

# Mosquito (Diptera: Culicidae) Collection Survey of Bryan/College Station, Texas

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**Abstract:** Mosquito-borne diseases are responsible for millions of hospitalizations and deaths worldwide each year. Many species with a high vectorial capacity for diseases such as West Nile virus, yellow fever, and equine encephalitis are endemic to the southern U.S. The different mosquito species can be found in a broad spectrum of environments, ranging from nearly clean water to brackish runoff. Certain mosquito species have a preference as to where they lay their eggs, including permanent water species and temporary water species. Four different locations were sampled for the presence of mosquito larvae. Some collected larvae were preserved immediately and the rest reared out to adults before they were identified down to genus and species. Mosquitos from the genus *Aedes*, *Culex*, and *Psorophora* were identified, with *Aedes* species being the most common. Identification of the different species collected is important in order to understand the various habitats these mosquitos breed and properly develop specific control methods to reduce populations. Knowing which species are present in a particular location is also essential in identifying the different diseases that may be present; as different mosquito species are vectors for different pathogens. Knowledge of what pathogens are in an area can help raise awareness about the importance of mosquito prevention. It also informs residents what symptoms to look for if a person falls ill with a suspected mosquito-borne disease. This survey served to identify some of the common species of mosquito present in various locations in the Bryan College Station area.

*Keywords:* Mosquito, *Aedes*, *Culex*, *Psorophora*, control, vector

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Mosquitoes belong to the insect order Diptera, family Culicidae and consist of more than 3,000 species worldwide. Mosquitoes lay their eggs in various habitats, which hatch in aquatic larvae before pupating and emerging from the water as adults (Crans, 2004). They can be divided into two groups based on where the females lay their eggs. These two classes include flood-water mosquitoes, which lay their eggs in dry areas subject to flooding with water, and

standing-water mosquitos, which lay their eggs in pools of standing, permanent water (Bentley et al., 1989). Males feed on nectar while females are blood feeders that must consume a blood meal in order to lay eggs (MMCA, 2013). Mosquitoes often obtain this meal by feeding on humans, making them a susceptible host to any diseases the mosquito may be carrying. Knowing the different species that may be present in a specific location is important, as

mosquitoes serve as vectors for various pathogens that can greatly impact human health. Diseases such as yellow fever, West Nile virus, and malaria are a few of the diseases that mosquitoes are capable of spreading. Mosquitoes pick up pathogens by feeding on infected individuals, then successfully transmit that pathogen by injecting into a second individual, often causing the new host to become infected with the disease (Paupy, 2009). There are reported cases of millions of deaths caused by mosquito-borne illness in the United States alone (WHO, 1996). Knowing the species of mosquito in a certain location as well as the diseases they vector can help prepare locals determine what precautions to take in order to avoid mosquito contact as well as help medical professionals diagnose cases that might have been caused by a mosquito vector and assist in different mosquito eradication efforts.

## **Materials and Methods**

### *Collection:*

Mosquito larvae were collected from various locations around the Bryan and College Station area, including Lick Creek Park (30.5714, -96.2187), Research Park (30.6047, -96.3579), an apartment complex in Bryan (30.6299, -96.3594), River Oaks Townhomes (30.6179, -96.3105), and Wolf Pen Creek (30.6181, -96.3042). Areas where water was present were found at these locations, including puddles, streams, and lakes, to collect from using a commercial dipper (Bioquip, Rancho Dominguez, CA) or a plastic cup (Solo Company, Lake Forest, IL) for obtaining water samples. Lick Creek Park samples were collected on two trips from various rain puddles and drainage ditches

surrounding the pathways, while Research Park samples were taken in one trip from the lakes located in this area. The samples taken from the Bryan apartment complex were obtained in one trip from a pothole filled with rainwater. Samples in the River Oaks Townhomes area were obtained from inside an open cooler filled with rainwater, and those from Wolf Pen Creek were collected from a drainage ditch filled with runoff water from a rainstorm.

Samples that contained mosquito larvae were transferred into recycled water bottles (Nestle Waters, Paris, France) for transport. Water containing live mosquito larvae were then transferred into the bottom half of a commercial mosquito breeder (Bioquip, Rancho Dominguez, CA) before being left out in a warm, dry environment to allow larvae to rear into adults.

### *Preservation:*

A small amount of larvae from each collection site was separated from the rest and killed using the hot water method. Approximately one cup of water was brought to a boil before placing the larvae in and removing them after 30 seconds. This effectively killed the larvae and allowed them to immediately be placed in glass vials (Bioquip, Rancho Dominguez, CA) containing either ethanol (The Lab Depot, Inc, Dawsonville, GA) or hand sanitizer (GOJO Industries, Akron, OH) for later identification.

Once adult mosquitoes were reared from the remaining larvae in the mosquito breeder, they were removed and placed in the freezer for 24 hours. Once dead, the adults were placed in glass vials filled with ethanol or hand sanitizer for later identification.

