

## PHLEBOTOMINAE FAUNA IN THE PROVINCE OF TUCUMÁN, ARGENTINA

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### SUMMARY

American Tegumentary Leishmaniasis is endemic in the province of Tucumán since 1916 where the first Argentinian case of leishmaniasis was reported. An epidemic outbreak took place in the province during 1986-1988, after that the number of cases increased gradually again between 1991-1996. Since October of 1999 sand flies captures were performed at different places associated with current and past transmission or sites identified as risky ones. The collections were carried out with CDC mini light trap and modified Shannon trap. In this study 2338 Phlebotominae were captured being prevalent *Lutzomyia neivai* (*Lu intermedia* complex) (97.7%), followed by *Lu. migonei*. We report *Lu. shannoni* for the first time in the province. Phlebotominae was abundant in the warm and humid months and showed a peak before the summer rains. *Lutzomyia neivai* showed a pattern (peridomestic prevalence, anthropophilia, abundance in secondary forest) consistent with other outbreak studies. Thus, the results reinforce this species incrimination as vector of leishmaniasis in the area. Domestic animals close to houses increase its abundance, and so the probable associated risk of human-Phlebotominae contact. Further studies should be done to understand the role of each Phlebotominae species in the transmission of leishmaniasis in Tucumán in order to design entomological surveillance strategies.

**KEYWORDS:** Phlebotominae, *Lutzomyia neivai*, Tucumán, Argentina.

### INTRODUCTION

Leishmaniasis is a re-emerging zoonosis of high impact on public health<sup>11,39</sup>. It is produced by parasites of the genus *Leishmania*<sup>2</sup>, and it is transmitted by small dipterous of the subfamily Phlebotominae<sup>20,21</sup>. In America tegumentary leishmaniasis (cutaneous and mucocutaneous) is endemic from the Yucatán peninsula to northern Argentina<sup>10,35,37,39</sup>. In Argentina this disease is endemic, and the parasite was identified as *Leishmania (Viannia) braziliensis*<sup>2,8,12,34,35</sup>. The first record in the country was in 1916, by PATERSON, in the province of Tucumán<sup>3,36</sup>, since then its vectorial transmission has been reported, in nine northwestern provinces: Jujuy, Salta, Tucumán, Santiago del Estero, Catamarca, Chaco, Formosa, Corrientes and Misiones<sup>4,37</sup>. In the 1980 decade an epidemic outbreak took place in Salta, the first recorded in the country, in rural and periurban areas, with similar incidence among sexes and cases among children. Since then human cases all over the Argentinian endemic area have registered an increase<sup>31</sup>. In the province of Tucumán an epidemic outbreak occurred in 1986-1988, with 118 reported cases, 95.31% of them autochthonous (incidence rate 12.1 per 100,000 inhabitants). Between 1991 and 1996, 232 new cases were reported in the province<sup>37</sup>. However, there are not data about Phlebotominae sand flies distribution in Tucumán after the entomological literature of the 1950 decade<sup>9</sup>.

This study was performed in the province of Tucumán in order to describe the Phlebotominae fauna of the area and its distribution after

the last epidemic outbreaks, mainly *Lutzomyia neivai*, suspected as the peridomestic major vector of tegumentary leishmaniasis in Argentina<sup>24</sup>.

### MATERIALS AND METHODS

The area of study includes the following localities: El Cadillal (26° 36' LS, 65° 12' LO) Tafí Viejo department; El Timbó (26° 41' LS, 65° 08' LO) and El Sunchal (26° 36' LS, 65° 04' LO), Burruyacú department, in the NE; Tte. Berdina, El Guayal (26° 56' 35" LS, 65° 26' 87" LO) Famaillá department, in the West-Center; El Molino (27° 19' 87" LS, 65° 39' 19" LO), Iltico (27° 19' 87" LS, 65° 39' 19" LO) Chicligasta department, and Yánima (27° 39' LS, 65° 29' LO) La Cocha department, in the south of the province (Fig. 1). The sites of study belong to the phytogeographic province of the Yungas or the Tucumano- boliviana Jungle of the Amazonic Domain<sup>6, 7</sup>.

Since October of 1999 sand flies were collected in sites associated with current and past transmission of leishmaniasis, or in the absence of recent cases in sites with phytogeographic characteristics potentially favorable for the development of Phlebotominae sand flies<sup>25</sup>.

