

**A Study of Riffle Beetle Behavior in the Checkhall River  
Coleoptera: Elmidae**

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## **ABSTRACT**

This study examined the behavior of riffle beetles around waterfalls in the Checkhall River on the island of Dominica. It was determined that both genders of Elmidae are active fliers in riffle areas of streams and rivers. The larva was located under rocks in areas where water was flowing over or around them. Through these observations, new information about riffle beetles was established.

## **INTRODUCTION**

The purpose of this study was to examine the beetle family Elmidae that live in riffle areas (Izaak Walton League 2006). Although these beetles are aquatic, they do not swim (White 1983). Instead they crawl on underwater debris and plants (White 1983). Riffle beetles are often found flying in the regions around falling water on the Checkhall River, Archbold Tropical Research and Education Center, Springfield, Dominica. The experiment was focused on whether both sexes perform this action or only one gender. The study was also interested in the time of day the riffle beetles are most active and whether rainfall affects their activity.

Adult riffle beetles are approximately 1/16 inch to 1/8 inch in size and have small, oblong bodies (Izaak Walton League 2006). Elmidae larvae are up to 1/2 inch long and have a long, hard, stiff body with two small hooks and several hairs on the posterior end (Izaak Walton League 2006). These characteristics make Elmidae easily recognizable. Riffle beetles are often good water quality indicators and have been used in several water quality experiments (White

1983). The most effective collecting method is to use an aquatic net or examine vegetation and debris near the riffle areas of the stream.

The study was conducted between May 25, 2007 and June 3, 2007 in the Checkhall River located on the Archbold Tropical Research and Education Center grounds.

## **MATERIALS AND METHODS**

The first day to collect was May 25, 2007. During previous days, the experiment was focused on locating the riffle beetles in the Checkhall River (between N 15° 23' 43.6" W 61° 22' 8.2" and N 15° 20' 43.9" W 61° 22' 8.4") and determining the setting of the study. An aquatic net, vial, ethanol, microscope, Petri dish, Bioquip® forceps and a journal were required to conduct the research. At 8:00 AM on May 25, 2007 one waterfall was watched for approximately 15 minutes and the number of riffle beetles sighted was recorded. At 12:00PM, 2:00PM and 4:00PM the same waterfall was watched for 15 minutes each to document the number of Elmidae spotted. This process was repeated on May 28, 2007 and June 1, 2007 for a total of 3 days. Beetles were collected during flight on May 25, 2007 at 3:30PM, May 28, 2007 at 4:00 PM and June 3, 2007 using the aquatic net. The beetles caught on May 25, 2007 and May 28, 2007 were analyzed to determine whether both genders were participating in flying around the waterfalls. On June 1, 2007 riffle beetles were caught and marked with pink nail polish to record the number of times each beetle flew to the top of the waterfall and returned to the bottom. Several hours were spent watching the

behavior of the riffle beetles. Approximately 55 beetles were collected during this experiment.

## **RESULTS**

There was a relationship found between the amount of beetles spotted and the time of day. The results supported that the riffle beetles are most active in the early morning and late afternoon (Refer to table 1). A relationship between the amount of rainfall and the activity level of the riffle beetles could not be established.

Through dissection, this experiment concluded that both males and females participate in flying up around the waterfalls of the Checkhall River. Below are pictures of areas of the river where riffle beetles were gathered. The whitewash located below the waterfalls was where the beetles emerged after riding down the waterfall. Riffle beetles could be caught when using an aquatic net as a strainer in the waterfall. Many Elmidae were collected in a larger area of whitewash below a waterfall. Several specimens were also found attached to the rock face where the water would flow over.

Although the larva stage was not a focus for this study, several Elmidae larvae were found under rocks when the study was being conducted. Samples taken on June 3, 2007 are returning to Texas A&M University- College Station for further study.



