

## SCIENTIFIC NOTE

### *HAEMAGOGUS EQUINUS* IN KINNEY COUNTY, TEXAS

WILLIAM J. SAMES IV,<sup>1</sup> DAVID B. PECOR<sup>2</sup> AND BRET B. ALLEN<sup>3</sup>

**ABSTRACT.** Larvae collected from an oak tree hole east of Brackettville, Kinney County, Texas, resulted in the collection of 3 species: *Aedes triseriatus*, *Ae. zoosophus*, and *Haemagogus equinus*. One larva and 1 female of *Hg. equinus* were recovered from this sample. This is the first report of *Hg. equinus* in Kinney County and the first report of this species being collected in Texas since 1962. Samples collected from other sites documented the presence of *Ae. epactius*, *Culex nigripalpus*, and *Psorophora signipennis* in Kinney County.

**KEY WORDS** County records, Culicidae, distribution, surveillance

On September 4 and 6, 1955, Trapido and Galindo (1956) reported the collection of *Haemagogus equinus* Theobald in Cameron County from 2 sites for the first record of this genus and species in the United States. This collection along with studies (Soper 1955, Rodaniche and Galindo 1957) implicating *Hg. equinus* as a vector of yellow fever virus caused public health concern because yellow fever had historically impacted this region of Texas (Gorgas and Hendrick 1924). In 1956 and 1957 the Texas State Department of Public Health (now Texas Department of State Health Services) and 4 other government agencies surveyed Brownsville, Texas, and Matamoros, Mexico, to determine *Hg. equinus* distribution and prevalence (Eads and Strom 1957). On March 5, 1957, *Hg. equinus* pupae were collected as part of these surveys from a Texas ebony tree, *Ebenopsis ebano* (Berland) Barneby and J.W. Grimes.

Breland (1958) reported 190 tree hole collections along the Texas-Mexico border from Cameron to El Paso County and found *Hg. equinus* larvae and pupae in 6 tree holes of Texas ebony and hackberry (*Celtis* sp.) trees, all of which were in Cameron County. Both Breland (1958) and Eads and Strom (1957) discussed unsuccessful attempts to collect adult specimens using light traps or sitting in areas where *Hg. equinus* larvae had been collected.

The last known collection of this species in Texas was on June 19, 1962, about 31 km (19 mi) east of Brownsville from a Texas ebony tree (Breland 1962). This tree was inspected annually by James D. Long and Jimmy K. Olson for about 40 years, but no additional *Hg. equinus* were found (Welch 2012, Sames 2017). The tree, which was between a state natural area and private property, was removed

during the placement of a boundary fence between these properties sometime between August 1999 and March 2021 (Sames, personal observation).

On August 29 and September 14, 2022, larvae were collected in Kinney County to document mosquito species not listed in Sames et al. (2021). Tires, water-filled containers, ground pools, and tree holes were sampled using dippers or bulb siphons. Specimens were identified as larvae or reared to the adult stage for identification. Larvae reared to the adult stage were allowed to develop within the water from which they were collected; no additional food was provided. Darsie and Ward (2005) and Carpenter and LaCasse (1955) were used to differentiate adult and larval specimens.

A total of 14 species were collected: *Aedes aegypti* (L.), *Ae. albopictus* (Skuse), *Ae. epactius* (Dyar and Knab), *Ae. triseriatus* (Say), *Ae. zoosophus* (Dyar and Knab), *Hg. equinus*, *Culex nigripalpus* Theobald, *Cx. quinquefasciatus* Say, *Cx. tarsalis* Coquillett, *Psorophora ciliata* (Fabricius), *Ps. columbiae* (Dyar and Knab), *Ps. cyanescens* (Coquillett), *Ps. discolor* (Coquillett), and *Ps. signipennis* (Coquillett). Based on Sames et al. (2021), *Ae. epactius* (32 specimens), *Cx. nigripalpus* (8), *Hg. equinus* (2), and *Ps. signipennis* (5) were new county records.

