

# Survey of Mosquito (Diptera:Culicidae) Species in Brazos County and Surrounding Areas

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**Abstract.** Mosquitoes (Diptera:Culicidae) are arguably the most medically important insect in the world, vectoring numerous diseases to animals. In order to adequately combat and control dangerous diseases, public health officials regularly observe and document the species composition of mosquito populations in any area also occupied by humans. Mosquito specimens were collected during the spring months of 2015 to determine which species were present in local Texas areas. Larvae were collected through use of a mosquito dipper and other various plastic containers, then reared in mosquito breeding containers (samples of larvae were preserved for identification). Regions surveyed were focused in the Bryan/College Station area, with several samples also collected in other Texas cities like, Round Rock, Humble, and De Kalb. Mosquitoes of the species *Culex quinquefasciatus*, *Aedes canadensis*, *Anopheles albimanus*, *Aedes vexans*, *Aedes albopictus* were collected in Brazos County. *Culex quinquefasciatus* was found to be present in Round Rock and Humble as well. Several mosquito species were consistently found in the various regions of Texas with a few exceptions.

*Keywords:* *Culex*, mosquito, Texas, *Anopheles*, *Aedes*

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Mosquitoes are widely regarded as the most detrimental and dangerous animal to mankind. These small insects and the diseases they vector are responsible for significant morbidity and mortality across the world, especially in undeveloped countries. Malaria alone, vectored primarily by the *Anopheles* genera, is responsible for

over 500,000 deaths per year (WHO 2015). Other diseases vectored by mosquitoes include chikungunya, yellow fever, and dengue virus.

In the Southern United States, risk of acquiring malaria or yellow fever is fairly low, but there are other diseases that make

up for this discrepancy. West Nile virus in particular, along with Western and Eastern Equine Encephalitis, are of significant concern to Texas citizens and can be fatal (Whitehorn 2014). Certain diseases hold higher concerns in different regions of Texas all depending on the genus and species of mosquitoes that are popular in the area. Monitoring and controlling populations of vectoring mosquito species is crucial for reducing disease transmission in local areas. More often than not, larval control appears to be the most successful means of reducing mosquito populations. But before populations can be controlled, local officials must know what breeding habits they are targeting as these can differ among genera and even species. Hence, surveyance and identification of local species must take place before any adequate control programs can be formulated.

## **Materials and Methods.**

*Bryan, TX:* Lake Bryan and surrounding puddles in Bryan, TX were examined in search of mosquito larvae. In a fenced area used for boat storage located about 50 feet from the lakeshore, seemingly forgotten vessels were holding standing water that contained plant debris along with many larval specimens. Specimens were collected with a mosquito dipper and transferred into a mosquito breeder for rearing and study.

The majority of the larvae were allowed to mature to adulthood, leaving only a few specimen for larval identification. The remaining larvae were killed by transferring

them into a vial of 70% ethyl rubbing alcohol (Wallgreen Co, Deerfield, IL). The adults were killed by placing them in the freezer and then sexed. Males were discarded and females were sorted by obvious visual differences in appearance. Females were identifies and then placed in to labelled vials containing 70% ethyl rubbing alcohol.

*Round Rock and Georgetown, TX:* Mosquito larvae were sought, but not found, along the edges of a pond located at Polo Bend in Georgetown, TX, 24 hours after heavy rainfall had occurred.. A park located at Hairy Man Rd in Round Rock, TX, was also surveyed for larvae with no specimens collected. Mosquito larvae were collected from a rain-filled wheelbarrow in the backyard of a house located on High Bluff Trail in Round Rock, TX. It is approximated that this wheelbarrow had harbored standing water for a month. Mosquitoes were caught by scooping with a medium-sized Ziploc Tupperware container (SC Johnson, Racine, WI) and transported to College Station, TX for relocation into a homemade mosquito breeder. The breeder was comprised of two 2 liter Coca-Cola bottles (The Coca-Cola Company, Atlanta, GA) cut in half and fixed together with clear shipping tape (OfficeMax, Naperville, IL) (see Figure 1).