Riffle  
beetles  
collected  
here

Riffle  
beetles  
collected  
here



Riffle  
beetles  
collected  
here



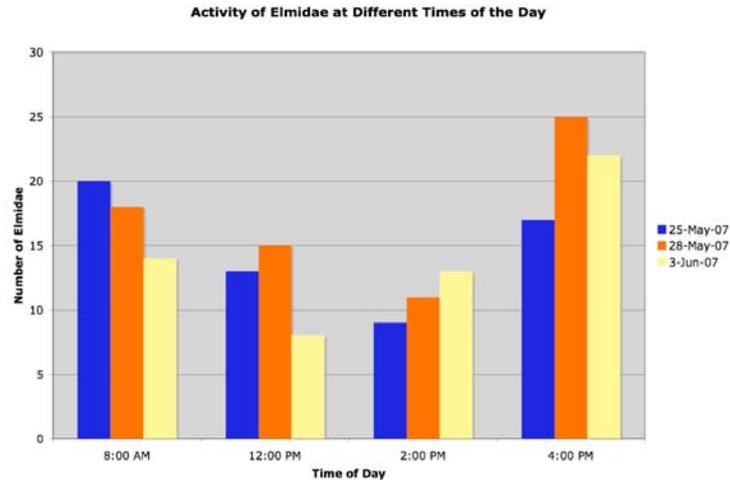
Riffle  
beetles  
collected  
here



Riffle beetle  
larva found  
under these  
rocks

**Table 1.**  
**Number of Adult Elmidae Spotted**

	<b>8:00 AM</b>	<b>12:00 PM</b>	<b>2:00 PM</b>	<b>4:00 PM</b>
<b>May 25, 2007</b>	20	13	9	17
<b>May 28, 2007</b>	18	15	11	25
<b>June 3, 2007</b>	14	8	13	22



## **DISCUSSION**

The purpose of this study was to learn about riffle beetles and understand them more. The primary goal was to determine what they are doing when they fly above waterfalls. Since both genders partake in flying around the waterfall but beetles were not observed in copula, the conclusion can be made that it is not a mating ritual. Two Elmidae were never caught attached during the collection process. Another observation was that the larger the riffle area, the more riffle beetles were present. The wider the waterfall, the more Elmidae were found moving upstream at one time. They fly in timed intervals. There would be a short amount of time where several would fly to the top of the waterfall and then an amount of time where you could not find a riffle beetle. Never was an incident recorded where two riffle beetles were at equal heights.

Since the rainy season began during the experiment, the idea was brought up to determine if the number of riffle beetles decreases the further you get into rainy season. Looking at the results of the activity levels of Elmidae at different times of the day, the rainfall did not affect the chance of spotting them. This may not be a true representation since we are so early into the rainy season in Dominica. We also tried to record the amount of times a single Elmidae traveled up and down a waterfall. Pink nail polish was used to mark one riffle beetle at a time. A problem arose when the beetles were not able to fly after the nail polish was applied. Following several more trials, that part of the experiment was eventually dropped.

The relationship between the time of day and the beetle activity level was very interesting. During the first few days of searching for riffle beetles it was difficult to find them in the early afternoon. The collection process slowly began later in the day and it became more efficient. The chart represents this. To get more thorough results, it was decided to record the amount of Elmidae found early in the morning. That proved to be a smart choice since it affected our results.

Several other insects have the same behavior where they are the least active in the heat of the day.

If this experiment were to be done again, more trials would need to be done. It would also be conducted during the year where it would overlap with a greater length of the rainy season. To record the number of times a riffle beetle would fly up to the top of a waterfall and emerge from the whitewash would also be conducted differently, possibly using spray paint or something that would not

affect a small insect as much. Determining the length of time between flights to the beginning of the waterfall would also be interesting to study.

Although 3 weeks was set aside to complete this experiment, it was difficult to observe several times a day. The comparisons were conducted only for days in which beetles were recorded for all four time periods.

## **REFERENCES**

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