A Survey of Mosquito Larvae in the Bryan-College Station Area

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Abstract: The vast amount of mosquito in different bodies of water is very apparent in this region. These mosquitoes can transmit a multitude of diseases including Malaria, West Nile Virus, and Zika Virus. In this survey, mosquitoes were captured from various bodies of water in the Bryan/College Station area in order to determine which mosquitoes were more prevalent in these areas. The objective of this was to identify these species to understand what bodies of water in this area contain which species and therefore protect ourselves from. Mosquito larvae were attempted to be gathered from 4 different locations that were 4 different types of water in this region, however larvae were only successfully collected in one of our locations. Different tools and containers were used to obtain these samples including rearing containers, measuring cups, etc. From these locations, the species that was identified was the male *Culex quinquefasciatus.* Due to this species being the only one identified from the various locations, it was concluded that it is a prevalent one in the Bryan/College Station area.

Keywords: Mosquito, survey, Texas, Brazos County*, Culex quinquefasciatus*

Mosquitoes are one of the driving forces in our ecological environment and a common vector of disease. Mosquitoes can transmit diseases, such as West Nile and Zika Virus (Bakhshi et. al. 2018). Surveying and monitoring mosquito species is an important tactic that can allow various people to understand the implication of mosquitoes on a certain area and inform necessary control procedures. Maintaining up to date surveillance information on the population dynamics of mosquito species can allow for more effective control in the event of a vectored disease outbreak (Shwab et. al. 2017). Mosquitoes go through four life stages-egg, larvae, pupa and egg-with the first three being aquatic stages and the adult phase being terrestrial. Eggs are either laid one at a time or attached together to form "rafts". Most eggs hatch within two days. Water is a very necessary part of their habitat. Once the egg is hatched into larvae the larvae lives in the water and come to the surface to breathe, they shed four times and they are larger after each shedding. Finally, after the fourth molt the larvae then becomes a pupa in which the mosquito is in its non-feeding stage of development. When development is complete the pupa skin opens, and the adult mosquito emerges. Once an adult, the mosquito waits above the surface of the water for all parts to dry and

harden before flying. Mating then occurs a few days after the adult emerges (AMCA). Water temperature can have a significant impact on the length of life cycle and survivability of the mosquito (Couret et. al. 2014). This experiment will involve retrieving various species of mosquito larvae from different bodies of water around the Bryan-College Station area. Previous studies in Texas have shown a wide population of mosquito species, including species of the genera *Aedes*, *Anopheles*, and *Culex* (Johnsen 2010). The collected specimens will then be reared into adults and identified in order to allow researchers to understand the physiological and ecological ramifications. The justification of this study is to inform the Bryan-College Station area of the various species of mosquitoes and the possible diseases that can be transmitted through them, as well as collecting information to help in future prevention and control procedures.

Materials and Methods

Survey Dates and Localities

Larvae collection of the Culicidae larvae took place at four bodies of water throughout the Bryan/College Station area. These areas included: Lake Bryan, the Junction Pond, White Creek, and a puddle of water in a backyard on Crested Point Dr. during the rainy season of April (table 1). The larvae were collected from both the water surface, and underwater in the lakes and pond, and the surface of a standing water puddle from Crested Point Drive.

Collecting Procedures

Mosquito larva at the location on Crested Point Dr. were collected from a puddle of standing water as a result of a recent rainstorm, using the lower portion of a mosquito rearing container (Bioquip, Rancho Dominguez, CA.) on April 10, 2019.

Table 1- Localities and Dates of Larva Collection

	Location of Collection	Date of Collections	Type of body of Water
1	Crested Point Dr., College Station, TX. 77840	April 10, 2019 April 15, 2019	Puddle
2	2415 Junction Boys Road, College Station, TX 77845	April 11, 2019	Pond
3	Lake Bryan, Bryan, TX. 77807	April 12, 2019	Lake
4	White Creek, RV Lot 58, Penberthy Blvd, College Station, TX 77840	April 17, 2019	Creek

Following the collection of water from the puddle of standing water, the top of the rearing container was attached, and the water was left for five days to allow for any potential eggs to hatch, and for larvae to develop. After yielding no results, the process stated previously was repeated again on April 15, 2019.

