

Survey of Insect Families Attracted to Carbon Dioxide in Thomas Park and the Surrounding Area in College Station, Texas

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Abstract It is very important to be aware of the insects living in or around one's home for many reasons. Insects can vector numerous diseases, damage structures and plants, and be pests. Knowing what insects are in certain areas can help aid in control and prevention methods. This experiment focused on surveying insect families attracted to carbon dioxide in and around Thomas Park in College Station, Texas. Three insect traps were made, the attractant used was carbon dioxide producing-yeast. The three traps captured 325 insects, a majority of them being vinegar flies. All three traps captured at least one fly from the family Calliphoridae and one from the family Muscidae. Trap 3 captured a beetle belonging to the family Bostrichidae. The flies captured were forensically important because they colonize remains soon after death. The beetle, known as a powderpost beetle, was significant because it was a wood-boring beetle that could cause structural wood damage. By knowing that these insects live in a certain location, proper control measures can be performed to effectively control the population.

Keywords: Thomas, Park, Calliphoridae, Muscidae, Bostrichidae

Introduction

Insect surveys provide invaluable entomological information that can be utilized in many different ways. It is important to keep a record of local insects for monitoring purposes. Monitoring certain insects is important for treatment and prevention purposes. If an insect pest population reaches a certain population threshold, prevention treatments can be performed to control the pest (Zehnder 2014). The only way to know when to perform these prevention treatments is to regularly survey insect activity.

Mosquitoes are the most popular insect pest because they cause the most deaths of any

insect (Mullen 2009). However, they are not the only insect pest to cause problems for humans and the environment. Insects such as wasps, fire ants, cockroaches, flies, wood-boring beetles, and moths can be pests to people and the environment. These insects may not cause as many deaths as mosquitos but they may be overlooked due to mosquito research.

The main pests that the survey was geared toward were wood-boring insects, flies, and stinging insects. Wood-boring insects will damage wooden structures such as fences, structural timbers, and furniture. These can include powderpost beetles, carpenter bees and ants, and termites (Koehler et al. 1994).

Flies are a nuisance pest that can vector bacterial diseases such as dysentery and food poisoning (Illinois Public Health Department). Stinging insects such as bees, wasps, and ants are medically important because people can be allergic to the venom ejected by the insect during a sting. Knowing where these insects are located, how many there are, and what effects they are having on the environment will allow for appropriate measures to be taken if they affect human or environmental health.

The purpose of this survey was to collect and identify insect families in and around Thomas Park in College Station, Texas to determine if any insect pests were present. This information could then be used to treat for the pests depending on the type and number collected.

Materials and Methods

Trap Design. Three 2-liter soda bottles (Dr. Pepper Snapple Group, Waco, Texas) were cut in half. The top halves of the bottles were inverted and placed into the bottom halves, creating a funnel. The two pieces were taped together with duct tape (Duck

Brand, Avon, Ohio) so that the narrow end of the funnel was about two inches above the bottom of the containers (Figure 1). These containers served as the trap containers for insect collection.

Bait. The bait was produced by first boiling one cup of water for each trap. One-fourth of a cup of brown sugar (HEB Brand, San Antonio, Texas) was mixed with the boiled water. The mixture was allowed to cool until a finger could be comfortably submerged into the mixture (32-38°C). Then one teaspoon of active dry yeast (ACH Food Companies Incorporated, Oakbrook Terrace, Illinois) was added to the mixture and the entire concoction was placed into the trap container. String (Darice, Strongsville, Ohio) was attached to the trap to allow it to hang.

