ORIGINAL ARTICLE

PHLEBOTOMINES IN THE AREA ADJACENT TO THE PORTO PRIMAVERA DAM, BETWEEN SÃO PAULO AND MATO GROSSO DO SUL STATES, BRAZIL

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ABSTRACT

A research project with the purpose of investigating the Culicidae mosquito fauna and *Anopheles* ecology was undertaken before, during and after the construction of Porto Primavera dam on the Paraná River, between São Paulo (SP) and Mato Grosso do Sul (MS) States, between 1997 and 2003. The objective of this article is to report on the species of sand flies that were also captured during the collections undertaken with Shannon traps and human bait. A total of 526 (430♀, 96♂) specimens, 73 (2♂, 71♀) with human bait and 453 (94♂, 359♀) with Shannon traps were captured, belonging to seven species: *Bichromomyia flavisculellata* (6♀), *Brumptomyia* sp. (1♀), *Evandromyia* sp. (2♀), *Lutzomyia almerioi* (1♂, 2♀), *Nyssomyia neivai* (92♂, 412♀), *Psathyromyia punctigeniculata* (2♀) and *Psathyromyia shannoni* (3♂, 5♀). *Ny. neivai*, a probable vector of *Leishmania braziliensis,* predominated (95.8%). *Bi. flaviscutellata*, the main vector of *Leishmania amazonensis,* is reported here for the first time in the west of SP and *Lu. almerioi,* an anthropophilic species, was captured for the first time in SP. Thus more studies are necessary in this region since these three species of sand flies may represent a risk for the transmission of *Leishmania* spp. to people frequenting the forested banks of this reservoir.

KEY WORDS: Sand flies. Leishmaniasis. Vector. Porto Primavera dam.

RESUMO

Flebotomíneos em área adjacente à represa Porto Primavera, entre os estados de São Paulo e Mato Grosso do Sul, Brasil

Em coletas realizadas com isca humana e armadilhas de Shannon com o propósito de investigar a fauna de mosquitos Culicidae e a ecologia de *Anopheles* entre 1993 e 2003, antes, durante e após a construção da represa Porto Primavera, localizada no rio Paraná entre os estados de Mato Grosso do

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Sul e São Paulo, foram também capturados alguns espécimes de flebotomíneos. A divulgação dos resultados desta investigação constitui o objetivo da presente nota. Um total de 526 (430♀, 96♂) flebotomíneos foi capturado, 73 (2♂, 71♀) com isca humana e 453 (94♂, 359♀) com armadilhas de Shannon pertencentes a sete espécies: *Bichromomyia flaviscutellata* (6♀), *Brumptomyia* sp. (1♀), *Evandromyia* sp. (2♀), *Lutzomyia almerioi* (1♂, 2♀), *Nyssomyia neivai* (92♂, 412♀), *Psathyromyia punctigeniculata* (2♀) e *Psathyromyia shannoni* (3♂, 5♀). Verificou-se o predomínio de *Ny. neivai* (95,8%), provável vetor de *Leishmania braziliensis*. A presença de *Bi. flaviscutellata*, principal vetor da *Leishmania amazonensis*, foi registrada pela primeira vez no oeste do estado de São Paulo. *Lu. almerioi*, espécie antropofílica, foi capturada pela primeira vez neste estado. Assim, são necessários mais estudos nesta região, uma vez que o encontro dessas três espécies pode representar um risco para a transmissão de *Leishmania* spp. aos frequentadores das margens florestadas deste reservatório.

DESCRITORES: Flebotomíneos. Leishmaniose. Vetor. Represa Porto Primavera.

INTRODUCTION

Among the Diptera, the immature forms of Culicidae live in aquatic habitats while those of Phlebotominae (Psychodidae) live in soils rich in organic matter with high levels of humidity and protection from direct sunlight. However, the adults of both groups are found both in forests and man-made ecosystems. Their females are haematophagous and may transmit pathogens to humans and animals (6, 7), representing a serious public health problem, in terms of malaria (27) and the arboviruses (1) transmitted by Culicidae, and leishmaniases by phlebotomines (27), among other diseases.

