

ORIGINAL ARTICLE

SAND FLY SPECIES COMPOSITION (DIPTERA: PSYCHODIDAE: PHLEBOTOMINAE) IN THE MUNICIPALITY OF CANTAGALO, AN AREA WITH SPORADIC CASES OF HUMAN CUTANEOUS LEISHMANIASIS IN RIO DE JANEIRO STATE, BRAZIL

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SUMMARY

The municipality of *Cantagalo* is an area with sustained transmission of American Cutaneous Leishmaniasis (ACL). Monthly sand fly collections were performed for three years (June 2012 - May 2015) using a CDC light trap. A total of 3,310 specimens belonging to 12 species were trapped: *Nyssomyia intermedia*, *Nyssomyia whitmani*, *Migonemyia migonei*, *Evandromyia lenti*, *Evandromyia cortelezzi*, *Micropygomyia quinquefer*, *Brumptomyia brumpti*, *Psathyromyia aragaoi*, *Micropygomyia schreiberi*, *Pintomyia fischeri*, *Sciopemyia sordellii*, and *Evandromyia edwardsi*. The last seven species have not been previously recorded in this area. The highest abundance of species occurred between October and March. October was the month with the highest number of captured sand flies, one month before the peak in the summer rainfall. In October the highest number of *Ny. intermedia*, *Ny. whitmani* and *Mg. migonei*, were also collected, the three epidemiologically most important species. The high abundance of species with epidemiological importance for ACL transmission might explain the sporadic occurrence of the disease in the area.

KEYWORDS: American Cutaneous Leishmaniasis; Sand flies; Vectors.

INTRODUCTION

Since 2003, American Cutaneous Leishmaniasis (ACL) has been reported in all Brazilian States. More recently, 61 (66%) of 92 municipalities in *Rio de Janeiro* State reported increasing ACL cases between 2007 and 2013¹ (Fig. 1-A).

The municipality of *Cantagalo* is an area where eight autochthonous cases of ACL were reported between 2005 and 2006. Since 2007, four autochthonous cases of ACL were reported: one case in 2007, two cases in 2008, and one case in 2012¹. *Cantagalo* ranked 21st among the municipalities of *Rio de Janeiro* State, however has had the highest number of ACL cases during this period. Nevertheless, little is known about ACL sand fly vectors in this area of *Rio de Janeiro* State.

Here we present the results of three years of entomological survey in the municipality of *Cantagalo*, *Rio de Janeiro*, Brazil. Our goal was to describe the sand fly fauna and to identify dominant vector species in this area of sustained ACL transmission.

MATERIAL AND METHODS

Study area

Cantagalo (21° 58' 52" S 42° 22' 05" W) is located in the mountain region of *Rio de Janeiro* State, 200 km from the state capital, bordering *Minas Gerais* State.

This municipality had an estimated population of 19,792 inhabitants in 2014; it has an area of 749.279 km², an altitude of 391 m, a tropical climate with temperatures ranging between 19 °C and 26 °C and two well defined seasons: a typically rainy summer concentrating over 80% of the rainfall and a predominantly dry winter. The area has scattered fragments of the Atlantic Forest².

Entomological captures

Collections were made using a single Centers for Disease Control (CDC) light trap one day per month, alternately on both sites (districts): *Euclidelândia* and *Boa Sorte* (Fig. 1-B). The sampling was performed monthly from June 2012 to May 2015, totaling 36 months of collection. The light trap was set in peridomiciliary areas (one meter above the floor) from 7 pm to 7 am, totaling 12 h of collection per day.