Trap Placement. The traps were placed in three different locations in and around Thomas Park, a neighborhood park in College Station,

Figure 1. Carbon-dioxide trap design

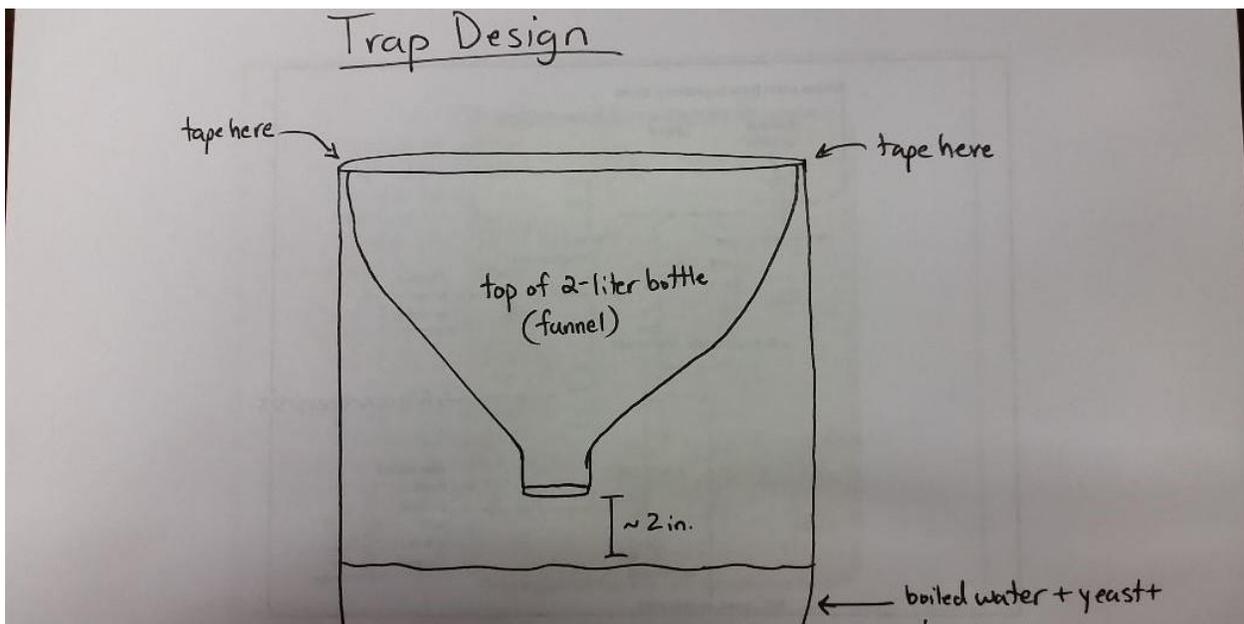
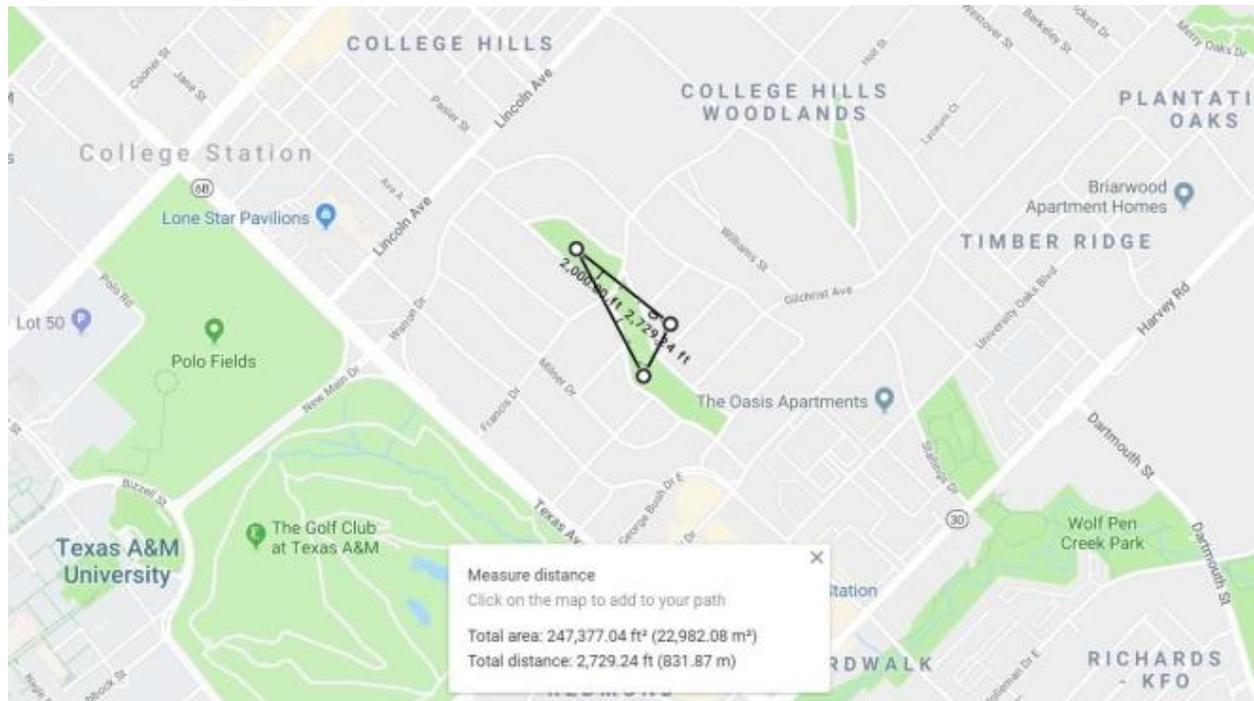