For the collection at the Junction Apartment complex, a mosquito larvae dipper was constructed of a one cup measuring cup (Farberware, Fairfield, CA.) fastened to a 70" Aluminum Telescoping Pole (Microfiber Tech, San Diego, CA.). On April 11, 2019 the mosquito dipper was inserted into the pond near an area of dense foliage. The dipper was brought up out of the water and collected into the lower portion of a mosquito rearing container (Bioquip, Rancho Dominguez, CA.). The container was closed, and the water was allowed to sit for seven days to allow any mosquito larva that may have been collected to develop.

At the location of Lake Bryan a mosquito larvae dipper constructed of the lower portion of a red solo cup (Solo Cup Co., Dallas, TX.) attached to a 5-gallon wooden paint stirring stick (Lowe's, College Station, TX.). The dipper was lowered into the water of Lake Bryan and removed. The water from this dip was collected into a mosquito rearing container (Bioquip, Rancho Dominguez, CA.). The water in the breeder was allowed to stand for the duration of 7 days to allow mosquito eggs to hatch and for larvae to develop. This collection was performed on April 12, 2019.

Collection of the mosquito larvae at White Creek occurred on April 17, 2019, following a heavy rainstorm. The same dipper utilized for the collection at the Junction Apartment Complex was utilized for collection at White Creek. To find an area of collection, the bank of White Creek near Texas A&M's lot 59 was examined for an area of dense foliage. The dipper was inserted into the water, and a cup of water was collected from White Creek. The water was collected into a mosquito rearing container (Bioquip, Rancho Dominguez, CA.), and was allowed to sit for seven days to allow larvae collected to mature into adults.

Any specimen obtained from dipping were allowed to mature into adults. The adult mosquitoes were killed using 63% ethyl alcohol (Walmart, Bentonville, AR) and collected into a cuvette (Bioquip, Rancho Dominguez, CA.).

Identification

The collected specimens were identified using a magnify glass (Gamerzia, Brooklyn, NY.) and the Ento 423 Laboratory Lab 5 - Adult Mosquitoes key. (Brundage A., 2019)

Results

The locations Lake Bryan, the Junction Pond, and Crested Point Dr. did not yield larvae, therefore there are no specimen to identify.

The dip from White creek yielded a single larva. Upon observation of the larva in the rearing container, it was noted that the larvae moved quickly around the water in the container.

Once the mosquito had matured into an adult, it was collected using the collection methods above, and identified using the key from the ENTO 423 lab manual.
The specimen (Figure 1) has plumose antennae, with a slightly curved proboscis. The scutellum of the specimen is trilobed and the Mecopostnotum was without setae.

The specimen is without iridescent blue scales nor post spiracular setae. On the wing of the organism the setae of the vein Sc is absent, and the scales are long and narrow. The apex of the abdomen is rounded bluntly. The proboscis of the organism lacks a pale ring of scales and the bands on the abdominal terga are basal and rounded. This specimen is best identified as a male *Culex quinquefasciatus.*

