Comparison of Pool and Riffle Fauna in the Check Hall River

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I. Abstract: The purpose of the study was to characterize pools and riffles by flow rate, depth, length, width and fauna. Every measurement was repeated for each sample site and an average of all the pools and all the riffles was calculated. Insects were collected, as well as several attempts to capture prawns and gobies. The result indicates that a difference does exist between the pool and riffle insect species. Two additional species were found exclusively in the riffle sample sites. This report also includes tabular keys of each insect species found, along with detailed photographs. This should assist future studies in predicting and identifying insect species in the Check Hall River.

II. Introduction:

The purpose of this project is to characterize the aquatic fauna of the Check Hall River in pools and riffles. In order to obtain this data the group chose three pool and riffle combinations in the Check Hall River located 20 meters from the path leading from the Archbold Research Center. The goal was to collect insect samples and aquatic fauna in conjunction with flow rate, depth, width, and length. It is our objective to use this data to differentiate between pool and riffle species based on their preference for flow rate, depth, width, and length.

III. Check Hall River Description: (Mejia 1995)

The Check Hall River is a tropical river that flows west through the steep slopes of the island. The river begins in the mountains east of the Springfield Estate flowing to the Caribbean Sea north of Roseau; just a five minute walk from the Canefield Airport.

Both Mejia (1995) report and Towers et al. (1998) indicate slightly alkaline water with a pH on 8.2 (Mejia 1995). The Mejia report speculates that the alkaline conditions occur because a lack of a buffering system. This could explain the abnormally high pH of the Check Hall River in comparison with most tropical streams, which have a near neutral pH of 7. Using temperature readings obtained from the three days of studying the average temperature was 75 degrees Fahrenheit. The substrate of river is composed of rocks and cobble (a combination of sand and rock).

IV. Materials

- Seine (large and small)
- nets (insect)
- nets (butterfly)
- plate traps
- flow meter (General Oceanic Mechanical Flow Meter- standard rotor)
- thermometer (-30 – 110 F)
- measuring tape (50m)
- depth stick (marked off bamboo)
- collecting bottles
- sorting pan
- bucket
- stakes
- orange flagging tape
- GPS (Magellan)
- camera (Nikon D1X)
- Ziploc bags

V. Methods:

Sampling was conducted in three paired nearby pool and riffle sites. The paired sample locations were chosen in approximately 150m near Springfield Station (N 15°20’50”, W 61°22’5”). They were marked with flagging tape and stakes. Beginning at our samples furthest down stream (Riffle 3 and Pool 3) a GPS reading was taken. Beginning in Pool 3 species were collected using the large and small seines. Two methods were used in regards to the seine. First, a crescent style was used with a fixed end on one shore and the other sweeping from down to upstream. Second, both ends of the seine were dragged upstream with the small seine pushing from behind and keeping the middle flush with the riverbed. The specimens that were collected were placed in a bucket and Ziploc containers. Smaller specimens from Pool 3 were captured by placing two insect nets and the small seine at the mouth of Riffle 3 (downstream). Rocks and litter in pools were overturned and disturbed for a couple of minutes. The debris was placed in pans and a bucket where all observed specimens were collected and placed in collection bottles containing alcohol solution. Larger specimens were placed in Ziploc containers with water so they could be returned later. Plate traps were sporadically placed in the river to be collected and observed later. All collected samples were taken to the lab for identifing and keying out.

The flow meter used to measure stream flow was a General Oceanics Mechanical flow meter model 2030 standard rotor. In order to take the reading the flow meter was zeroed and then submerged 5 cm beneath the surface. The flow meter was held under water for 60 seconds and then the reading was recorded. The readings were repeated twice for each pool and riffle and then divided by 60 to get counts per second. This number was then compared to a graph to obtain the flow rate in cm/s. Average flow rate was then calculated for each pool and riffle.

