The Sand Fly Fauna (Diptera: Psychodidae: Phlebotominae) of a Focus of Cutaneous Leishmaniasis in Ilhéus, State of Bahia, Brazil

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The municipality of Ilhéus, State of Bahia, has a focus of cutaneous leishmaniasis where entomological studies were carried out to determine the sand fly species and their habits. Lutzomyia migonei, L. sallesi, L. tupynambai, L. schreiberi, L. intermedia, L. whitmani, L. yuilli yuilli, L. fischeri, L. pessoai, L. shannoni and L. misionensis *were identified.*

Lutzomyia whitmani *was the predominant species. Specimens were collected indoors, at peridomestic sites, in the cocoa plantations and in other types of collections. Females fed readily on humans and were attracted to domestic animals. Our evidence suggests that* L. whitmani *is a probable vector.*

Key words: sand fly fauna - cutaneous leishmaniasis - State of Bahia - Brazil

American Cutaneous Leishmaniasis (ACL), caused by *Leishmania (V.) braziliensis*, is one of the parasitic diseases of high incidence in some states of northeast Brazil. The municipality of Ilhéus, State of Bahia, is an endemic area of ACL. There are several cases of mucosal involvement (FNS - Fundação Nacional de Saúde 1991, personal comunication). We decided, in collaboration with FNS in 1990, to identify the local sand fly fauna and to study those aspects of the biology of the sand fly species as related to their role as vectors in some endemic areas in this region.

At present, no control measures have been applied in this region. Therefore, data obtained from these studies may be helpful in planning control programmes.

MATERIALS AND METHODS

Study area and meteorological data - The municipality of Ilhéus is located about 462 km from Salvador City (14°50' latitude South and 39°06' longitude West). It has a wet, hot tropical climate and high annual rainfall (1,500-2,000 mm). In the past, it was covered by "Mata Atlântica" forest, but now consists of plantations of cocoa-tree, the regions major economical agricultural activity.

We worked at two sites: Violeta and Cipó farms, where the average temperature ranged between 19°C and 29°C, and relative humidity was 87%.

Sand fly captures - These were carried out between 18:00 hr and 20:00 hr one week per month (December 1990, February, March, September and October 1991, March until August, and November 1992). Sand flies were captured in houses, on the inside and outside walls, using manual aspirators; at peridomestic sites (up to 10m from houses) using manual aspirators on equines, and by CDC light traps (Sudia & Chamberlain 1962, Gomes et al. 1985, Natal et al. 1991) in domestic animal shelters. In cocoa plantations, a Shannon trap (Sherlock & Pessoa 1964) was used for collections up to 50m and 100m from houses, and a Falcão light trap (Falcão 1981, Aguiar et al. 1985) was used only to capture 100m from houses.

The degree of anthropophily was determined by considering the number of females collected bitting man, in peridomestic sites and in cocoa plantations.

Identification of sand fly species - Sand flies were stored in 70% ethyl alcohol and later preserved on slides, using Berlese's medium, for taxonomic studies.

Search for natural infections of sand flies - Some captured females were kept in cages, in plastic bags with high humidity, and dissected in physiological saline, within 24hr. These were identified by their spermathecae during the dissections.

RESULTS

Sand fly fauna - During 242 hr we collected a total of 8695 specimens belonging to the following *Lutzomyia* species, listed according to the classification by Young and Duncan (1994):

Group *Migonei* Theodor, 1965

L. migonei (França, 1920)

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L. sallesi (Galvão & Coutinho, 1939)
L. tupynambai (Mangabeira, 1942)
Subgenus *Micropygomyia* Barretto, 1962
L. schreiberi Martins, Falcão & Silva, 1975
Subgenus *Nyssomyia* Barretto, 1962
L. intermedia (Lutz & Neiva, 1912)
L. whitmani (Antunes & Coutinho, 1939)
L. yuilli yuilli Young & Porter, 1972
Subgenus *Pintomyia* Costa Lima, 1932
L. fischeri (Pinto, 1926)
L. pessoai (Coutinho & Barretto, 1940)
L. sp.
Subgenus *Psathyromyia* Barretto, l962
L. shannoni (Dyar, 1929)
Subgenus *Psychodopygus* Mangabeira, 1941
L. sp.
Ungrouped species
L. misionensis (Castro, 1959)

The predominance of *L. whitmani* (97.7%) over the other collected species was very evident. *Lutzomyia intermedia* (1%) followed in abundance and the other species appeared in much lower percentages (Table).