A modified Shannon trap with protected human bait (SALOMÓN *et al.*, 1995) and 2 CDC-like mini light traps, were used since the dusk for three hours. The Shannon trap was placed in areas of close vegetation, and the CDC traps, one no less than 50 m from the Shannon trap, and

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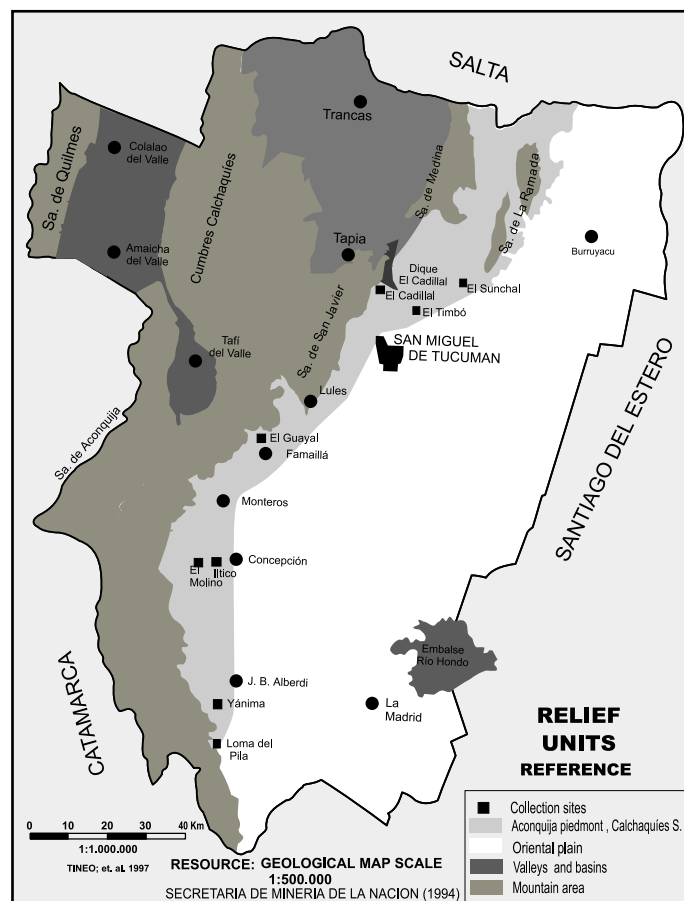


Fig. 1 - Area of the study including the different localities.

the other in the border between primary and secondary vegetation. In the case of using more mini light traps, these were located in possible Phlebotominae rest sites (tree trunks, scratches, caves, etc) or in peridomestic habitats (animal pens, poultry yards, etc) of houses with human cases<sup>15</sup>.

In December of 1999 at Yánima Shannon trap captures were performed in reference to a recent case, in peridomestic, secondary and primary forest (500 m from the dwelling) sites. The light trap were located in a pig pen (50 m), in the bushes close to a water stream (20 m), and in the primary forest. In the summer of 2000 the captures were repeated but the pig pen had been destroyed, so the CDC trap was then located in a tree where the poultry use to sleep.

The collected material was transferred dry to the laboratory where the insects were clarified and mounted (phenol - potassium hydroxide - dehydration in etilic alcohol (50° - 100°) - diaphanization in vegetal creosota and mounting in balsam), and the species were determined<sup>38</sup>.

The continuity of 1999 and 2000 longitudinal captures at El Guayal were only interrupted by weather conditions or unavoidable operative difficulties.

## RESULTS

A total of 2338 Phlebotominae were collected during the period of study. Sand flies were present in all the localities where the captures were performed, except in El Sunchal (trapping in the two consecutive summers).

The collected material corresponds to three species: *Lutzomyia neivai* (*Lu. intermedia complex*), *Lu. migonei* and *Lu. shannoni*, the last one cited for the first time in Tucumán<sup>4,10,22,24</sup>. *Lutzomyia neivai* was the most frequent species (97.7%), followed by *Lu. migonei* (2.3%), and 3 individuals of *Lu. shannoni* (Table 1). The former species was prevalent in mini light CDC-like trap (sex ratio females: males 1.4:1), as in Shannon trap (sex ratio 4.1:1), it was present in every capture with at least an individual. *Lutzomyia migonei* was captured only with CDC trap in 8 opportunities (sex ratio 1.6:1), always together with *Lu. neivai* (Table 2). *Lutzomyia shannoni* was collected once, three females, in El Timbó (Table 1).

The captures by CDC-like trap and simultaneous Shannon trap do not show significant differences.

