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## SANDFLY FAUNA (DIPTERA: PSYCHODIDAE) IN PARQUE DO SABIÁ COMPLEX, UBERLÂNDIA, MINAS GERAIS, BRAZIL

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### SUMMARY

Between April 2003 and May 2009 phlebotomine sandflies were collected in Parque do Sabiá complex, Uberlândia municipality, Minas Gerais State, Brazil, using CDC and Shannon traps. The objective was to associate the sandfly species captured to the risk of the transmission of leishmaniasis in the municipality. The 126 captured specimens belonging to six species of phlebotomine, among which *Lutzomyia (Psychodopygus) davisi* (Root, 1934) predominated with 113 specimens (89.7%). The remaining captured species were *Lutzomyia (Pintomyia) mamedei* Oliveira, Afonso, Dias & Brazil, 1994 - five specimens (3.9%); *Lutzomyia (Nyssomyia) flaviscutellata* (Mangabeira, 1942) - four specimens (3.2%); *Lutzomyia lenti* (Mangabeira, 1938) - two specimens (1.6%); *Brumptomyia avellari* (Costa Lima, 1932) - one specimen (0.8%); and *Lutzomyia (Nyssomyia) whitmani* (Antunes & Coutinho, 1939) - one specimen (0.8%). The collection of species that may be involved in the transmission of *Leishmania* reveals the need for continuous entomological surveillance.

**KEYWORDS:** *Lutzomyia*; Phlebotomine; Leishmaniasis; Ecology of vectors.

### INTRODUCTION

Leishmaniasis are manifested in several diseases that afflict humans and that are caused by different species of Trypanosomatidae. A significant increase in these diseases has recently been registered in peri-urban and urban areas of large cities, particularly in Brazil<sup>9</sup>.

In the New World, several phlebotomine species (Diptera: Psychodidae) are involved in the transmission of leishmaniasis. Some of them, which were previously found only in their natural environment, are now frequently found near human dwellings, in banana plantations and in domestic animal shelters, demonstrating that they are adapting to anthropic modifications<sup>20</sup>. Knowledge about local phlebotomine fauna composition and the behavior of sandfly species helps shed light on several aspects involved in the transmission of leishmaniasis and has been the focus of several investigations<sup>5,19,21</sup>.

During the period from 2005 to June 2010, the National Database on Reportable Diseases website (<http://dtr2004.saude.gov.br/sinanweb/>) reported 10 cases of American cutaneous leishmaniasis (ACL) from rural areas that were related to fishing activities, but only a single case of autochthonous human ACL was confirmed in this period. On the other hand, in 2008, a child was diagnosed with visceral leishmaniasis (VL), and subsequent epidemiological studies showed the autochthony of the case as well as the first record of the vector, *Lutzomyia longipalpis*, in the municipality<sup>17</sup>.

The Parque do Sabiá complex was created with the main purpose of providing less privileged citizens a space for sports and other leisure activities. The complex comprises several ecotopes that favor the presence of sandflies. Moreover, it is close to two neighborhoods in the city where specimens of *Lutzomyia longipalpis* (Lutz & Neiva, 1912), a vector incriminated in the transmission of visceral leishmaniasis (VL), have been found and two cases of human VL have been recorded, showing that VL is an important public health problem in the municipality<sup>17</sup>. The objective of this study was to survey the sandfly fauna in the Parque do Sabiá complex and to evaluate the risk of transmission of leishmaniasis.

### MATERIAL AND METHODS

**Study area:** Located in the eastern sector of the municipality of Uberlândia, Minas Gerais State, Brazil, the Parque do Sabiá complex comprises an area of 1,850,000 m<sup>2</sup> with 350,000 m<sup>2</sup> of woodlands and three springs that supply seven reservoirs, one large and seven smaller lakes (Fig. 1). It also has a 300-meter-long artificial beach, a zoo with dozens of native and exotic animal species, a fish farm, a 1,080 m<sup>2</sup> pavilion housing aquariums and 36 fish species of economic and ornamental value, a 5,100 m walking track and several resting spaces.

