

Presence of *Lutzomyia longipalpis* and *Nyssomyia whitmani* in Entre Rios, Argentina

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ABSTRACT

The objective of this study was to evaluate the presence of *Lutzomyia longipalpis* in the Argentine city of Concordia, in the province of Entre Rios, without record of this species despite previous samplings, but with canine cases of visceral leishmaniasis and *Lu. longipalpis* reports both, from Northern Argentine localities and from the city of Salto, Uruguay, located just across the river and the international border. This study confirms the presence of *Lu. longipalpis* and *Nyssomyia whitmani*, related to the risk of visceral and tegumentary leishmaniasis, respectively, in Concordia-Entre Rios. The presence of *Lu. longipalpis* confirms the ongoing dispersal along the Uruguay river basin. The presence of these species in the study area alerts about the risk of transmission of *Leishmania spp.*

KEYWORDS: *Lutzomyia longipalpis*. *Nyssomyia whitmani*. Dispersal. Argentina.

INTRODUCTION

Leishmaniasis, a worldwide health issue with special relevance in public health, is considered a vectorial emergent or re-emergent disease. Processes such as urbanization and landscape modification favor vector colonization of an environment modified by humans especially in the Americas^{1,2}.

The urban cycle of visceral leishmaniasis (VL) includes the incriminated agents *Leishmania infantum* and *Lutzomyia longipalpis* as parasite and vector, respectively^{1,3,4}. Since its urban showing up in 2004 at the North border with Paraguay, *Lu. longipalpis* dispersed in Argentina from the Northeastern region to the South reaching Chajari (Entre Rios) 600 km far away in approximately seven years, and establishing the Latin-American Southernmost registry at the moment in Salto (Republica Oriental del Uruguay)^{5,6}.

For tegumentary leishmaniasis (TL), more phlebotominae species are incriminated as vectors, being in Argentina *L. braziliensis* the principal parasite associated to outbreaks⁷, with *Nyssomyia neivai* as its principal vector except for the outbreak in Puerto Iguazu (Misiones) where *Ny. whitmani* was incriminated⁷. Well documented human cases date from the first outbreak in 1984, however there are known cases since 1916⁷.

In the case of these last two species, their occurrence in Northeastern Argentina is more sporadic. According to current references, *Ny. neivai* was found in cities by the river Parana, whereas *Ny. whitmani* was not captured in the provinces of Corrientes nor in Entre Rios⁷⁻¹⁰.

In this sense, the objective of this study was to evaluate the presence of

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Lu. longipalpis in the Argentine city of Concordia (Entre Rios), having no registered captures in previous studies.

MATERIAL AND METHODS

Area of study

The sampling was developed in the city of Concordia, Entre Rios - Argentina (31°18'S 58°00'W), placed within the Pampean phytogeographic region (Pampean Uruguayan phytogeographic district), on the border with the Eastern Republic of Uruguay through the Uruguay river and connected by an international bridge (Figure 1A). The city has a population of 149,450 inhabitants and a density of 63.8 inhab/km² (INDEC, Census 2010). Climate is temperate with an annual maximum mean temperature of 24.8 °C (31.8 °C in January and February) and an annual minimum mean temperature of 13.1 °C (19.3 °C in January and February) (Sistema Meteorologico Nacional).

The fieldwork took place between January 30th and February 2nd, 2017, during the austral summer. With the purpose of sampling all the study area, the city was divided into four landscape strata: urban, semiurban, periurban and coastal, using the images provided by GoogleEarth® and GoogleStreet Maps®. Each landscape was divided into 400 x 400 m quadrants (Figure 1B) that were then random selected, so that the number of sampled quadrants per landscape was proportional to the total surface (Quadrants/surface total (km²): urban 30/5.57; semiurban 104/20.44; periurban 30/6.33; Coastal 14/3.33).

The landscape urban is the central area with paved

streets and low density of vegetation, the surface measures 2, 5.57 km.

Sand flies were captured with REDILA-BL minilight traps¹⁰. Each trap was active from approximately 5:00 p.m. to 8:30 a.m. of the next day. Traps were placed 1.5 m above the ground during three consecutive nights in each landscape: 5 traps in urban, 18 traps in semiurban, 5 traps in periurban and 2 traps in coastal landscape.

Each trap was placed in a domestic unit of the sampling quadrant, selected by the criterion described by Feliciangeli *et al.*¹¹ choosing sites with the higher probability of urban phlebotomine occurrence due to habitat conditions. The geographic coordinates of all the sampled sites were recorded with a Global Positioning System (Garmin Trex10®). In all the domestic units, an informed consent was signed by the adult who authorized the entry.

During the sampling days, the weather was windy with intermittent rain.

All phlebotominae sandflies were dried and preserved prior to processing. The specimens were cleared with lacto-phenol and identified according to Galati¹² under a microscope (Zeiss, 400x).

RESULTS

The sampling effort was of 30 trap/night. Of the total studied sites, we found phlebotomine specimens in 10%. These sites with phlebotomine were distributed and located at three out of the four sampled landscapes (urban, semiurban and periurban), being the coastal the only one without phlebotomines (Figure 1B).