Figure 2. Map of Thomas Park and three trap locations



Texas, USA (Figure 2). All three were hung from tree branches about six feet above the ground. The traps were collected after one week and the insects were removed and identified down to family.

Identification. The insects were identified using “Keys to Genera and Species of Blow Flies (Diptera:Calliphoridae) of America North of Mexico” by Terry Whitworth.. The insects that were not located in that key were sight identified using morphological structures unique to each family.

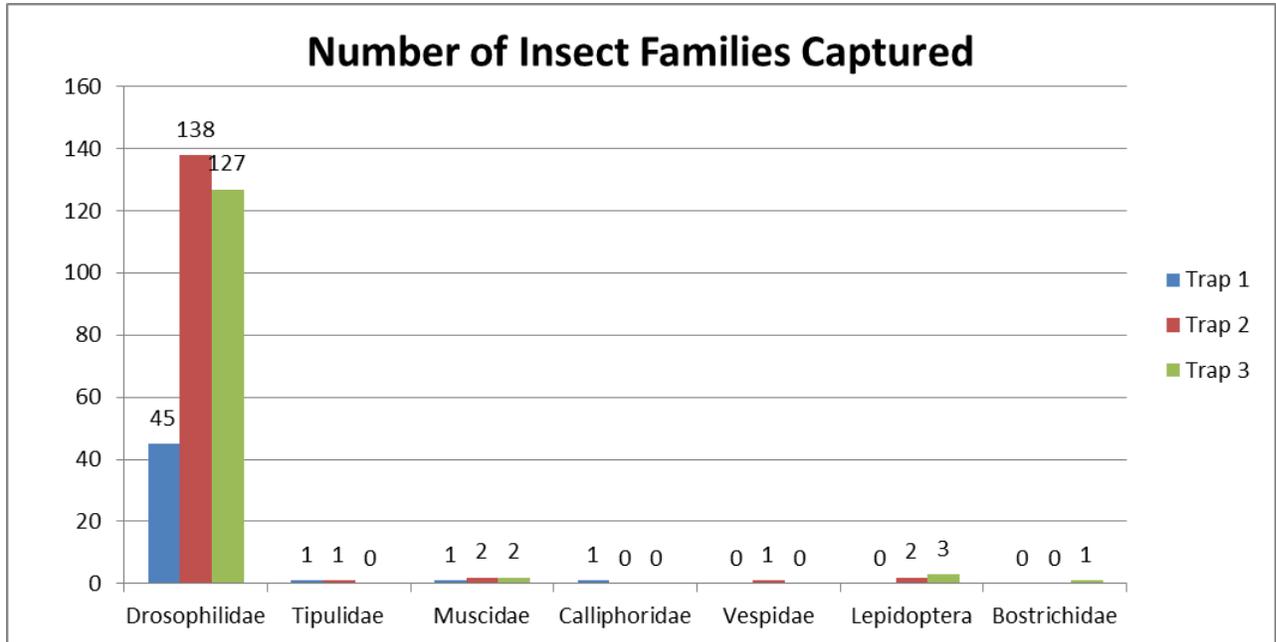
Results

The three traps captured 325 insects belonging to seven different families in Thomas Park and surrounding neighborhood (Figure 3). Trap 1, located in the backyard of my house close to Thomas Park, captured vinegar flies (Drosophilidae), one crane fly (Tipulidae), one Muscidae fly and one blow fly (Calliphoridae). Trap 2, located in

Thomas Park in a tree next to a pavilion, captured the largest number of vinegar flies, one crane fly, two Muscidae flies, one wasp (Vespidae), and two moths (Order: Lepidoptera). The moths were not identified down to family due to the lack of identification keys for moths. Trap 3, located on the opposite end of the park near a playground, captured vinegar flies, two Muscidae flies, three moths, and one Bostrichidae beetle.

All of the traps captured many more vinegar flies than any other type of insect. Traps 2 and 3 captured a larger variety of insects, as well as many more vinegar flies than Trap 1. Trap 2 captured the highest number of vinegar flies and the most variety of insects with five different families. It is important to note that the beetle belonging to the family Bostrichidae was captured in Trap 3.

Figure 3. Record of insect families captured in Thomas Park and the surrounding neighborhood in College Station, Texas.



Discussion

A variety of insects were collected from Thomas Park and the surrounding area. The majority of insects collected were of no significant importance to human or environmental health, but there were a few families collected that have the potential to pose harmful effects on humans and the environment.

The insect families of no real significance to human or environmental health that were collected include Drosophilidae, Tipulidae, Vespidae, and Lepidoptera. These families include vinegar flies, crane flies, wasps, and butterflies and moths, respectively. The insects in these families do not post any significant effects to humans or the environment. At worst, they can act as a