**Entomological captures:** A total of eight annual sandfly collections, between April 2003 and May 2009 were carried out in the woods along the walking track, using a Shannon trap exposed from 6 p.m. to midnight for three consecutive days. Simultaneously, three CDC traps were set up,

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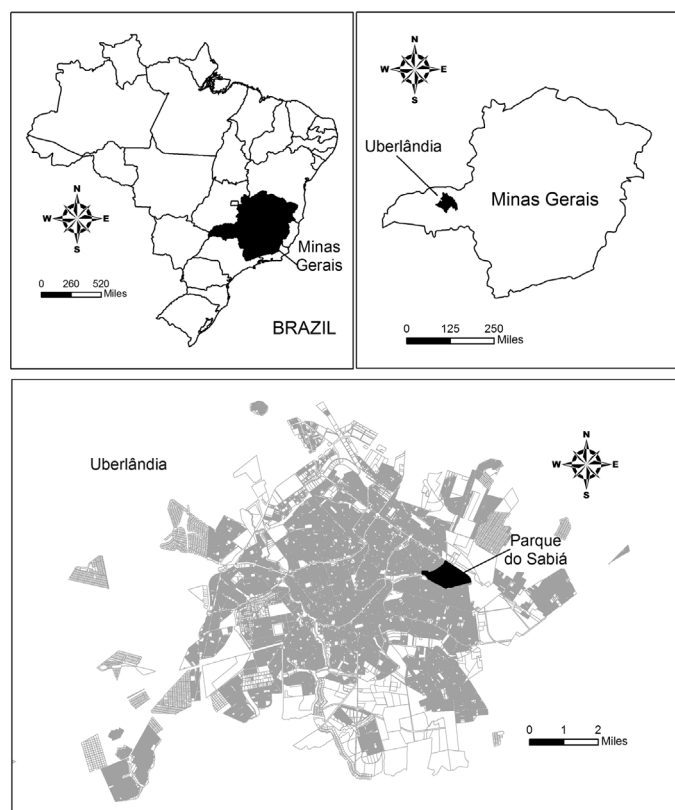


Fig. 1 - Map of Parque do Sabiá, Uberlândia, Minas Gerais State, Brazil.

one in the dog kennel of the military police station, one in the zoo (near the monkey cage), and one in the fish farm, these sites were chosen due to their proximity to the walking track used by the public. The collected insects were taken to the Laboratório de Entomologia at the Centro de Controle de Zoonoses (CCZ) of Uberlândia Municipal City Hall (PMU), where they were separated, processed, immersed in Berlese's fluid and mounted in microscope slides and coverslips. They were then identified according to the classification by YOUNG & DUNCAN (1994)<sup>24</sup>.

## RESULTS

One hundred and twenty-nine specimens of phlebotomines were captured, comprising 95 females (73.6%) and 34 males (26.4%). From the total of females, 78 (60.5%) were captured using Shannon trap and 17 (13.2%) with CDC traps. From the total of males, 26 (20.2%) were captured using Shannon trap and eight (6.2%) were captured with CDC traps (Table 1). Six species belonging to two genera were identified: *Lutzomyia* and *Brumptomyia* (Table 2). The genus *Lutzomyia* presented three subgenera (*Psychodopygus*, *Nyssomyia* and *Pintomyia*) and one species of the *migonei* group. Five species of the genus *Lutzomyia* were identified: *Lutzomyia (Psychodopygus) davisi* (Root, 1934) predominated (89.7%), followed by *Lutzomyia (Pintomyia) mamedei* Oliveira, Afonso, Dias & Brazil, 1994 (3.9%), *Lutzomyia (Nyssomyia) flaviscutellata* (Mangabeira, 1942) (3.2%), *Lutzomyia lenti* (Mangabeira, 1938) (1.6%), and *Lutzomyia (Nyssomyia) whitmani* (Antunes & Coutinho, 1939) (0.8%). The genus *Brumptomyia* was represented by *Brumptomyia avellari* (Costa Lima, 1932) with 0.8% of the total of sandflies collected, *L.(P.) davisi* was still the most captured specie in both type of traps: Shannon (84.6%) and CDC (100%). Three specimens that were damaged could not be identified and were therefore excluded from the analysis.