*Aedes epactius*, *Cx. nigripalpus*, and *Ps. signipennis* are common within the region, so their collection was not a surprise. However, the collection of *Hg. equinus* was unexpected. The collection site is east of Brackettville, about 306 km (190 mi) northwest of Brownsville, Cameron County, and about 53 km (33 mi) directly east of the Texas and Mexico international border (Fig. 1).

On September 14, 2022, using a bulb siphon, larvae were collected east of Brackettville from an oak (*Quercus* sp.) tree hole. This was the only tree hole sampled, and it was sampled on both days of this study. In addition to *Ae. triseriatus* (7 specimens) and *Ae. zoosophus* (1), 1 larva and 1 female *Hg. equinus* were recovered from the sample. The larva was damaged during identification and not kept; the adult was in excellent condition and point mounted. The

<sup>1</sup> PO Box 547, Leakey, TX 78873.

<sup>2</sup> Walter Reed Biosystematics Unit, Smithsonian Institution Museum Support Center, MRC-534, 4210 Silver Hill Rd, Suitland, MD 20746.

<sup>3</sup> Kinney County Extension, PO Box 266, Brackettville, TX 78832-0266.



Fig. 1. The state of Texas depicting reported records of *Haemagogus equinus* in Cameron County (first and last collections in Texas were September 4, 1955, and June 19, 1962) and Kinney County (second county with this species, collected on September 14, 2022).

height of the tree hole was about 0.46 m, and the distance from the tree hole to the center of the adjacent creek bed was approximately 65 m. The distance to the 3 closest human habitations were 0.75, 1.15, and 2.45 km. Previous collections from this tree hole were on September 23, 2020, and August 29, 2022. *Aedes triseriatus* (3 and 11 specimens, respectively) and *Ae. zoosophus* (10 and 24 specimens, respectively) were collected each time.

Initially identified as *Hg. equinus* from characters presented in Darsie and Ward (2005), the female specimen was compared to the descriptions in Arnell (1973) for *Hg. equinus* and allied species *Hg. soperi* Levi-Castillo and *Hg. acutisensis* Arnell. This comparison also resulted in a determination of *Hg. equinus*. *Haemagogus equinus* specimens from Cameron County (wild caught and laboratory reared) preserved in the Osmund P. Breland Collection at the University of Texas Biodiversity Collection, Austin, Texas, were examined and compared to the Kinney County specimen.

To ensure the accuracy of the identification, the point-mounted female was sent to the Walter Reed Biosystematics Unit (WRBU), Suitland, Maryland, for confirmation. The WRBU manages the Smithsonian Institution Culicidae collection and routinely receives specimens for identification confirmation and accession into the US National Museum (USNM). Upon arrival at WRBU, the specimen was examined, and the identification confirmed again as *Hg. equinus* from characters presented in Darsie and Ward (2005). Additionally, the specimen was compared to *Hg. equinus* specimens in the USNM that were collected in Cameron County, Texas. The point-mounted specimen was officially accessioned

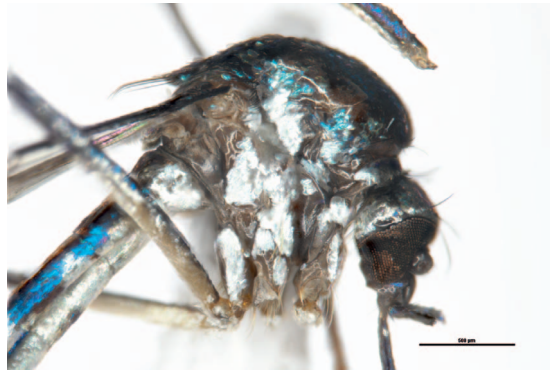


Fig. 2. Lateral view (pleuron) of *Haemagogus equinus* collected in Kinney County, TX, USNM01239690, specimen deposited at the Smithsonian Institution, Washington, DC.

into the USNM under the catalog number USNM01239690. Diagnostic characters confirming the identification as *Hg. equinus* were captured using a Nikon NIS Elements D 5.30.02 imaging platform mounted to a Nikon SMZ18 stereoscope at 3× magnification, and an example image is presented in Fig. 2.