In the locality of Yánima 366 Phlebotominae were collected in December of 1999 and 30 in February of 2001. The relative abundance

**Table 1**  
Captures by species, site of capture and date. Tucumán province, Argentina, 1999-2000

Locality	<i>Lu. neivai</i>	<i>Lu. migonei</i>	<i>Lu. shannoni</i>	Date	Nights of capture
El Guayal	62	1	0	10/99 to 11/00	13
El Sunchal	0	0	0	10/99 & 2/01	2
El Molino	312	0	0	12/99	1
Yánima	395	1	0	12/99 & 2/01	2
Iltico	1058	1	0	1/00 & 12/00	3
El Cadillal	8	6	0	4/00	1
Loma del Pila	3	0	0	1/01	1
Timbó	0	0	3	5/01 & 6/01	4
<b>Total</b>	<b>1838</b>	<b>9</b>	<b>3</b>		

**Table 2**

Captures of *Lu. migonei* with CDC like trap by place and date, and *Lu. neivai* collected in the same event. Tucumán province, Argentina, 1999-2000

Locality	Date	<i>Lu. migonei</i> (f/m)	<i>Lu. neivai</i> (f/m)
Yánima	12/99	1 / 0	105 / 90
Iltico	01/00	1 / 0	135 / 192
El Cadillal	04/00	3 / 3	6 / 0
El Guayal	12/00	1 / 0	7 / 1
El Guayal	01/01*	23/17	206/207
El Guayal	02/01**	6/1	4/1

\* 4 Traps, \*\* 2 traps

by site of capture with CDC trap was 1: 1.78: 4.36 in primary forest: peridomestic secondary vegetation: pig pen, in the first year. The capture obtained in the primary forest with CDC was similar to the one obtained with Shannon trap (45 and 35 individuals respectively), and 3.5 times superior to the one obtained with CDC in the border of the primary forest close to the agriculture area. In the year 2001 the capture in primary forest was 0.28 times the capture of the year 1999, and the relation primary forest: peridomestic tree with chickens was 1:2.3. The unique individual of *Lu. migonei* was collected in the pig pen.

According to the results and the accessibility we have started a schedule of captures with CDC trap, every fifteen days, in El Guayal. In relation to the rainfall a peak of abundance of sand flies was observed in January of 2001 just before the summer rain, and after this period it was observed a decrease in the population density ( Fig. 2 ).

**DISCUSSION**

Phlebotominae were reported in Tucumán province after 40 years without entomological data. Three species were collected: *Lutzomyia neivai* (Pinto, 1926), *Lu. migonei* (França, 1920) and *Lu. shannoni* (Dyar, 1929). *Lutzomyia neivai* was previously identified as *Lu. intermedia sensu lato (s.l.)*, but the two species of the *Lu. intermedia* complex were recently differentiated<sup>16,17,18</sup>. *Lutzomyia intermedia sensu lato (s.l.)* was

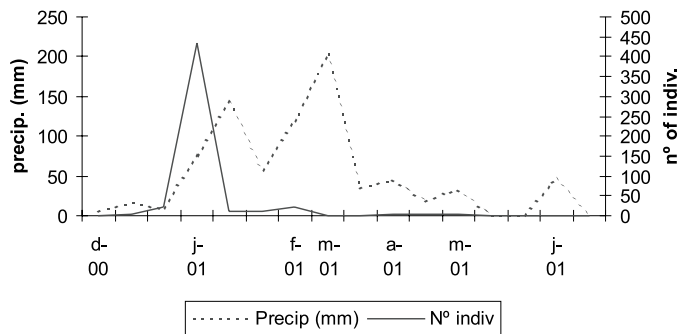
cited in Taffí Viejo, Río Chico and Yerba Buena departments, Tucumán up to 1950<sup>3,21</sup>. This species was again captured in this study in all the localities sampled, except in El Timbó, but the collections were performed in last autumn, so we can not discard its presence in other seasons. However, the relative abundance of *Lu. neivai (Lu. intermedia s.l.)/Lu. migonei* was reversed since those first reports, and currently *Lu. neivai* turned to be the prevalent species. This fact may be related to extensive deforestation, as it has been proposed for Brazil and Salta province, Argentina<sup>14,15,26,27</sup>.

