

**LIFE CYCLE AND COMMUNITY STRUCTURE OF ELMID BEETLES
(COLEOPTERA: ELMIDAE) IN THE NAVASOTA RIVER, TEXAS.**

An Undergraduate Research Scholars Thesis

by

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Submitted to Honors and Undergraduate Research
Texas A&M University
in partial fulfillment of the requirements for the designation as an

UNDERGRADUATE RESEARCH SCHOLAR

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May 2015

Major: Biology

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ABSTRACT

Life Cycle and Community Structure of Elmids (Coleoptera: Elmidae) in the Navasota River, Texas. (May 2015)

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Research focused upon the structure and function of low elevation, turbid lotic ecosystems is lacking throughout much of the United States. This lack of basic ecological data severely hampers decision makers involving management of freshwater resources. The Navasota River, a low elevation, turbid lotic ecosystem, originates in southeast Hill County and flows approximately 125 miles south to join the Brazos River. Only limited data is available concerning the invertebrate communities and ecological functions these communities contribute to the Navasota River. The purpose of this study is to gain a better understanding of the life cycle and community structure of elmids (Coleoptera: Elmidae) in the Navasota River, near where it joins the Brazos River. At least four species of elmids are present in the Navasota River, with adults present in low numbers throughout the year. Larvae are also present throughout the year, but with various size classes. Spring (March and April) appears to be when the majority of larvae transform into adults.

CHAPTER I

INTRODUCTION

Research focused upon the structure and function of low elevation, turbid lotic ecosystems is lacking throughout much of the United States. This lack of basic ecological data severely hampers decision makers involving management of freshwater sources. The Navasota River is no exception. The river has been largely void of freshwater insect research. The Navasota is a low elevation, turbid lotic ecosystem, which originates in southeast Hill County and flows 125 miles south to join the Brazos River. Only limited data is available concerning the invertebrate communities and ecological functions these communities contribute to the Navasota River.

From 2013-2014, elm mid beetles (Coleoptera: Elmidae) (Figure 1) were collected from the Navasota River with the goal of better understanding the life history, community, and changes in population levels and population cycle (Figure 2). This research area is important because it provides a basis to develop a better understanding of turbid, low elevation, aquatic ecosystems.

Because of the confused taxonomic status of certain elm mid genera, included species in some cases cannot be recognized (Burke 1963). However, previous studies have documented the importance that elm mid larvae contribute to the ecosystem that surrounds them. The biomass of the benthic insect community in a Neotropical stream showed their importance in the food chain of an ecosystem much like the Navasota River (Ramirez and Pringle 1998). By specifically

studying elmids in the Navasota River, it is hoped that a better understanding of their importance to ecosystems such as the Navasota River will be documented.

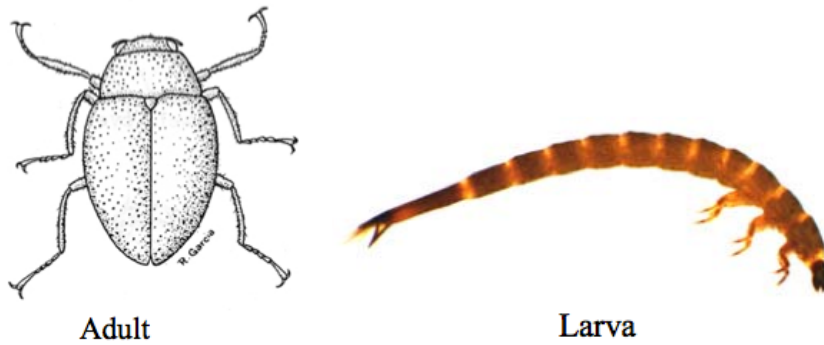


Figure 1. Adult (left) and Larva (right) elmids (Coleoptera: Elmidae). Adults mostly black, approximately 5mm in length, with long, thin legs; larvae typical of most beetle larvae, with distinct legs, and head, elongate, up to 10mm in size.



Figure 2. Navasota River and data collection location.

