



# The Morphological Structure of the Gyrinidae Beetles Compound eyes



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## Abstract

The Gyrinidae beetle is unique compared to other beetles in the order Coleoptera. The factor that puts a stamp on this family of beetles is the structure of its compound eye. The compound eyes of the Gyrinidae beetles are divided, giving them a four-eyed appearance. The beetle's eyes are located on the anterior dorsal and anterior ventral part of the head. The division of the eyes allows the beetle to see above and below the water surface at the same time for prey and predators. The structure of their compound eye is very complex and is the key component for further research. The purpose of this study is to determine the morphological structure of the Gyrinidae beetle compound eye, and to determine if the length between each eye is due to the different species or sex of the beetle. There are five different species that were to be examined which include male and female; *Dineutus analis*, *Dineutus assimilis*, *Dineutus ciliates*, *Dineutus carolinus* and *Dineutus discolor*. The eyes were examined and measured under the scanning electron microscope and viewed under a dissecting microscope. After the specimens were measured, results showed that there is a similarity in the measurements between the dorsal-to-ventral eye distance in male and female *Dineutus* species; there also seems to be a variation for all species in the dorsal-to-dorsal and in the ventral-to-ventral eye separation.

## Introduction

Beetles have inhabited planet earth for centuries; their fossils can be dated back to the Permian period which is approximately 291.5-253 million years ago (1) Beetles are part of the insect order, Coleoptera, the largest order in the animal kingdom, representing one-fourth of all known insect species: one of the families of Coleoptera beetles is the Gyrinidae beetles (common name whirligig beetle) meaning to go about in a circular pattern.

The main goal of this study was to determine if the distance between the eye located on the dorsal portion of the beetle and the bottom eyes located on the ventral portion of the beetle is based on the species or sex, and to also determine if the eyes on the dorsal portion are smaller than the eyes on the ventral portion of the beetle.

## Methods

The *Dineutus analis* and *Dineutus carolinus* species were collected from the Big Thicket National Preserve located in Saratoga, Texas, from the Lance Rosier unit leading to Little Pine Bayou. GPS reading (30 degree 15 634' West 094 degree 31523' DO 1.47 Mg L). *Dineutus discolor* was collected at Greenbrier River and New river at Hinton, GPS reading ( 37 degree 39. 129'N;080 degree 53.148'W0) and *Dineutus assimilis* was collected from the Kirby trail in Kountze, Texas.

The beetles were collected using a finely meshed fishing net, and stored in a small container containing seventy percent isopropyl alcohol. The specimens were then taken back to the laboratory to be viewed under the scanning electron microscope Hitachi, model S-3400, giving an in depth view of the surface anatomical structure of the Gyrinidae beetle.

In lateral view, the distance between the lowest point of the dorsal eye to the highest point of the ventral eye was measured as dorsal-to-ventral distance, the tip of the head to the posterior part of the ventral eye (head height); the distance between the dorsal eyes, ventral eyes and the length and width of the dorsal and ventral eye were measured.

## Results

The head height was used to normalize all measurements to beetle size by dividing all measurements by head height, to determine if there is a change in the dorsal-to-ventral, dorsal-to-dorsal or ventral-to-ventral eye distance. Information obtained from the data showed that there is a similarity in the dorsal-to-ventral (lateral) eye distance in the male and female species. There seems to be a difference in the distance between the dorsal-to-dorsal and the ventral-to-ventral eye measurements in all species and sexes ( see figure1). Information also shows that the dorsal eye is smaller than the ventral eye in all species (see figure2).

## Discussion

Results indicated that the *Dineutus* species do not have a variation in distance between the dorsal-to-ventral eyes. This could be because the distance between the eyes is more prominent in different families of the Gyrinidae beetles or because the study's time span of the *Dineutus* species was too short and needs to be studied year after year so that, the beetles can be compared to other beetles from previous years. Also, data showed that there is a difference between the different species in dorsal-to-dorsal and ventral-to-ventral eye distances; indicating that some species are wider or narrower than other species. Data also indicated that the dorsal eye is smaller than the ventral eye; therefore, the hypothesis that there are more ommatidium on the ventral eye than the dorsal eye due to the different light mediums was supported.