TABLE

Sand flies collected in Ilhéus, Bahia, Brazil. December 1990, February, March, September and October 1991, March-August and November 1992

Sand flies species	Females	Males	Total	%
L. migonei	8	11	19	0.2
L. sallesi	1	-	1	0.0
L. tupynambai	2	-	2	0.0
L. schreiberi	5	1	6	0.1
L. intermedia	52	39	91	1.0
L. whitmani	3099	5390	8489	97.7
L. y. yuilli	1	-	1	0.0
L. fischeri	34	14	48	0.6
L. pessoai	7	1	8	0.1
L. (Pi) sp.	6	-	6	0.1
L. shannomi	1	-	1	0.0
L. (Ps) sp.	1	2	3	0.0
L. minionensis	20	-	20	0.2
Total	3237	5458	8695	100.0

L.: *Lutzomyia*

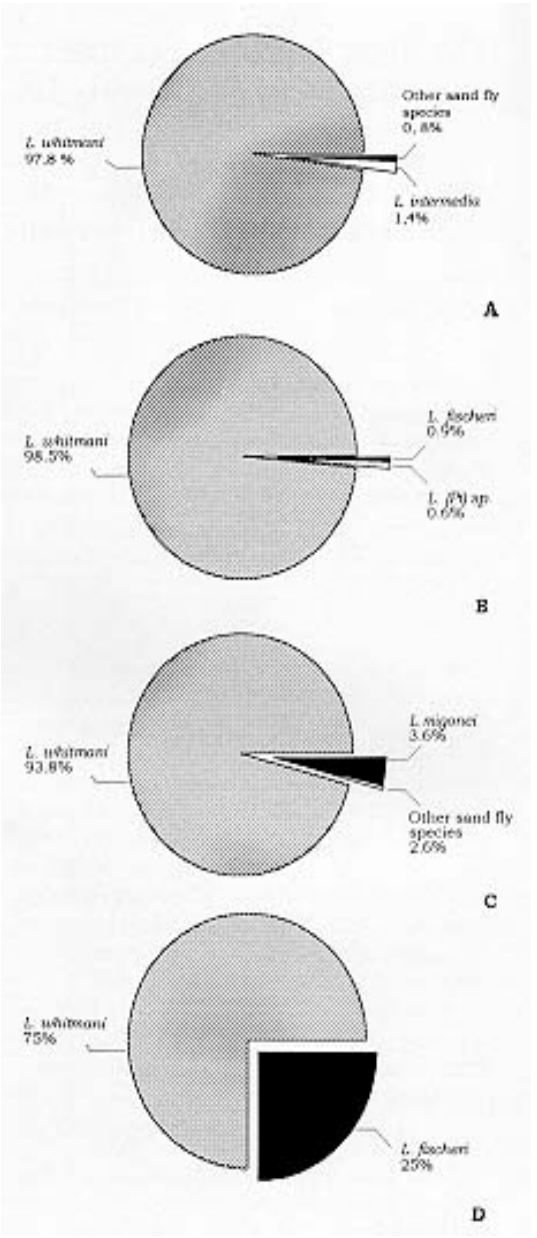

Fig. 1: frequency of *Lutzomyia whitmani* on A: inside houses, B: animal bait (equine) and C, D: in domestic animal shelters (C = chicken house, D = cowshed).

Frequency of species caught with differents type and site of captures - In 108 hr we collected 6327 specimens from inside and outside houses: *L. whitmani* (97.8%) was the most common captured species. We also collected *L. migonei, L.sallesi, L. tupynambai, L. schreiberi, L. intermedia, L. fischeri, L. pessoai, L.* (*Pi*) sp, *L. shannoni and L. misonensis.* (Fig.1).

From light traps in domestic animals shelters, we collected 274 specimens. In a chicken-house most sand flies captured in 22 hr were *L. whitmani* (93.8%). *Lutzomyia migonei, L. tupynambai, L. intermedia, L. fischeri , L. pessoai* and *L. (Pi)* sp. were also found. In the cowshed, only two species were caught (56 specimens in 10 hr): *L. whitmani* (75%) and *L. fischeri* (25%). The number of sand flies attracted to equines, during 16 hr, was 318 and again most were *L .whitmani* (98.5%), followed by *L. fischeri* (0.9%) *and L. (Pi)* sp. (Fig.1).

In cocoa plantations (during 86 hr) we collected 1720 specimens. Near houses (994 speci-

mens), *L. migonei*, *L. y. yuilli* and *L. misionensis* were found, with *L. whitmani* predominating (97.9%). As far as 100m from houses (694 specimens), only two species were collected - *L. whitmani* (99.9%) and *L. misionensis* (0.1%). Further away from houses when a Falcão light trap was used (32 specimens), *L. whitmani* (75.8%), *L. pessoai* (9.1%), *L. fischeri* and *L. misionensis* were collected (Fig. 2).

The specimens identified as *Lutzomyia* spp. are related to subgenera *Psychodopygus* (possibly *L. ayrozai)* and *Pintomyia* sp. that may be an undescribed species.

Search for natural infections - We dissected 225 specimens, but no infections were detected.

Although we have not yet identified the *Leishmania* isolated from patients, the clinical and parasitological features indicate that the disease in Ilhéus is caused by *Le. (V.) braziliens*is.