**Table 1**  
Sandfly species captured in Parque do Sabiá, Uberlândia, MG, Brazil between April 2003 and May 2009, according to type of trap

Number of capture	Month/year	Species	Shannon		Total Shannon	CDC		Total CDC	Total
			Males	Females		Males	Females		
1	04/2003	<i>L. (P.) davisi</i>	9	25	34	8	17	25	59
		<i>L. sp</i>	-	1	1	-	-	0	1
2	09/2004	-	-	0	-	-	0	0	
3	05/2005	<i>L. (P.) davisi</i>	-	6	6	-	-	0	6
		<i>Brumptomyia avellari</i>	1	-	1	-	-	0	1
4	09/2005	<i>L.(N.) flaviscutellata</i>	-	2	2	-	-	0	2
5	08/2006	<i>L. (P.) mamedei</i>	-	3	3	-	-	0	3
		<i>L. (N.) whitmani</i>	1	-	1	-	-	0	1
		<i>L. sp</i>	-	1	1	-	-	0	1
6	09/2007	<i>L. (N.) flaviscutellata</i>	-	2	2	-	-	0	2
		<i>L.(P.) mamedei</i>	-	1	1	-	-	0	1
		<i>L. sp</i>	-	1	1	-	-	0	1
		<i>L. lenti</i>	1	1	2	-	-	0	2
7	08/2008	-	-	0	-	-	0	0	
8	04/2009	<i>L. (P.) davisi</i>	14	34	48	-	-	0	48
		<i>L.(P.) mamedei</i>	-	1	1	-	-	0	1
<b>Total</b>			26	78	104	8	17	25	129

**Table 2**

Frequencies, by sex and type of trapping of the sandfly species captured in Parque do Sabiá, Uberlândia, MG, Brazil between April 2003 and May 2009

Species	Shannon			CDC			Total of specimens (%)
	Males (%)	Females (%)	Total (%)	Males (%)	Females (%)	Total (%)	
<i>L. (P.) davisi</i>	23 (18.3)	65 (51.6)	88 (69.9)	8 (6.3)	17 (13.5)	25 (19.8)	113 (89.7)
<i>L. (P.) mamedei</i>	-	5 (3.9)	5 (3.9)	-	-	-	5 (3.9)
<i>L. (N.) flaviscutellata</i>	-	4 (3.2)	4 (3.2)	-	-	-	4 (3.2)
<i>L. lenti</i>	1 (0.8)	1 (0.8)	2 (1.6)	-	-	-	2 (1.6)
<i>Brumptomyia avellari</i>	1 (0.8)	-	1 (0.8)	-	-	-	1 (0.8)
<i>L. (N.) whitmani</i>	1 (0.8)	-	1 (0.8)	-	-	-	1 (0.8)
Total	26 (20.7)	75 (59.5)	101 (80.2)	8 (6.3)	17 (13.5)	25 (19.8)	126 (100)

## DISCUSSION

The 129 sandflies captured in this study provided a picture of the phlebotomine fauna in the Parque do Sabiá complex, one of the only and largest public leisure spaces in the city of Uberlândia, and indicated that some of the captured species are involved in the transmission of *Leishmania*. Our study showed a predominance of females, which is not a new finding and can be explained by the attraction to light and the availability of bloodmeal source close to the traps<sup>12</sup>.

Four specimens of *L. (N.) flaviscutellata* were captured. The attraction of this phlebotomine to rodents places it in contact with the main reservoirs of *Leishmania (L.) amazonensis*<sup>17</sup>, which is one of the reasons for suggesting it as a vector of this leishmania<sup>18</sup>. This species is not very anthropophilic, and despite its wide geographical distribution and studies that suggest an alteration in the epidemiological profile of cutaneous leishmaniasis by *L. (L.) amazonensis*<sup>17</sup>, evidence of its vectorial role in the study area was not observed.

The specie *L. (P.) mamedei*, of which five specimens were captured in this study, is characterized for its obligatory parthenogenetic females, and hence, the absence of a morphological description of males<sup>4</sup>. Moreover, this species, as well as *B. avellari* and *L. lenti*, which were also captured in this study, have not yet been incriminated in the transmission of leishmaniasis<sup>3,16</sup>.

According to CASTELLÓN *et al.* (1994), among the species of the subgenus *Psychodopygus*, *L. (P.) davisi*, the most numerous one in our study, is considered the one with the strongest anthropophilic tendency<sup>7</sup>. This species is usually trapped at ground level<sup>1</sup>, a fact that CHANIOTIS *et al.*<sup>8</sup> propose as one of the criteria for incriminating phlebotomine species as potential vectors of leishmania for humans, as well as their population density correlated with their circadian rhythm and with seasonality. On the other hand, the fact that this species was highly abundant in the Shannon trap located in primary woods surroundings contradicts previous researches which reported the presence of animals in the peridomicile providing support to the colonization of this species<sup>22,23</sup>. In this study area, this species still remains closer to the primary woods. This species has already been incriminated as a probable vector of *Leishmania (Viannia) naiffi*, which causes cutaneous leishmaniasis in the Amazon region<sup>10,13</sup>.