The collection of *Hg. equinus* in Kinney County was the first known collection of this species in Texas since 1962 (Breland 1962). In Kinney County, trees large enough to develop tree holes grow along creeks and drainage areas. As the distance from the creek bed or drainage ditches increases, the vegetation changes to low-growing shrubs, which do not develop tree holes. This suggests that in at least Kinney County, *Hg. equinus* may be present in riparian areas that favor the growth of trees that develop tree holes. Additional tree hole surveillance, especially in South Texas, is needed to help determine the distribution of *Hg. equinus* in Texas.

We thank Clarke Mosquito Control Products, Inc., for their assistance with the publication costs of this article. We also thank Bethany Bolling, Texas DSHS, for her discussions and comments on this paper, and Alex Wild for his assistance in accessing the University of Texas Biodiversity Collection, Austin, Texas. The WRBU work was financially supported by the Military Infectious Diseases Research Program (MIDRP) MI220219 and provided salary support for D. Pecor. The activities undertaken at WRBU were performed in part under a Memorandum of Understanding between the Walter Reed Army Institute of Research (WRAIR) and the Smithsonian Institution, with institutional support provided by both organizations. The view(s) expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Departments of the Army, Air Force, or Navy, the Department of Defense, or the U.S. Government. The use of trade names in this document does not

constitute an official endorsement or approval of the use of such commercial hardware or software. Do not cite this document for advertisement. The publication has been cleared for publication by the Walter Reed Army Institute of Research (WRAIR).

#### REFERENCES CITED

- Arnell JH. 1973. Mosquito studies (Diptera, Culicidae). XXXII. A revision of the genus *Haemagogus*. *Contrib Am Entomol Inst* 10:1–174.
- Breland OP. 1958. A report on *Haemagogus* mosquitoes in the United States with notes on identification. *Ann Entomol Soc Am* 51:217–221.
- Breland OP. 1962. Notes on the mosquito *Haemagogus equinus* Theobald. *Mosq News* 22:301.
- Carpenter SJ, LaCasse WJ. 1955. *Mosquitoes of North America (North of Mexico)*. Berkeley, CA: University of California Press.
- Darsie RF, Ward RA. 2005. *Identification and Geographic Distribution of the Mosquitoes of North America, North of Mexico*. Gainesville, FL: University Press of Florida.
- Eads RB, Strom LG. 1957. An additional United States record of *Haemagogus equinus*. *Mosq News* 17:86–89.
- Gorgas MD, Hendrick BJ. 1924. *William Crawford Gorgas: his life and work*. Garden City, NY: Doubleday, Page, and Company.
- Rodaniche E, Galindo P. 1957. Isolation of yellow fever virus from *Haemagogus mesodentatus*, *H. equinus*, and *Sabethes chloropterus* captured in Guatemala in 1956. *Am J Trop Med Hyg* 6:232–237.
- Sames WJ. 2017. 2017 AMCA Memorial Lecture Honoree: Dr. Jimmy Karl Olson 1942–2015. *J Am Mosq Control Assoc* 33:156–165.
- Sames WJ, Dunton RF, Bolling BG. 2021. A checklist of the mosquito species in 13 counties west of San Antonio, Texas. *J Am Mosq Control Assoc* 37:119–124.
- Soper FL. 1955. Yellow fever conference. *Am J Trop Med Hyg* 4:571–661.
- Trapido H, Galindo P. 1956. Genus *Haemagogus* in the United States. *Science* 123:634.
- Welch JB. 2012. 2012 AMCA Memorial Lecture Honoree: Dr. James Duncan Long 1925–2009. *J Am Mosq Control Assoc* 28:137–144.