, from January to May 2001, from May to November 2004 and from January to November 2005

Year	Areas	Total of mosquitoes collected	Total of home	Capture time (hours)	Average $\bar{X}$
2001	Central	738	16	960	0.8
	Eastern	7,676	96	5,760	1.3
	Total	8,414	112	6,720	1.3
2004-2005	Central	4,556	119	1,428	3.2
	Southern	3,594	81	972	3.7
	Western	5,947	119	1,428	4.2

Eastern	2,946	80	960	3.1
Northern	2,879	98	1,176	2.4
Total	19,922	497	5,964	3.3

Fonte: Laboratório de Entomologia - CCZ, Caxias, MA.

RESUMO

OCORRÊNCIA DE FLEBOTOMÍNEOS (*Diptera psychodidae*) EM ÁREA ENDÊMICA DE LEISHMANIOSES

Antonia S GUIMARÃES-E-SILVA; Francisco S LEONARDO; Erlen R e Silva COSTA; Sérgio H de ALCÂNTARA; Valéria C Soares PINHEIRO e José M Macário REBÊLO

Objetivo: descreve-se a ocorrência de flebotomíneos em áreas urbanas com notificação de casos autóctones de leishmaniose visceral (calazar) e leishmaniose tegumentar. **Método**: nos períodos de janeiro a dezembro de 2001, maio a novembro de 2004 e janeiro a novembro de 2005 foram feitos inquéritos entomológicos de flebotomíneos em 40 bairros da cidade de Caxias, estado do Maranhão. Os espécimes foram coletados utilizando-se armadilhas luminosas do tipo CDC instaladas das 18 às 6 horas, no peri e intradomicílio. **Resultados**: foram coletados 28.336 espécimes (machos: 21.006; fêmeas: 7.330), de 11 espécies, sendo 10 pertencentes ao gênero *Lutzomyia* e 1 ao gênero *Brumptomyia*. A espécie mais abundante foi *L. longipalpis* (93,7%) e também a mais bem distribuída dentro da cidade, seguida por *L. whitmani* (5,2%). **Conclusões**: por esse padrão de abundância, verifica-se que essas duas espécies são as mais bem adaptadas ao ambiente urbano, sendo atraídas principalmente por galinheiros, chiqueiros e estábulos, além dos domicílios humanos. As demais espécies foram consideradas visitantes ocasionais e raras nas áreas. Os casos de calazar e leishmaniose tegumentar notificados em Caxias são atribuídos a essas duas espécies, respectivamente.

DESCRITORES: *Lutzomyia*, Flebotomíneos, Levantamento e Leishmanioses.

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Autor(a) para correspondência:
antoniasuely-silva@bol.com.br

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