The abundance of *Lu. neivai* in CDC and Shannon traps, in secondary forest and modified environments, its peridomestic prevalence related to human cases (in some occasions 100%), as its anthropophilic habit (females ratio in Shannon trap with protected human bait) supports the hypothesis of its incrimination as the vector of leishmaniasis in the area. This is consistent with other outbreak studies in Argentina, in the same phytogeographic domain<sup>27,29,30,31</sup>. Although up to now there are not identified isolates, the clinical and epidemiological pattern of human cases in Tucumán are consistent with leishmaniasis due to *Leishmania (Viannia) braziliensis*<sup>35</sup>, the main parasite in the endemic region of Argentina. This fact is important if we consider that the species of the *Lu. intermedia* complex had been found naturally infected with *L. (Viannia) braziliensis* in Brazil<sup>22,23</sup>. Thus, the sand fly attractiveness to animal (pigs, chicken) pens that increase its abundance would increase also the risk of *Leishmania* transmission, when the animal and human dwellings are close enough<sup>26,31</sup>. In Brazil, *Lu. intermedia s.l.* was found in chicken houses thorough the year, where it is sheltered during the winter<sup>1,5</sup>.

*Lutzomyia migonei* was previously reported feeding on domestic animals in Chicligasta, Trancas, Taffí Viejo, Lules, Yerba Buena, Río Chico, Burreuyacá departments, Tucumán<sup>3,21</sup>. In the current study it was collected in almost all the sampled sites, only by light trap and always together with *Lu. neivai*, during the peaks of abundance of the latter. The relative abundance seems different in El Cadillal because *Lu. neivai* abundance remained low, but this species still showed the higher anthropophilia.

Longitudinal captures (El Guayal) resulted in a neat peak after a month of unusual low rainfall (December 2000: 56 mm; December mean: 161 mm)<sup>19</sup>, just before the summer rainfall season (January-March), when the sand fly abundance dropped dramatically. Phlebotominae populations showed the higher density peaks during the warm-humid months, and the lower in the cold-dry season, both in Brazil and Argentina foci<sup>1,13,14,30</sup>. But in Argentina the concentrated rainy season usually interrupts the spring-summer abundance peak<sup>28,33</sup>.

In conclusion, after 40 years three species were found in Tucumán province, *Lu. neivai*, *Lu. migonei* and *Lu. shannoni*, the last reported for the first time in the province, although it was cited in the adjacent provinces. *Lutzomyia neivai* in the current study became the prevalent species around peridomestic habitats related to human leishmaniasis cases, while the leishmaniasis incidence increased in the last twenty years. The Phlebotominae were present thorough the Tucumán - Bolivian phytogeographic environment, where the outbreaks of leishmaniasis may happen. Taking into account the precedent results, further studies will be done on the spatial and seasonal distribution of sand flies in order to contribute to design surveillance strategies based on entomological data<sup>26</sup>.



**Fig. 2** - Phlebotominae abundance and weekly precipitation in El Guayal in the period December 2000 - June 2001.

## RESUMEN

### Fauna flebotomínica en la Provincia de Tucumán, Argentina

La Leishmaniasis Tegumentaria Americana es endémica en la provincia de Tucumán desde 1916, lugar donde se reportara el primer caso argentino de leishmaniasis. Entre 1986-88 ocurrió un brote epidémico en la provincia, después de este hecho el número de casos aumentó en forma gradual nuevamente entre los años 1991-1996. A partir de Octubre de 1999 se realizaron capturas de Phlebotominae en la provincia en diferentes sitios asociados con transmisión actual o pasada de leishmaniasis o en aquellos sitios identificados como de riesgo. Los muestreos se llevaron a cabo con mini trampa de luz tipo CDC y trampa Shannon modificada. En el presente estudio 2338 individuos fueron capturados e identificados siendo prevalente *Lutzomyia neivai* (Complejo *Lu intermedia*) (97.7%), seguida de *Lu. migonei*. Se reporta por primera vez la presencia de *Lu. shannoni* para la provincia de Tucumán. Los datos preliminares muestran que estos insectos son abundantes en los meses cálidos y húmedos y presentan un pico de actividad anterior a las lluvias de verano. *Lutzomyia neivai* mostró un patrón (prevalencia peridomiciliaria, antropofilia, abundancia en bosque secundario) consistente con otros estudios de brotes epidémicos. De este modo, los resultados refuerzan la incriminación de esta especie como vector de leishmaniasis en el área. Los animales domésticos cercanos a las viviendas aumentan su abundancia, y por lo tanto el probable y asociado riesgo de contacto hombre - Phlebotominae. Estudios posteriores deben realizarse para comprender el rol de cada especie de Phlebotominae en la transmisión de Leishmaniasis en Tucumán y así poder diseñar estrategias de vigilancia entomológica.

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