**Figure 1: Homemade Mosquito Breeder**

Source:

<http://www.bitsandpieces.us/2013/04/07/homemade-mosquito-trap/>

A sample of the larvae were hot-water killed by exposure to boiling water for 15 seconds and a coffee filter (Melitta, Clearwater, FL) was used to separate the larvae from the boiling water. After separation, dead larvae were carefully moved to a capped glass vial filled with unscented Purrell hand sanitizer (GOJO Industries, Akron, OH). These vials were then transported to the lab for identification. Once adult mosquitoes emerged, the top of the breeder was separated from the base and placed in a freezer for 24 hours. Killed adults were then stored in hand sanitizer-filled vials and taken to the laboratory for identification. Vials were labeled once proper identification was completed for both larvae and adults

*Laura Ln. College Station, TX:* The back door of a house located on Laura Lane in College Station, TX, was opened at dusk (between 7:00 p.m. and 8:00 p.m.) to allow for entry of specimens. A room adjacent to the door was monitored for mosquito entry. A single adult female mosquito was collected after landing on an adjacent wall. The mosquito was trapped using a Ziploc

Tupperware container and placed in a freezer for 24 hours. Tweezers were used to transport the mosquito to a capped glass vial containing unscented Purrell hand sanitizer. The mosquito was then brought to the laboratory for identification and labeled appropriately.

*De Kalb, TX:* Around 1:30 p.m., a pond in a wooded area within the town, De Kalb, TX was examined for the collection of larvae. Using vials, pond water and water from the puddle was scooped up along with any larvae. Once enough was collected, the larvae were hot-water killed and placed in 70% ethanol immediately after for later identification.

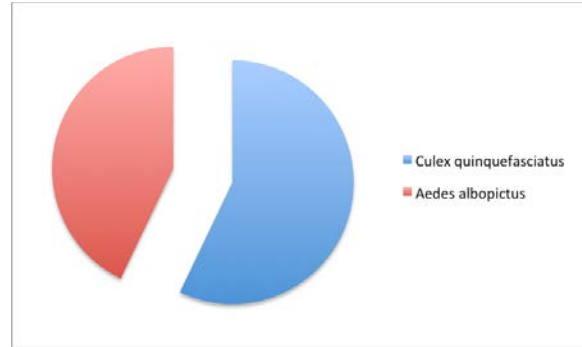
*Lick Creek Park in College Station, TX:* The mosquitoes collected were found along one of the trails near standing water from previous rainfall. Two Ziploc bags were used to catch adult mosquitoes once they landed. Later, the adult mosquitoes were killed by placing them in the freezer for 24 hours and placed in the vials with 70% ethanol for identification. Both the larvae and adult mosquitoes were identified using a and labeled accordingly.

*Humble, TX:* Areas selected for collection were shaded within the wooded area around a horse stable where water had accumulated providing an ideal location for large populations of mosquito larvae to perpetuate. The same procedure was performed each of the three different collection dates which included March 22 and 29 and April 19, 2015. Samples were

taken around 9:00 a.m. when the temperature was beginning to rise for the day. Within the wooded area behind the horse stalls there was standing water built up in the mud from several days of rainfall. Plastic Ziploc Tupperware containers were used to obtain samples of water containing an abundant number of mosquito larvae. Once several samples were collected, the larvae were transferred to homemade mosquito breeders (see Figure 1) - where some were removed to be heat-killed for identification. The larvae within the breeders were allotted time to mature into adults. Female adult mosquitoes were placed in the freezer in Ziploc bags for 24 hours before being transferred to vials of 70% ethanol. The larvae and adults were then identified.

## Results

*Lake Bryan, Sandy Point Road, Bryan, Texas - 30 March 2015:* No collection was made from rainfall puddles near the lake due to inability to find larvae. However, many larval specimens were collected from a single old vessel in a fenced off area located near the lakeshore. While the only larval specimens identified were *Culex quinquefasciatus*, identification of the reared female adult specimens proved that there were also *Aedes albopictus* larvae cohabitating in the same pool of standing water (See Figure 2).