*L. (N.) whitmani*, which is incriminated as one of the vectors of *Leishmania (Viannia) braziliensis*, the most prevalent parasite infecting

humans and one of the main species involved in American cutaneous leishmaniasis (ACL) in Brazil, is also associated with the presence of domestic animals<sup>6,11,13</sup>. Studies carried out in areas of ACL transmission in Minas Gerais have found *L. (N.) whitmani* displaying great behavioral flexibility, anthropophilic activity in surrounding woods and around human dwellings, where it may be developing hematophagous habits involving humans and domestic animals<sup>14,17</sup>. As for seasonality, more systematic studies in southeastern Brazil have demonstrated that this species may be present throughout the year<sup>2</sup>.

In the southeastern region of the Minas Gerais State, known as the Triângulo Mineiro, 14 cases of human ACL coming from the municipalities of Carmo do Paranaíba, Patos de Minas and São Francisco de Sales were reported from 1981 to 1986. Later, from July to November 1987, 25 patients were diagnosed with ACL, 19 of them living in Uberlândia. The pattern of transmission was considered peridomiciliary, but all the patients' homes were located on the banks of the Araguari river, which they frequented for work, sports and leisure activities, suggesting that the outbreak was of sylvatic origin<sup>15</sup>.

Later studies of the phlebotomine fauna conducted in that region by LEMOS & LIMA (2005) revealed the presence of only one specimen of *L. (N.) whitmani* in a total of 6,551 captured phlebotomines<sup>14</sup>. Since the aforementioned period, no other ACL outbreak or epidemic have been registered in the municipality.

Although the focus of the human ACL epidemic registered in the municipality was related to a rural environment, the presence of even a small number of *L. (N.) whitmani* is a fact that should keep the health authorities on the alert, since it indicates a risk for the appearance of ACL in this ecotope. In addition, the number of users of this park has been increasing significantly, especially as a result of recent improvements that have been implemented, such as reforestation and environmental control to ensure the preservation of green areas and the headwaters, making it necessary to keep the park under continuous entomological surveillance.

## RESUMO

### Flebotomíneos (DIPTERA: PSYCHODIDAE) no complexo Parque do Sabiá, Uberlândia, Minas Gerais, Brasil

Entre abril de 2003 e maio de 2009, realizaram-se capturas de flebotomíneos no complexo Parque do Sabiá, município de Uberlândia,

estado de Minas Gerais, utilizando-se armadilhas CDC e de Shannon. O objetivo foi associar as espécies encontradas ao risco de transmissão de leishmanioses no município. Foram capturados 126 exemplares, distribuídos em seis espécies de flebotomíneos. Houve predomínio de *Lutzomyia (Psychodopygus) davisi* (Root, 1934) com 113 espécimes (89,7%). As demais espécies capturadas foram *Lutzomyia (Pintomyia) mamedei* (Oliveira, Afonso, Dias & Brazil, 1994) - cinco espécimes (3,9%); *Lutzomyia (Nyssomyia) flaviscutellata* (Mangabeira, 1942) - quatro espécimes (3,2%); *Lutzomyia lenti* (Mangabeira, 1938) - dois espécimes (1,6%); *Brumptomyia avellari* (Costa Lima, 1932) - um espécime (0,8%) e *Lutzomyia (Nyssomyia) whitmani* (Antunes & Coutinho, 1939) - um espécime (0,8%). A captura de espécies que podem estar envolvidas na veiculação de *Leishmania* revela a necessidade de uma vigilância entomológica constante.

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#### AUTHOR CONTRIBUTIONS

*Elisângela de Azevedo Silva Rodrigues*: conception and design of the study, collection, assembly, analysis and interpretation of data and drafting of the article.

*José Dilermando Andrade Filho*: analysis and interpretation of data, drafting of the article and critical revision of the article for important intellectual content.

*Jean Ezequiel Limongi*: analysis and interpretation of data and drafting of the article.

*Márcia Beatriz Cardoso de Paula*: conception and design of the study, collection, assembly, analysis and interpretation of data and drafting of the article.

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