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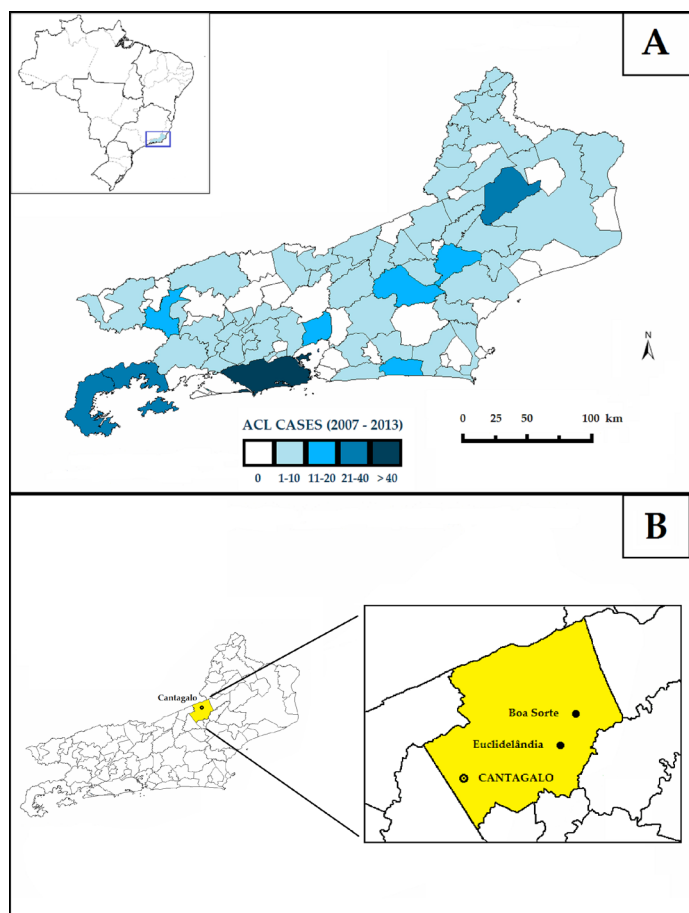


Fig 1 - Number of cases of ACL reported in the municipalities of *Rio de Janeiro* State from 2007 to 2013 (last year with infection records available).

The collected specimens were placed in plastic tubes containing 70% alcohol cleared in 10% potassium hydroxide solution (KOH) for 2 h, and then identified based on morphological characteristics, mainly the morphology of spermathecae and cibarium (females), as well as male terminalia, according to the nomenclature proposed by Galati (2003)³.

RESULTS

A total of 3,310 specimens belonging to 12 species were captured (Table 1): *Nyssomyia intermedia*, *Nyssomyia whitmani*, *Migonemyia migonei*, *Evandromyia lenti*, *Evandromyia cortelezzi*, *Micropygomyia quinquefer*, *Brumptomyia brumpti*, *Psathyromyia aragaoi*, *Micropygomyia schreiberi*, *Pintomyia fischeri*, *Sciopemyia sordellii*, and *Evandromyia edwardsi*.

DISCUSSION

Carvalho *et al.* (2014)⁴ published a review on the sand fly fauna of *Rio de Janeiro* State with data from 2002 to 2012, in which the presence of only six species of sand flies was reported in the municipality of *Cantagalo*. In our study, a total of twelve species were identified, seven of which have been detected for the first time in this municipality: *Evandromyia cortelezzi*, *Evandromyia lenti*, *Brumptomyia brumpti*, *Psathyromyia aragaoi*, *Micropygomyia schreiberi*, *Sciopemyia sordellii*, and *Evandromyia edwardsi*. This fact might reflect that our sampling was more comprehensive⁵, that sampling with CDC traps allowed the capture of additional species⁶, opening questions about which other species could have been found if we had also used sampling techniques aimed at resting sand flies⁷, or whether the new species are actually invading the studied area.

The five most abundant species collected in the region were *Ny. intermedia* (38%), followed by *Ny. whitmani* (24%), *Ev. lenti* (19%), *Ev. cortelezzi* (8%), and *Mg. migonei* (7%).

Table 1
Sand fly species captured from 2012 to May 2015 in the municipality of *Cantagalo*, *Rio de Janeiro* State

Species	Females		Males		Total	
	n°	%	n°	%	n°	%
<i>Ny. intermedia</i>	620	43.75	660	34.87	1280	38.67
<i>Ny. whitmani</i>	367	25.90	442	23.35	809	24.44
<i>Ev. lenti</i>	174	12.28	457	24.14	631	19.06
<i>Ev. cortelezzi</i>	162	11.43	107	5.65	269	8.13
<i>Mg. migonei</i>	58	4.09	181	9.56	239	7.22
<i>Mi. quinquefer</i>	5	0.35	21	1.11	26	0.79
<i>Br. brumpti</i>	5	0.35	20	1.06	25	0.76
<i>Pa. aragaoi</i>	11	0.78	1	0.05	12	0.36
<i>Mi. schreiberi</i>	8	0.56	3	0.16	11	0.33
<i>Pi. fischeri</i>	5	0.35	0	0.00	5	0.15
<i>Sc. sordellii</i>	2	0.14	0	0.00	2	0.06
<i>Ev. edwardsi</i>	0	0.00	1	0.05	1	0.03
Total	1,417	100.00	1,893	100.00	3,310	100.00

Among the five most abundant species, three species of epidemiological importance for ACL were found: *Nyssomyia intermedia*, *Nyssomyia whitmani*, and *Migonemyia migonei*. It is worth noting that these three vector species correspond to 70% of the sand flies that we have collected.