mild nuisance to people and a pest to fruiting plants (Cini et al. 2012).

The insects belonging to the families Muscidae and Calliphoridae are of greater importance than the previous insects due to their behavior. Most of the flies in these two families are necrophagous and are known to colonize dead and decomposing organisms shortly after death. These flies will develop faster under warmer temperatures and tend to live in warmer climates (Byrd 2002). They can be used in forensic investigations to provide information about the time of death of the corpse (Wang et al. 2017). The presence of these flies in this area and knowledge about them can help forensic

entomologists make accurate predictions about a death investigation.

The insects belonging to the family Bostrichidae are beetles known as powderpost beetles. Powderpost beetles are notorious pests of wood and will bore into many types of wood products if they get the chance (Kangkamanee 2011). The presence of a wood-boring beetle in one of the traps in Thomas Park indicates that there could be more of these beetles living near or in the park. If that is the case, wood damage could be an issue for the surrounding structures. If an infestation of these beetles occurred it could prove to be very expensive to replace the damaged wood structures.

It is very important to keep an up-to-date account of the insects that live close to people. Some insects can cause harm to people or structures and can be costly. By understanding the insect populations living near parks and homes, people can be aware of any potential threats that may arise.

One weakness of this experiment was the weather during the collection phase. Many of the days experienced cold mornings and evenings which could have affected insect populations present near the collection sites. It also rained one night which could have affected insect behavior relating to their collection. Another variable to note is the specific time of the season. The traps were set out for nine days from March 10, 2018 to March 18, 2018. The weather was still transitioning from winter to spring so it was not very warm which could have affected insect activity.

Experiments conducted in the future on this topic could include more surveys enveloping a larger area around Texas A&M University. These surveys could also be performed at different times of the year to account for seasonal effects. Also, follow-up surveys could be enacted near sites where a pest species were discovered to monitor the density of the pest species present.

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