CHAPTER II

METHODS

Monthly samples were collected from a shallow riffle in the Navasota River, approximately 30-km south of College Station, TX. There were no samples collected during November or December due to excessively high water levels from extensive rains. There was also no data collected in May due to a research presentation. During each collecting event, four quantitative, replicate samples were performed using a Hess sampler with a net size of 250 μm . The sample consisted of insects dislodged from rocks atop of the bed of the river and from the benthos. A laboratory lab cleaning brush and an ErgoLoop Garden Hand Weeder with Fulcrum were used for dislodging the insects. The insects were kept in a 500 mL Nalgene bottle and preserved using 75% ethyl alcohol in order to transport them from the river to the lab. All aquatic invertebrates were removed and sorted into separate dram vials using a dissecting microscope. The vials were labeled with the appropriate date and location. Each morpho-type of elmud larva was separated based on their overall appearance. The intraocular distance of the larva were measured in millimeters using an ocular micrometer on the dissecting microscope. The data was put into Excel and then organized into graphs.

CHAPTER III

RESULTS

Four distinct species were identified during the study. They were *Microcylloepus pusillus*, *Hexacylloepus* sp. A, *Hexacylloepus* sp. B, and *Heterelmis* sp. Over the course of this study, each species followed a similar trend when it came to population size. The highest months of overall population were September 2013 and January 2014 (Tables 1-4). Of the two highest months, each species showed more specimens in September 2013 except for *Hexacylloepus* sp. A, which had more specimens in January 2014 (Table 2). The lowest months of overall population within all morphologies were February and March 2014; February had only 20 specimens collected. Of all the elmids species, the most prevalent head capsule measurement was 0.1mm. The only species that did not correlate with this trend would be that the *Hexacylloepus* sp. A, whose most prevalent head capsule measurement was 0.14mm (Table 2). This showed primarily in the month of January 2014.