A project was undertaken seeking to evaluate the impact of the construction of the Porto Primavera dam on the Paraná River, on the Culicidae mosquito fauna (12, 22) and *Anopheles* ecology (13, 14, 15). During some of the collections, sandflies were also captured, but haphazardly, as the mosquitoes were the target. The purpose of this article is to report on these sandflies.

MATERIALS AND METHODS

The study was carried out in two municipalities: Bataguaçu (UTM 22K 352900 E/7597800 S- DATUM WGS84) - Mato Grosso do Sul state (12) and Presidente Epitácio (UTM 22K 352900 E/7597800 S - DATUM WGS84) - São Paulo state (22), both situated on the banks of the Paraná River that separates these two states. Areas of these two municipalities were flooded for the construction of the Porto Primavera dam.

The insects were captured between July 1997 and March 2003. Samples were collected monthly during 24 hours with human bait, with Shannon traps from 18.00 to 06.00 hours, and with a Shannon trap at dusk in two fixed localities: Romualdo's small farm (RSF): UTM 368982 E/7595288 S, in Bataguaçu and JB's small farm (JBSF): UTM 395729 E/7605880 S, in Presidente Epitácio, and in

eight other exploratory localities of this latter municipality: 1) Urban Forest Garden (UFG): UTM 386556 E/7593388 S, 2) on the edge of Veado stream (EVS): UTM 393183 E/7597270 S, 3) in Barreiro (B): UTM 391187 E/7599697 S, 4) Lagoinha (L): UTM 393559 E/7604523, 5) on Laercio's small farm (LSF): UTM 401904 E/7603612 S, 6) in a Forest Reserve (FR): UTM 400865 E/7611967 S, 7) Santo Antonio small farm (SASF): UTM 404100 E/7614497 S; and 8) on the edge of Peixe river (EPR): UTM 398540 E/7617453 S (Figure 1).

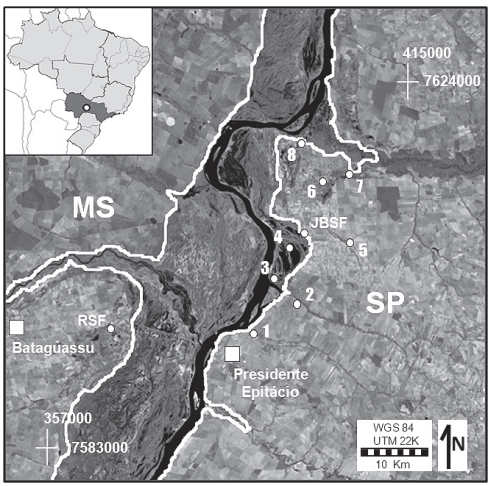

Figure 1. Location of collection sites: Romualdo's small farm (RSF) and JB's small farm (JBSF): main urban centres (squares); 1- 8 (circles): 1. Urban Forest Garden (UFG), 2. Edge of Veado stream (EVS), 3. Barreiro (B), 4. Lagoinha (L), 5. Laercio's small farm (LSF), 6. Forest Reserve (FR), 7. Santo Antonio small farm (SASF) and 8. Edge of Peixe river (EPR). The current limit of the shell (white line) on LANDSAT image 5/IR. Date: March 9, 1997, WRS: 223/075. Black tones represent bodies of water, dark gray: forests or floodplain, light gray: soil exposed, farmland or fields.

The phlebotomine were clarified in accordance with Forattini (6) and identified following the identification keys of Galati (9). The abbreviation of the species names follows Marcondes proposal (17).

RESULTS

A total of 526 (430♀, 96♂) sandfly specimens belonging to seven species were captured, with *Nyssomyia neivai* predominating in human bait (87.7%) and Shannon trap (97.3%) (Table 1).

Table 1. Numbers of sandfly specimens, by species, sex and method of captures undertaken between 1997 and 2003 in riparian residual forests in flooded areas or situated at the edge of the Porto Primavera dam.