*Identification:*

Larval and adult mosquito specimens were identified in a laboratory setting under a dissecting microscope (Olympus Corp, Tokyo, Japan), using dichotomous keys. Each specimen was identified down to genus and species and labeled accordingly.

**Results**

Only trips to Lick Creek Park, the Bryan apartment complex, River Oaks Townhomes, and Wolf Pen Creek were successful. From Lick Creek Park, three larvae were identified to be *Culex restuans* (Theobald) and one adult was reared, also *Culex restuans*. Many of the remaining larvae died during the rearing process and were unidentifiable. From

the Bryan apartment complex four larvae were identified as *Aedes albopictus* (Skuse) and seven adults were reared and keyed out as *Aedes albopictus*. Six larvae and two adults were identified as *Aedes albopictus* and four larvae were identified as *Culex restuans* from River Oaks Townhomes. From Wolf Pen Creek ten larvae and two adults were identified as *Aedes vexans* (Meigen), while 2 larvae were unidentifiable after the heating method. On a second trip, four larvae were collected and one adult reared out to all be *Psorophora confinnis* (Lynch-Arribalzaga). The species of each mosquito collected from the sites can also be found below, listed on Table 1. No mosquitoes were collected at Research Park. The average temperature during collection trips was around 27° Celsius.

Collection Site	Number of Mosquitoes	Species Name
Lick Creek Park	4	<i>Culex restuans</i>
Research park	0	N/A
Bryan apartment complex	11	<i>Aedes albopictus</i>
River Oaks Townhomes	12	<i>Aedes albopictus, Culex restuans</i>
Wolf Pen Creek	20	<i>Aedes vexans, Psorophora confinnis</i>

**Table 1.** Collection sites and numbers of specimens (larvae and adults) collected along with identified species

**Discussion**

Understanding where mosquitoes inhabit as well as their lifestyles important in order to determine effective methods of control. Controlling the potential vectors can greatly reduce the amount of diseases transmitted to humans in these areas (WHO, 1996). The three genera that were collected were *Aedes*, *culex*, and *Psorophora*. The results of this survey show that *Aedes albopictus* was the most common species of mosquito found in the Bryan College Station area, followed by *Aedes vexans*, *Culex restuans*, and *Psorophora*. Species from the genera *Aedes* and *Psorophora* are floodwater mosquitoes, laying their eggs in areas like drainage ditches and puddles (Bentley et al, 1989). This information supports our findings as the larvae of *Aedes albopictus*, *Aedes vexans*, and *Psorophora confinnis* were all found in locations where rainwater had accumulated after a storm passed through the area. At the Bryan apartment complex, *Aedes albopictus*

larvae were collected from a pothole filled with rainwater, and at River Oaks Townhomes the same species was found in the water filled cooler. *Aedes vexans* were collected at Wolf Pen Creek in a drainage ditch, and *Psorophora confinnis* were found in a puddle near a tree. Most of these collection sites are temporary water sites that fill up after rainfall and remain long enough for mosquitoes to lay their eggs, the larvae to hatch, and fully develop into adults. The *Culex* genera are considered standing or permanent water mosquitoes, who prefer to lay their eggs in pools of water that will not evaporate in time (Bentley et al., 1989). *Culex restuans* were found both at Lake Creek Park in a pool underneath a bridge, and River Oaks Townhomes inside the cooler. The presence of *Culex* larvae in these locations can be attributed to the fact that the water beneath the bridge at Lake Creek Park is an area that is almost always filled with dirty rainwater because it is in a spot underneath enough shade to not easily evaporate. The cooler at River Oaks Townhomes is also a large and permanent water source for mosquitoes to lay eggs in. Larvae were not found at Research Park partly due to the location that the samples were collected from. Research Park has several large ponds inhabited by turtles, ducks, and fish, along with areas of running water. Due to the presence of small fish that act as predators towards mosquito larvae, it was not surprising to find no larvae at this location.

Each of the four species collected during this survey are vectors to various diseases. *Aedes albopictus* is known to be an aggressive biter of humans, and is also a vector for yellow fever, dengue fever, and eastern equine encephalitis (Rios et al., 2004). *Aedes vexans* is a common vector for canine heartworm, while *Culex restuans* is a vector for West Nile virus, St. Louis, and western equine encephalitis (Culex Environmental, 2014). *Psorophora confinnis* is a known vector of Venezuelan equine encephalitis (Moncayo et al., 2008). All of these diseases influence both animal and human health, and knowing that these potential pathogen vectors are present in an area greatly raises awareness as well as pushes for control. Each of the collected species are blood-feeders as females who will readily feed upon humans given the opportunity, increasing the risk of pathogen transmission from mosquito to human, so control is important in order to reduce this risk (MMCA, 2013). Eliminating areas where water can collect naturally, such as potholes or open containers, will greatly reduce the abundance of mosquito breeding grounds, therefore lowering their population.

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