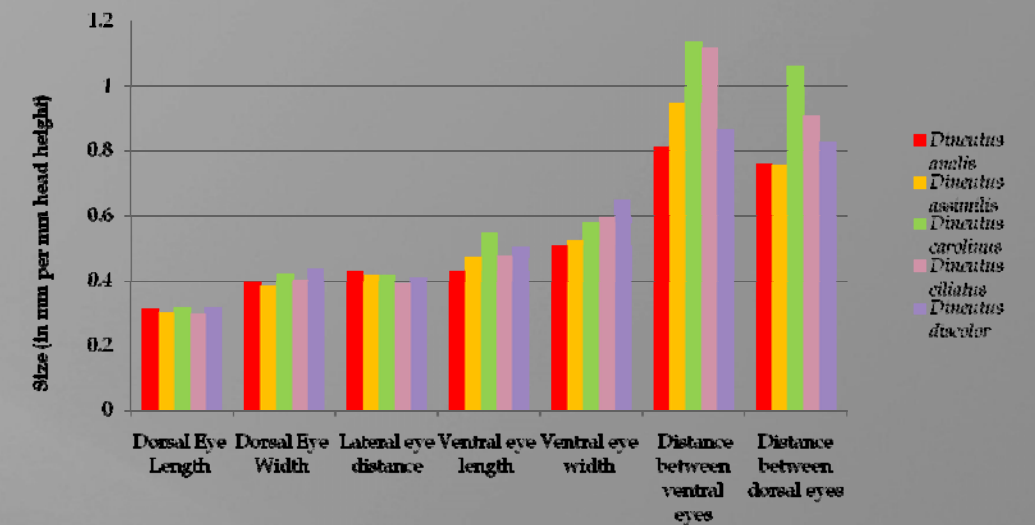


Figure 1: morphology between *Dineutus* species

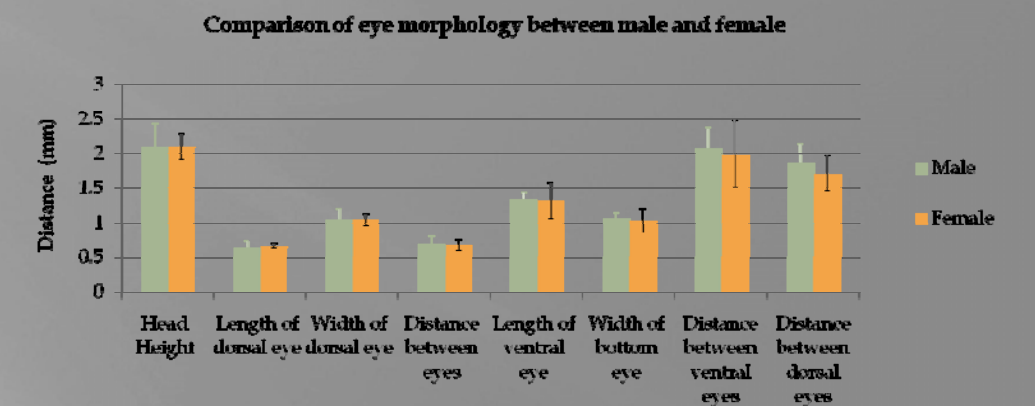


Figure 2: morphology between male and female

## Literature Cited

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## Acknowledgments

I would like to acknowledge Edward Realzola and Dr. Jerry Cook for giving me tips and pointers on my project and acknowledge Eastfield college project pathways summer institute supported by the Science Talent Expansion Program Grant # DUE-0525536, the Dallas County Community College District, the National Park Service, and the Big Thicket Association. For giving me the opportunity to do research work I would also like to give a special thanks to Dr. Knight and Dr. Baggett for their help with my paper and analysis of my study.