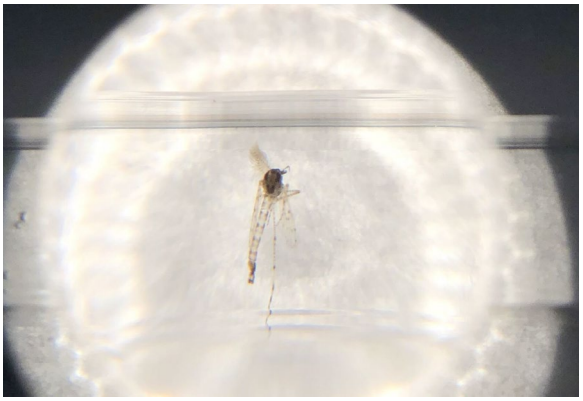

Figure 1- Specimen collected from dip of White Creek on April 17, 2019

Discussion

The mosquito collected and prevalent in the College Station are was *Culex quinquefasciatus*, the Southern House mosquito. This species is typically active during evening or early morning hours and prefers polluted waters for breeding (TAMU 2016). *Culex quinquefasciatus* can vector diseases such as West Nile Virus, St. Louis encephalitis, and lymphatic filariasis (Arensburger 2010). The presence of this mosquito in the Brazos Valley implies that there is a risk of these vector-borne diseases in the area. This could potentially cause a public health issue and require intervention should an outbreak occur. Knowing of this risk is helpful in being prepared for such events.
To ensure the population of the Brazos Valley does not get infected with these viruses there are a few things they should do. While there is no current vaccination for humans to prevent West Nile (CDC), the disease can be prevented by making sure that when people are out in peak *Culex* feeding hours, dusk to dawn, that they are using the preventative measures needed to not get bit by mosquitoes. Those preventative measures are wearing long sleeves, pants, and mosquito repellant. By providing less open body surface the mosquitoes will have a harder time to feed, therefore a harder time to transmit diseases.

The largest limitation of this study is the lack of data available due to unsuccessful sampling. This issue has several possible explanations. It is likely that temperature and rainfall had an effect on the availability of mosquito larvae for collection. Temperature can have a large effect on larval development and population. Mosquito activity is highest during warm weather times, with ample rainfall. For example, *Anopheles gambiae sensu stricto* has been found to have an optimal water temperature of 27°C, or 80.6 °F (Asare et. al. 2016). Collection took place in April,

when the weather was sporadic, and often cold. Weather data showed that the month prior to collection, May 2019, had an average temperature of 60°F and an average minimum temperature of 32°F. The month of collection, April 2019, had an average temperature of 68°F and an average minimum temperature of 45°F at the time of writing (WU). This weather is not optimal for mosquito breeding and was likely a factor in the unsuccessful sampling seen in this study. Additionally, the single larvae obtained was collected following a night of rainfall, but there was little rainfall preceding the initial collections. Studies have shown a positive correlation between rainfall and mosquito populations, so this could also have impacted the collections (Resien et. al. 2007). Another issue that could arise from collecting at privately owned sites is the possibility of treated water. One method of mosquito control is treating water to prevent breeding by using larvicide in it (EPA 2016). Because the information on how the water has been treated by the owners, it is possible that such chemicals were used and therefore affected the success of the sampling.

While the results of this study were largely limited by a lack of representative data, the objective is still an important issue. Future surveying studies should take the discussed factors into account in order to obtain more representative data. To modify collection procedures and timing in the future, collection should take place on a hot day possibly following rainfall, and in untreated bodies of water.

Conclusion

The data presented above was done so that they could analyze the species of mosquitoes found in the Brazos Valley so that they could inform the public on what types of mosquito borne diseases they needed to protect themselves from. The collection of mosquitoes was limited due to the sporadic Texas weather in the middle of April. Since the weather went from hot to freezing and back to hot and rainy within a week multiple times during April the mosquitos were not able to lay as many eggs as they would during this time of year. They also believe that some of the locations that were dipped for larvae could have been treated with insecticide which would also limit the number of mosquito larvae recovered. The one larva that they successfully contained was a *Culex quinquefasciatus.* This mosquito is known to vector diseases such as West Nile virus, Western equine encephalitis, and Saint Louis encephalitis.

Only having one mosquito larva to study is not ideal and does not include all species found in the brazos valley. They know that there are more than one species that call the Brazos Valley home, but since *Culex quinquefasciatus* was the only one caught, they can conclude that it is the most common in the area. A study done on *Culex quinquefasciatus* proved that *Culex quinquefasciatus* feed on humans 50% more often than any other species (Phumee, Chompoosri, Intayot 2019). If people of the Brazos Valley would take the proper preventative measures to avoid contact with mosquitoes the majority of disease cases can be prevented.

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