DISCUSSION

Our survey in Ilhéus indicated the presence of 13 species of sand flies, most of which were captured in houses and in peridomiciliary surroundings. At both areas *L. whitmani* was predominant, and was present in each type of collection. This finding supports previous studies, in the States of São Paulo (Barretto 1943, Forattini 1960, Taniguchi et al. 1991), Minas Gerais (Mayrink et al. 1979), Bahia (Barretto et al. 1982, Vexenat et al. 1986) and Ceará (Azevedo & Rangel 1991), where *L. whitmani* was recorded in domestic habitats.

In spite of its high degree of anthropophily, *L. whitmani* is also attracted to domestic animals, suggesting its adaptation to the domestic habitat.

This sand fly species is considered a vector of *Le. (V.) braziliensis* in other endemic areas of northeast and southeast Brazil, where it enters dwellings places and sites near houses (Pessoa & Coutinho 1941, Mayrink et al. 1979, Azevedo et al. 1990, Queiroz et al. 1991). In Três Braços, State of Bahia, the high percentage of *L. whitmani* inside houses and in peridomestic sites, associated with the presence of infected specimens with *Le.(V.) braziliensis* in peridomi-ciliary areas, suggests a domestic or peridomestic transmission cycle of ACL (Hoch et al. 1986, Ryan et al. 1990).

Because the primary forest in this area has been replaced by several types of agriculture, mostly cocoa tree cultivation, we suggest that domestic and peridomestic transmission is occuring. Although no natural infection of *Leishmania* was found in *L. whitmani*, our studies suggest that this sand fly species is the vector because it feeds readily on humans and is the predominant

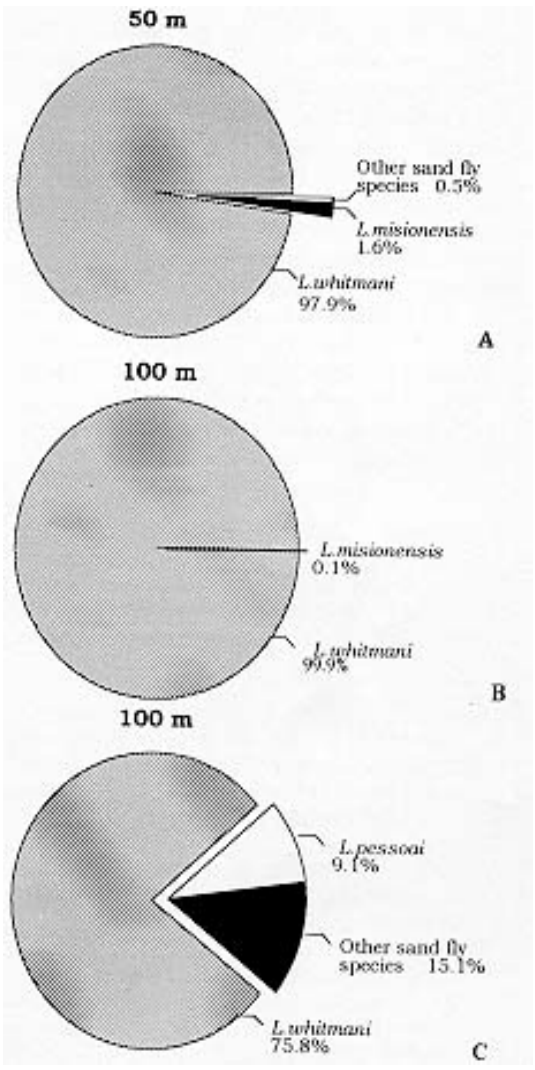

Fig. 2: frequency of *Lutzomyia whitmani* in plantations of cocoa. A, B: using Shannon trap, and C: using light trap.

species in domestic and peridomestic sites, where a peridomestic transmission cycle involving a domestic reservoir may be occurring. On the other hand, we cannot dismiss the likelihood that transmission may also occur in cocoa plantations, indicating, that it is also an occupational disease.

Recently, Rangel (1993) studied *L. whitmani* by comparing populations from States of Pará, Ceará and Bahia. Sand flies from these areas are morphologically very similar but have distinct behaviorial characteristics. When the author used morphometric characters, genomic DNA fragments as diagnostic probes and phylogenetic analysis, this survey showed strong evidence that there are at least two distinctive forms of this

sand fly species, that are geographically isolated: one occurrring in State of Pará (north Brazil) and the other in northeast Brazil (States of Ceará and Bahia, including Ilheús, this type locality). This suggests the possibility that these two forms are involved in the transmission of ACL in two different environments.

We found two other sand fly species in Ilhéus, *L. intermedia* and *L. migonei*, which are involved in the transmission of ACL due to *Le. (V.) braziliensis* in other states from northeast and southeast Brazil (Araújo Filho 1979, Rangel et al. 1984, 1986, 1990, Azevedo et al. 1990). In the present study area, these species are uncommon and we believe that they are not transmiting the disease to man.

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