

**Observations on riffle beetle (*Hexanchorus caraibus*) behavior  
and associated insects**

**LaKeisha Shaw**

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**Dr. James Woolley and Dr. Thomas Lacher  
Texas A&M University**

## **Abstract**

This study looked at the behavior of the riffle beetle *Hexanchorus caraibus* as well as an associated midge, Blephariceridae. It was determined that the riffle beetles fly out of the water and dive back in again continuously. The midges were found to be aquatic and tend to follow along the same path as the beetles upstream. The adult of each were collected as well as the larvae of Blephariceridae.

## **Introduction**

The main focus of this study was to understand the behavior of riffle beetles when they fly upstream. Morgan Kohut (2007) gave a detailed description of the adult riffle beetle and its larvae. She only identified them to family, but for this study they were identified to genus and species, *Hexanchorus caraibus* (Spangler and Santiago-Fragoso 1992). She also looked at the time of day that they were most active and also attempted to count the number of times a beetle will fly upstream. Her study inspired the idea to understand why the beetles continuously fly upstream.

While studying *H. caraibus*, the net winged midge, Blephariceridae, was also observed. The adults of Blephariceridae have a short life span that last anywhere from 1-2 weeks. Some females are predators, feeding on soft-bodied aquatic insects. It is not known what other females and the males feed on but nectar is likely (Courtney 2001). The larvae are found on rocks near the splash zones of the riffle areas. There are four larval stages which have a cephalothorax and six suction disks that allow them to cling to the rocks. As they cling to the rocks, they scrape off algae, bacteria and other organic material with their mouthparts (Courtney 2001).

## **Materials and Methods**

For this study vials, ethanol, insect net, a Canon XL1 camcorder, an Olympus Stylus Tough 8000 waterproof camera and a small tripod were used. All specimens were observed and collected from one location: coordinates 15° 20.7N, 61° 22.13W, elevation 1162 ft (see picture below.). Adults of *H. caraibus* were collected as well as the adults and larvae of Blephariceridae. In Kohut's paper she stated that the riffle beetles are abundant in the early morning or late afternoon so every recording was done at about 5:30 pm. The first recording was a test trial done on May 24, 2009 with the Olympus camera. Still shots were taken of the location as well as of the Blephariceridae larvae. A short movie was also recorded with the camera. The first day to use the Canon was May 27, 2009. The Canon was balanced on a rock near the riffle area using the tripod. One person had to hold the tripod while the other focused the camera. The second day of filming was on May 31, 2009. After each filming, the footage was placed on Dr. Woolley's laptop and the clips were edited in iMovie. In this program the clips were slowed down to examine specifically what the beetles were doing and the best clips were chosen. Voucher specimens of Elmidae have been deposited in the insect collection at the Archbold Tropical Research Education Center, Springfield, Dominica.

## **Results**



This is the location of all collections and filming.

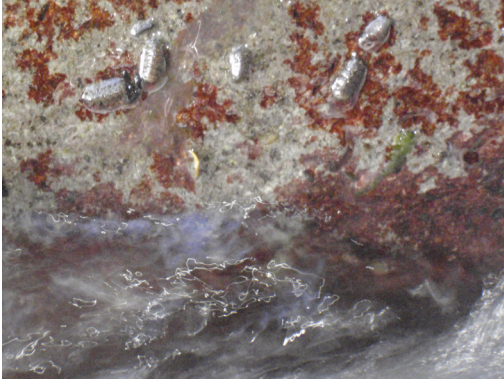
### **Riffle Beetles**

The filming was done for only two days and each film was about 20 minutes in length. After analyzing each clip, the exact behavior of the beetle was determined. First, the beetles fly straight up out of the water from the whitewash below each riffle area.

Sometimes the beetles will make a somersault like motion as they are flying out. After they have flown out of the whitewash, they will continue flying upstream, against the current. Some of the beetles will fly directly upstream, but others will fly off course in zig-zag and somersault motions. It was very rare to see more than one beetle flying together upstream. They usually find their way individually. Once they reach the peak point of the riffle area, the beetles dive back into the water. The beetles do not swim so they simply ride down with the current and fly back out again in the whitewash area (refer to attached video.).

### **Blephariceridae**





This dipteran was seen flying along with the beetles upstream (see video). It was also seen hovering on the rocks near the splash zone where its larvae were found. To correctly identify this fly, a picture was sent to John Gelhaus, Academy of Natural Sciences,

Philadelphia. It is unclear why they follow the beetles upstream or if they have any relation to the behavior of the beetle.

## Discussion

When this experiment first began, the goal was to understand why riffle beetles constantly fly upstream. The recordings were to be used to see why they do this. However, the “why” could not be answered simply by these recordings, but the “how” was. It was also interesting to find the dipteran that seems to follow along the stream with the beetles. It is also unclear why the flies follow the beetles. In future studies, it would be good for someone to find a more efficient method to determine why the beetles perform this behavior. One hypothesis is that they do this for breathing purposes, possibly to replenish the plastron. It is possible that their larvae may also play a role in why the beetles are doing this. A study with more focus on the larvae of the beetles would be pertinent for this. So far what is known about the larvae is that they are up to 16mm long and their bodies are well sclerotized. They also have filamentous gills on the abdomen (Hammond 2009). Another great study would be a focus on Blephariceridae and its behavior.

## References

1. Courtney, Gregory W. Biology of Blephariceridae. Jan. 2, 2001. June 4, 2009.  
[www.ent.iastate.edu/dept/research/systematics/bleph/biology.html](http://www.ent.iastate.edu/dept/research/systematics/bleph/biology.html)
2. Kohut, Morgan E. A study of Riffle Beetle Behavior in the Checkhall River  
Coleoptera: Elmidae. 2007.  
[http://dominica.tamu.edu/student%20projects/Dominica%20Projects%20pdf%20copy/Kohut\\_Morgan.pdf](http://dominica.tamu.edu/student%20projects/Dominica%20Projects%20pdf%20copy/Kohut_Morgan.pdf)
3. Hammond, G. "Elmidae" (On-line), Animal Diversity Web. 2009. June 07, 2009.  
<http://animaldiversity.ummz.umich.edu/site/accounts/information/Elmidae.html>.
4. Spangler, Paul J. and Silvia Santiago-Fragoso. The Aquatic Beetle Subfamily Larainae (Coleoptera: Elmidae) in Mexico, Central America, and the West Indies. Smithsonian Institute Press, Washington, D.C. 1992.

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