Species	Human bait			Shannon trap			Total		
	♂	♀	T	♂	♀	T	♂	♀	T
Bichomomyia flaviscutellata	-	3	3	-	3	3	-	6	6
Brumptomyia sp.	-	-	-	-	1	1	-	1	1
Evandromyia sp.	-	-	-	-	2	2	-	2	2
Lutzomyia almerioi	-	2	2	1	-	1	1	2	3
Nyssomyia neivai	2	61	63	90	351	441	92	412	504
Psathyromyia punctigeniculata	-	2	2	-	-	-	-	2	2
Psathyromyia shannoni	-	3	3	3	2	5	3	5	8
Total	2	71	73	94	359	453	96	430	526

In human bait, the following species were captured by locality and sex: *Bi. flaviscutellata* - RSF (1♀), JBSF (1♀) and FR (1♀); *Lu. almerioi* - JBSF (2♀); *Ny. neivai* - RSF (5♀), JBSF (1♂, 46♀) and FR (1♂, 10♀); *Pa. punctigeniculata* - RSF (2♀) and *Pa. shannoni* - RSF (1♀) and FR (2♀). With Shannon traps for 12 hours: *Bi. flaviscutellata* - UFG (1♀), LSF (1♀) and EPR (1♀); *Brumptomyia* sp. - JBSF (1♀); *Ny. neivai* - RSF (10♀), JBSF (5♂, 29♀), UFG (6♂, 17♀), L (2♀), LSF (5♂, 13♀), SASF (16♀), and EPR (64♂, 215♀); *Pa. shannoni* - RSF (1♀) and EPR (3♂, 1♀). With Shannon traps at dusk: *Evandromyia* sp. - RSF (1♀) and EVS (1♀); *Evandromyia* sp. - RSF (1♀) and EVS (1♀); *Lu. almerioi* - RSF (1♂); *Ny. neivai* - RSF (15♀), EVS (7♂, 14♀), B (3♂, 20♀).

DISCUSSION

Since the mosquitoes were the main target of the capture of the insects, and the experience of the researchers who undertook the collections as regards the identification of the sandfly specimens was initially inadequate, the numbers of these insects captured were certainly underestimated. Despite the limitations of the data, the results have provided new information about the São Paulo and Mato Grosso do Sul States sandfly fauna and corroborated some already published data.

Apart from *Lu. almerioi*, information on the other four species identified to species level in both states has already been published (8).

Lutzomyia almerioi, an anthropophilic species with diurnal and nocturnal activity, is predominant in the Speleological Province of the Serra da Bodoquena located in southwestern Mato Grosso do Sul state (10). Its collection with human bait in the present research project corroborates its anthropophily beyond the limits of the Serra da Bodoquena. This species on the Bodoquena range also presents ornitophilous habits (16) and has been found naturally infected by *Leishmania infantum chagasi* and *Leishmania* (*Viannia*) sp. (26), showing itself susceptible to experimental infection by *L. i. chagasi*, *L. braziliensis* and *L. amazonensis* (24).

Another noteworthy observation is the presence of *Bi. flaviscutellata*, proven vector of *L. amazonensis,* over an extensive area of Brazil (4). This species had already been registered in the southeastern region of São Paulo State, in the Serra do Mar (11), this being the first record of it in the western area of the State, where Porto Primavera is located. However, its presence in this area is not surprising as it has been widely captured in neighboring MS (4, 10, 19, 21).

Ny. neivai was the only species present at all the sites sampled and always predominated over the others. The overwhelming dominance of *Ny. neivai* on the Planalto Paulista (20) as found in this research was already known. The species has been associated with the transmission of the agent of cutaneous leishmaniasis in the South and Southeast regions of Brazil due to its high density in ACL endemic areas and the finding of natural infection by *Leishmania* (*Viannia*) *braziliensis* (23), *L.* (*Viannia*) sp. (18) and flagellates (3, 5), and it has also been found naturally infected by the agent of visceral leishmaniasis, *L. i. chagasi* (25). This sandfly species still deserves attention because of its persistence in high densities in anthropic areas.

The *Evandromyia* sp., cortelezzii complex, was so named because of the similarity of its females to those of *Ev. cortelezzii* and *Ev. sallesi.* Although there is no register of the anthropophily of the species of this series, in Minas Gerais State species of this complex have been found naturally infected by *L. i. chagasi* (2, 25).

Despite the small sandflies sample on the study area, four species with potential to transmit at least three *Leishmania* species were captured, raising the need for systematic research in the forested areas surrounding the dam, because several rural settlements have arisen in that area as well as several other facilities used for leisure activities, particularly at night when the sandfly species are most active.

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