Table 1. Head Width (mm) of *Microcylloepus pusillus* Population

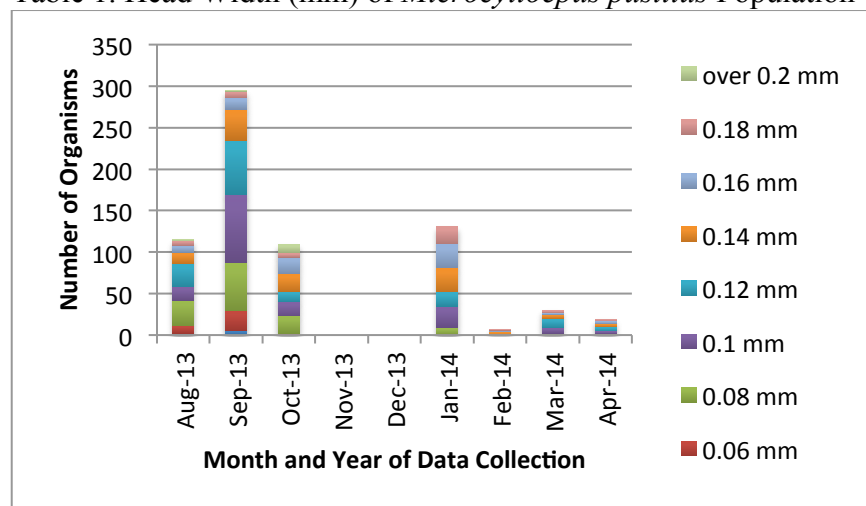


Table 2. Head Width (mm) of *Hexacylloepus* Sp. A Population

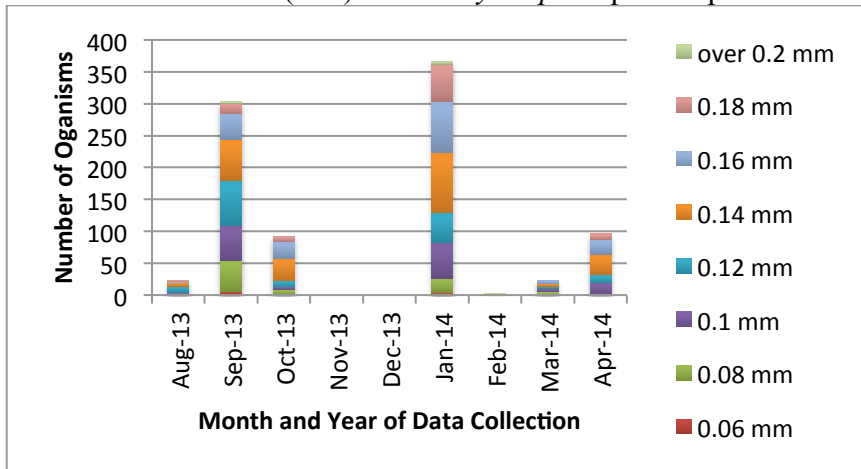


Table 3. Head Width (mm) of *Hexacylloepus* Sp. B Population

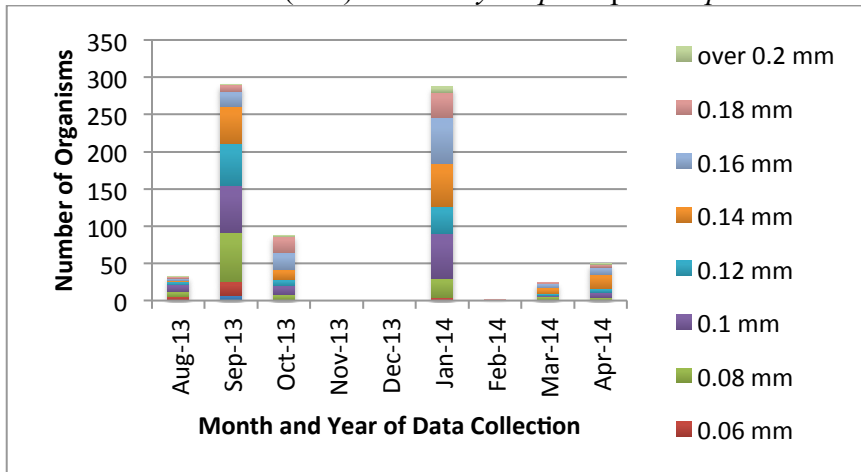
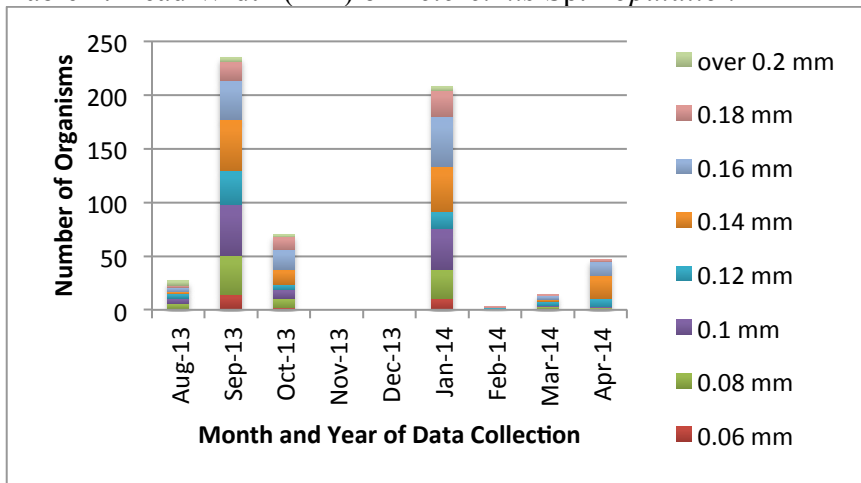


Table 4. Head Width (mm) of *Heterelmis* Sp. Population



CHAPTER IV

DISCUSSION

The largest populations of elm mid larvae were in September 2013 and January 2014. The most common species of elm mid larvae was *Hexacylloepus* sp. A. This data can be used to infer the periods of major reproduction cycles of the elm mid beetles. This data can contribute to science by providing evidence of the biomass concentration of elm mid beetles and how it affects the ecosystem. The large biomass of elm mid larvae in September and January could be due to a low predatory population period (Ramirez and Pringle 1998). The elm mid adult beetle population remained generally the same throughout the entire study. This is possibly because once they become adults, they are able to travel on land, no longer confined to water. It could also be due to multiple generations being present. A study by Phillips (1997) found a similar adult percentage of elm mid adults in the samples. The different species of elm mids could be a demonstration of the different stages of the life cycle that the larvae are currently in or be different subspecies of the elm mid beetles. The fall samples showed the highest prevalence of adult beetles and the largest larvae. This could be contributed to the temperature of the water or the possibility of abundant food available. A better understanding of the lifecycles of these species will aid in future research of the Navasota River. The high water levels in November and December possibly contributed to the population spike in January. Ramirez and Pringle (1988) demonstrated that it is crucial for the water level to remain high for the species to flourish.

CHAPTER V

CONCLUSION

Although this was only the first attempt to understand, in detail, the community structure and life history of elmids in the Navasota River, it has provided important details into the overall community of elmids in the Navasota River. A lack of data in November, December, and May certainly contributed to a shortfall in a better understanding. It is hoped that the continuation of this research, along with research of other invertebrates, will further knowledge and understanding of the community structure and the ecosystem of the Navasota River.

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