SCIENTIFIC NOTE

A SURVEY OF THE MOSQUITO SPECIES IN MAXCANU, YUCATAN, MEXICO

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ABSTRACT. A survey was carried out to identify the mosquitoes inhabiting human premises in the rural locality of Maxcanú, Yucatán, Mexico. Using the Centers for Disease Control and Prevention backpack aspirators, simple random sampling was carried out inside of 101 homes during the November 2013 rainy season. A total of 1,492 specimens were collected. Three subfamilies (Anophelinae, Culicinae, and Toxorhynchitinae) and 5 species were identified: *Anopheles albimanus, Aedes aegypti, Culex interrogator, Limatus durhamii*, and *Toxorhynchites theobaldi*. The most abundant species was *Cx. interrogator* (74%) followed by *Ae. aegypti* (25%). The Chao 1 and Bootstrap species richness estimator indicated that it was possible to collect 90% of the expected species. This is the 1st time that the presence of *An. albimanus, Cx. interrogator, Li. durhamii*, and *Tx. theobaldi* has been recorded in Maxcanú.

KEY WORDS Aedes aegypti, Culex interrogator, new records, species richness, suburban area

One of the best-known groups of Diptera in Mexico are mosquitoes, where 20 genera and 247 species have been recorded (Ibáñez-Bernal et al. 1996). The Yucatan state (southern Mexico) has the most complete mosquito species richness inventory in Mexico (mainly because of the species of medical/ veterinary importance), including 13 genera and 56 species (Baak-Baak et al. 2016). In Merida (capital city of Yucatan), 6 genera and 16 species of mosquitoes are known to occur: *Aedes aegypti* (Linnaeus), *Anopheles albimanus* Wiedemann, *Culex*

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The town of Maxcanú in the state of Yucatan is located 65 km west (20°33' and 20°46'N, 89°53' and 90°24'W) of the city of Merida (Fig. 1) and has a population of 21,704 inhabitants distributed in 5,221 households, of which 74.4% do not have basic services such as running water, electricity, etc. (SEDESOL 2010). Many homes are single-room unfurnished dwellings with dirt floors and no drainage facilities. Likewise, 90% of this locality has a large backyard used for animals (SEDESOL 2010). The climate is classified as warm and semidry with summer rains. Average annual temperature is 26.4°C with an annual rainfall amount of 1.0742 mm (INEGI 2010). The vegetation in the area consists of low deciduous forest with secondary vegetation; the main activities for earning a living are seasonal

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Fig. 1. Accumulation curve for species of Culicidae collected indoors in the community of Maxcanú, Yucatán, using the Centers for Disease Control and Prevention backpack aspirators.

agriculture and livestock production (Flores and Espejel 1994).

A single entomological survey was performed during November 2013 in 101 houses across the town of Maxcanú. Resident permission was obtained according to the inclusion criteria outlined by Thrusfield et al. (2001). A spatially random selection of houses nested in blocks was performed to representatively capture the geography of the town. Indoor adult mosquito collections were performed between 9:00 a.m. and 3:00 p.m. by 4 2-person teams using the Centers for Disease Control and Prevention backpack aspirators (Model 1412; John W. Hock Co.[®], Gainesville, FL) during 3 straight days. Collections were limited to a maximum of 10-15 min per team per household (Deming et al. 2016). All collected adult mosquitoes were transported to Collaborative Unit for Entomological Bioassays (UCBE) of the Collaborative of the Universidad Autonoma de Yucatan (UADY) for identification, using standard taxonomic keys (Carpenter and LaCasse 1955, Belkin et al. 1970, Wilkersson et al. 1993, Darsie and Ward 2005). Subsequently species determination was confirmed at the National Entomology Laboratory at the Instituto de Diagnóstico y Referencia Epidemiológicos. A species accumulation curve (Chao 1 and Bootstrap estimators) was used to calculate sampling efficiency. EstimateS ver. 9.1.0 (Storrs, CT, USA) was used to determine the number of species missing from the collection. The accumulation curve was plotted through R studio 3.4.3 (R. RStudio, Inc., Boston, MA).

A total of 1,492 specimens were collected, which belonged to 3 subfamilies (Anophelinae, Culicinae, and Toxorhynchitinae) and 5 species: *An. albimanus*, *Ae. aegypti*, *Cx. interrogator*, *Li. durhamii*, and *Tx. theobaldi. Culex interrogator* (74%) and *Ae. aegypti* (25%) were the most abundant species. The remaining species were *Li. durhamii* (3 specimens), *An. albimanus*, and *Tx. theobaldi* (1 specimen each). The species accumulation curve adjusted by Chao 1 and Bootstrap estimators indicated that 90% of the expected 6 species were collected (Fig. 1).

These are the 1st records of An. albimanus, Cx. interrogator, Li. durhamii, and Tx. theobaldi presence in Maxcanú. The species collected in this study represent 10% of the known species richness in Yucatan (Baak-Baak et al. 2016). The dominance of Cx. interrogator and Ae. aegypti can be explained through several factors. The behavior of these species is highly endophilic and anthropophilic. They gravitate to areas in which they can shelter within human homes, find a variety of natural and artificial items to use as breeding sites, and access human or farmyard animal bloodfeeding. Aedes aegypti is most frequently found in urban and suburban environments with high concentrations of human beings, while Cx. interrogator is mainly found in rural and suburban areas (Nájera-Vázquez et al. 2004, Zapata-Peniche et al. 2007).

We recorded 3 rare species. Limatus durhamii is mainly sylvatic but also can be found in suburban and rural areas, using artificial containers as breeding sites (Nájera-Vázquez et al. 2004). Anopheles albimanus is found almost exclusively in the sylvatic areas in which they develop, but in some cases, the adults can fly long distances to get blood from farm animals (horses and cattle) and humans. This could explain the low abundance of this species inside the houses (Ortega 2010). Toxorhynchites theobaldi is found in suburban and, sometimes, urban areas, developing in natural and artificial sites where they feed on the larvae of other mosquito species (e.g., Aedes and Culex). The presence of this species inside houses is likely due to their seeking shelter during the hottest hours of the day (Focks 1985, Nájera-Vázquez et al. 2004). Species such as Ae. aegypti and An. albimanus are important in Mexico for their roles as vectors of dengue, chikungunya, and Zika viruses (Ae. aegypti) and malarial parasites (An. albimanus). The presence of these vectors in the locality requires a response from the vector control program and the community.

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