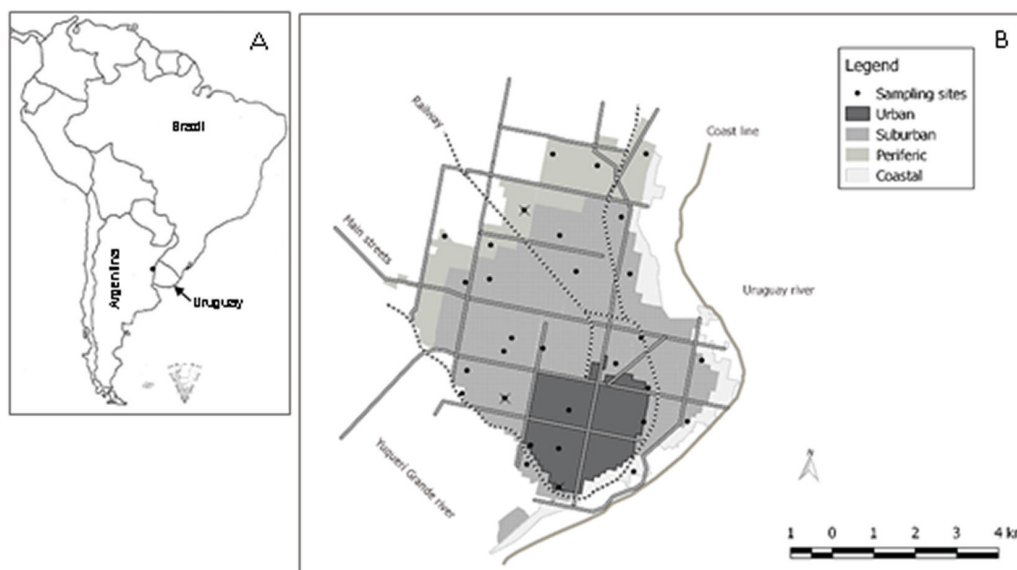


Figure 1 - A) Location of the study area (black point) in South America, bordering the Eastern Republic of Uruguay; B) Study area showing the four landscapes sampled and the distribution of the sites (points). Stars highlight the sites with phlebotomine occurrence. The sampling period was from January 30th to February 2nd, 2017

We captured a total of 8 phlebotomines, belonging to two species: *Lu. longipalpis* and *Ny. whitmani*. There were two male *Lu. Longipalpis*, one in the semiurban landscape and the other in the periurban landscape, but we found six female *Ny. whitmani* in the urban landscape.

During the sampling nights, mean maximum temperatures ranged from 30.4 °C to 33.8 °C, and mean minimum ranged between 20.9 °C and 22.6 °C.

DISCUSSION

This study reports the presence of *Lu. longipalpis* and *Ny. whitmani* in Concordia-Entre Rios, Southern to the Southernmost previous record in Argentina, despite the historical sampling in the area. The presence of *Ny. whitmani* is interesting as its distribution up to now seemed discontinuous along the residual gallery forest of the Parana and Uruguay rivers, while the report of *Lu. longipalpis* support the hypothesis of an ongoing dispersal, expanding to territories without previous records². Some major constructions among others had taken place in the study area, the binational dam of Salto Grande, the main pipeline of Entre Rios and the national motorway N° 14 that had changed the physiognomy of the landscape. According to different authors, these changes triggered climate changes, demographic and transit of goods and services profiles at the local level, contributing to vector dispersal especially when there is ecological continuity and least cost steps¹³⁻¹⁵.

The presence of *Lu. longipalpis* and *Ny. whitmani* in the study area alerts about the transmission risk of *Leishmania* spp. in latitudes which are not considered receptive or vulnerable.

To present, *Lu. longipalpis* Southernmost distribution in Argentina was 30°46'00"S 57°59'00"W, Chajari - Entre Rios¹⁰, but American Southernmost location where individuals of this species were found was 31°23'18"S 57°57'38"W Salto -R.O. del Uruguay¹⁶. The results of this study update this distribution to 31°23'32"S 58°01'01"W Concordia-Entre Rios, supporting the risk of *Lu. longipalpis* dispersal already shown in other studies under certain conditions of temperature and humidity and exceptional ones⁶.

The number of individuals obtained from both species is very low, but the climate conditions according to the records during the study were not optimal for the activity of phlebotomines¹⁷. Even though the scenario is adverse and there is eventual recent colonization, *Lu. longipalpis* was found in the anthropogenic environments¹⁸. In this sense, while the odds of permanent colonization by *Lu. longipalpis* in the current climate and landscape context

are low, the presence of *Lu. longipalpis*, the outbreak of canine cases that took place in Salto-Uruguay⁵ and the occurrence of canine cases of LV in Concordia (National Health Surveillance System - Argentina) warn about the risk of autochthonous transmission of *L. infantum* in the region.

Another finding of this work is the presence of *Ny. whitmani* in the study area. So far, the studies carried out in other cities of the Mesopotamia Argentina do not report the presence of this species, but identified specimens of *Ny. neivai* and other phlebotomine species^{8-10,14}. *Ny. whitmani* is a species that is mainly found in rural areas and in zones with primary or secondary vegetation^{19,20}. However, in this study the specimens captured were from the urban landscape¹⁸, perhaps due to a probable trend towards urban occupation that this species shows²⁰. Although its presence is incipient, these results could be related to regions of intense agriculture leading to a possible anthropization of the vector²¹.

Finally, considering the foregoing, active surveillance is recommended for *Lu. longipalpis* and *Ny. whitmani* with periodic monitoring in the areas adjacent to known records. Likewise, there is a need to develop instruments for decision makers, starting from validated models that allow timely identification in space environments with risk of incipient vector colonization, estimating the likelihood of transmission risk for leishmaniasis in regular and exceptional conditions, considering climate or environmental change scenarios in order to reduce the risk of occurrence of human and canine cases of LV and/or LT.

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