Nyssomyia intermedia is considered a dominant vector of ACL in Brazil⁸. *Nyssomyia whitmani* has been considered a vector of *L. (V.) braziliensis* in the northeastern, southeastern, central, and southern Brazil. In northern Brazil, *Ny. whitmani* is also a vector of *L. (V.) shawi*⁹. Several entomologic surveys confirmed *Ny. intermedia* as the predominant species in peridomestic environments in many municipalities of *Rio de Janeiro* State, while *Ny. whitmani* is not very abundant⁴. It is possible to note that the greater the distance from the coastal region of *Rio de Janeiro* State, the greater the density of *Ny. whitmani*, and this probably happens due to the phyto and physio-geographical conditions of each region. In the studied area (Fig. 1-B) as well as in endemic areas for ACL in *Rio de Janeiro* State (Fig. 1-A), *Ny. intermedia* was the most abundant species, followed by *Ny. whitmani*^{10,11,12,13,14,15} (Fig. 2-B).

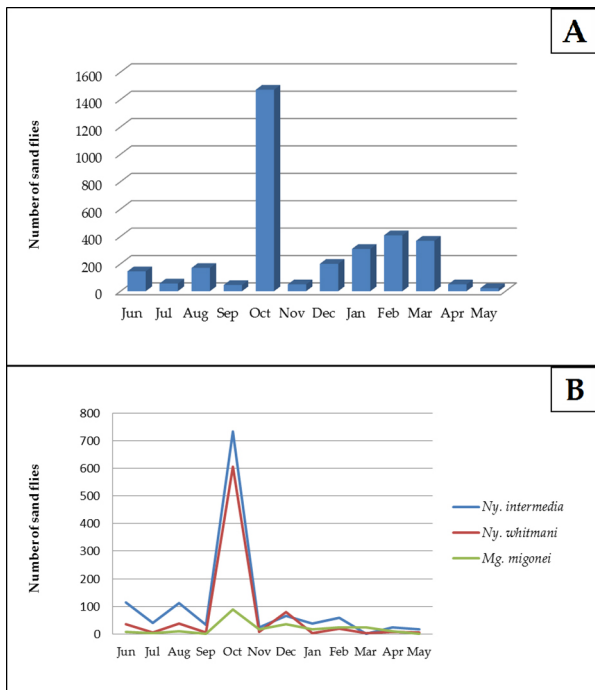


Fig. 2 - Seasonality of the species captured from June 2012 to May 2015 in the municipality of *Cantagalo*, *Rio de Janeiro* State.

Migonemyia migonei has been documented as a high potential vector species of ACL¹⁶. *Pintomyia fisheri* is associated to ACL transmission cycles in some Brazilian States¹⁷. Females belonging to the *cortezzi* complex were found to be infected by *L. braziliensis* in *Minas Gerais* State¹⁸.

A limitation of our study was the alternation of traps between the two studied sites (districts). This has biased data from each individual site, nevertheless data are still valuable to describe the phlebotomine sand fly fauna of *Cantagalo*.

The highest abundance of sand flies was observed between October and March. October was the month with the highest abundance of collected sand flies (Fig. 2-A), one month before the peak in the summer rainfall. October was also the month with the highest abundance of species of epidemiological importance for ACL in this area - *Ny. intermedia*, *Ny. whitmani* and *Mg. migonei*.

Finally, our collections allowed us to report seven species for the first time in *Cantagalo*, *Rio de Janeiro*, Brazil. We also found that dominant vector species were among the most abundant in the community of sand flies that we sampled with a CDC trap. Given the sporadic occurrence of ACL cases in the area, but the sustained transmission of infection, we believe that the monitoring of sand flies in this area could be part of a pro-active surveillance program to better understand, and prevent, the transmission of ACL.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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