**Figure 2: Distribution of Reared Female Specimens Collected from Lake Bryan, TX**

*High Bluff Trail, Round Rock, Texas - 10 April 2015:* A large sample of *Culex quinquefasciatus* larvae and pupae were observed and collected from a wheelbarrow that had been collecting standing water for approximately a month. The collection was achieved shortly after and during rainfall between 5:00pm and 7:00pm. All reared larvae produced *Culex quinquefasciatus* adults.

Mosquito larvae were absent at a nearby park (approx. 1 mile away) where standing water was present in a drainage ditch. This observation occurred at approximately 6:00pm. Mosquito larvae were sought at the edges of a pond but not found at Polo Bend, Georgetown, Texas (24.1 miles from High Bluff Trail). This observation was made at approximately 12:00pm.

*Laura Lane, College Station, Texas - 12 April 2015:* A single *Anopheles albimanus* adult female was collected at 8:00pm inside a house after doors had been left open for approximately 30 minutes.

*De Kalb, Texas -5 April 2015:* A large sample of *Aedes canadensis* was found in a small near by forest in the town of De Kalb, TX, around 1:00 p.m. in the afternoon.

*Lick Creek Park, College Station, Texas- 20 April 2015:* A wide variety of both adult and larvae *Aedes* species was found at the Lick Creek Park in College Station, TX; the creek running through the park and the amount of standing water from rainfall made it a suitable environment for mosquitoes.

*Humble, Texas - 22 March-19 April 2015 :* Multiple samples were collected from the wooded areas of a horse stables in Humble, TX. First survey of the region provided a large sample of *Aedes vexans* larvae collected from various puddles of stagnant water following excessive rainfall at 9:00 a.m. No larvae were found in a collection that was taken from a small pond in the same area due to larger organisms being present in the environment. A small sample of *Culex quinquefasciatus* larvae were collected around 9:00 am in shallow standing water that remained while the area dried up following a week of steady rain during the second survey. During the final survey at approximately 9:00 am, an abundant amount of *Culex quinquefasciatus* larvae were collected the morning after heavy rainfall. Within the sample a small number of *Psorophora confinnis* larvae were collected as well.

## Discussions/ Conclusions

According to these findings, the *Culex* genera is found in North Austin, Humble and the Bryan/College Station area. Likewise, *Culex quinquefasciatus* appears to be prevalent in both areas. This species is a container breeder and eggs are not resistant to desiccation.

*Culex quinquefasciatus* has been found to vector many pathogens to both humans and animals. *Culex q.* is considered the dominant vector of St. Louis encephalitis in the southern United States and is also a proficient vector of West Nile Virus and Eastern Equine Encephalitis. Population reduction protocols should be implemented to reduce *Culex q.*, populations so as to reduce risk of transmission of these diseases to humans and animals. As this species is a container breeder, management can be achieved by encouraging citizens to minimize mosquito-breeding habitats on their property. If any eggs or larvae are observed in containers, they should be dumped immediately as neither stage can survive without water. Larviciding ditches and other standing water after rainfall may also be effective (Hill and Connelly 2013).

A single *Anopheles albimanus* female was collected, suggesting the presence of this species (and presence of the *Anopheles* genera) in Bryan/College Station. *Anopheles albimanus* is a known night-feeder and a versatile breeder, laying eggs in varying levels of water purity. Eggs are resistant to desiccation and may survive for several

months without rainfall. Larvae are not sensitive to food type and will utilize almost any nutritive substance to which they are exposed. *Anopheles albimanus* is of medical concern because it is considered a dominant malaria vectoring species in both South and Central America (VectorBase 2014).

Presence of this species in the Brazos County area may be reason for concern, as this could suggest a rising possibility of malaria circulation in the area. It is advised that population control methods be implemented to reduce this possibility.

Control of *Anopheles spp.* is difficult due to their hardy nature. It is suggested larviciding standing water as a first step toward control.

A large variety of *Aedes spp.* was also found in the Bryan/College Station area and in East Texas around Texarkana. This different species, in particular, have been known to vector Dengue Fever, Chikungunya and Yellow Fever. This can be a concern if in close contact with specific vectors such as *Aedes aegypti* and *Aedes albopictus* (Center for Disease Control and Prevention 2014).

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