VI. Results

Seven species of aquatic invertebrates were found in pools and nine species in riffles (table 1). Riffle beetle larva and chironomid larva were found only in riffle samples, but all species found in pool samples were also found in riffles.

2-6 and Figure 2-? tables provide tabular and illustrations keys, diagnoses of all species encountered to ad in identification.

VII. Discussion

We hypothesize that a large difference would be found between the insects of pools and riffles. Perhaps the insects found only in riffles require a habitat with higher stream flow rates. As is indicated by table 6 (Appendix) the riffles had a flow rate double that of the pools. While we expected major differences in pool and riffle characteristics, a more subtle difference was found. In the riffles a greater diversity of insects was observed. Including riffle beetles and the Chironomid larva. The riffle beetles were expected since they are always seen in riffles. The worms came as a little bit of a surprise.

One aspect of our sampling worth changing would be to disperse the sample sites. If altitude affects insects found it would certainly affect the hydrophilic larvae. Choosing only one subsequent pool and riffle set at three varying altitudes in the Check Hall River would be beneficial. Having only 150 meters of sample space is a small micro system. Secondly, the proximity of the sample site to the sea affects the ecosystem. This in turn affects fauna as well as flora. A change in fauna would vary the food chain, and predators of possible results. Dispersal of sample sites along the river would also show an affect on pH thus proving that the locality of organisms varies with pH.

The greatest trial was isolating, capturing, and/or identifying macro organisms. Any future work would be beneficial with more effective traps and snares for larger, faster organisms. Detailed, more complex traps were not readily available for catching fish and prawns. Seining produced only one species of prawns, *Xiphocaris*.

The difficulty seining in the riffles was caused by the fast current, which prevented the seine from staying on the bottom. Another problem that occurred with the seine in both the pool and the riffle was large rocks. In attempting to raise the seines over the rocks everything escaped. Also the rock bottom of the stream allowed organisms to escape underneath the nets. The least success we had was in pool 3. This was most likely due to the absence of large rocks and slower current, which allowed us to catch an abundance of prawns.

VIII. Conclusion

The Check Hall River has many riffles and pools as it winds its way down the mountains towards the Caribbean. The ability to understand the difference between insects in the pool and riffle can be quite valuable. As was expected there was a difference between the insects in the pool and riffle. This study has provided a valuable key to insects found in the Check Hall River along with detailed pictures. Future studies can focus a greater deal on prawns and gobies. This data would provide an even more detailed means to differentiate between pools and riffles. In order to accomplish this study better means of catching fish and prawns needs to be developed. In the future groups will know exactly what type of insects to find in pools and riffles and will have the ability to identify insects caught.

IX. Sources

"General Oceanics Digital Flowmeter Mechanical & Electronic Operations Manual". General Oceanics Inc. Miami, FL, 16 pp.

Dr. Jim Woolley, Department of Entomology, Texas A&M University assisted in identifying and developing insect prescriptions. He also assisted in photography on the insects caught figures A-L.

Appendix A:

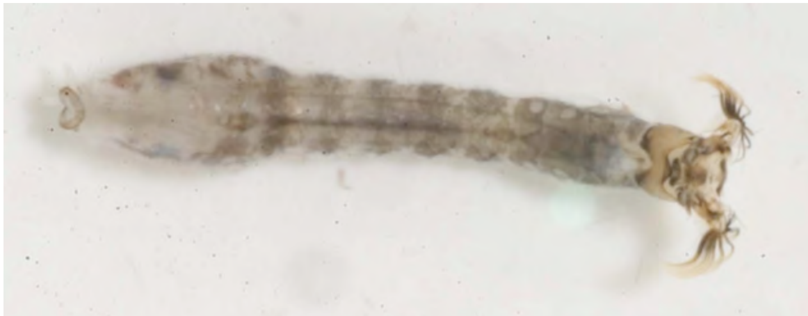

Figure A: Black fly

Figure B: Caddis fly 2

Figure C: Caddis fly 1

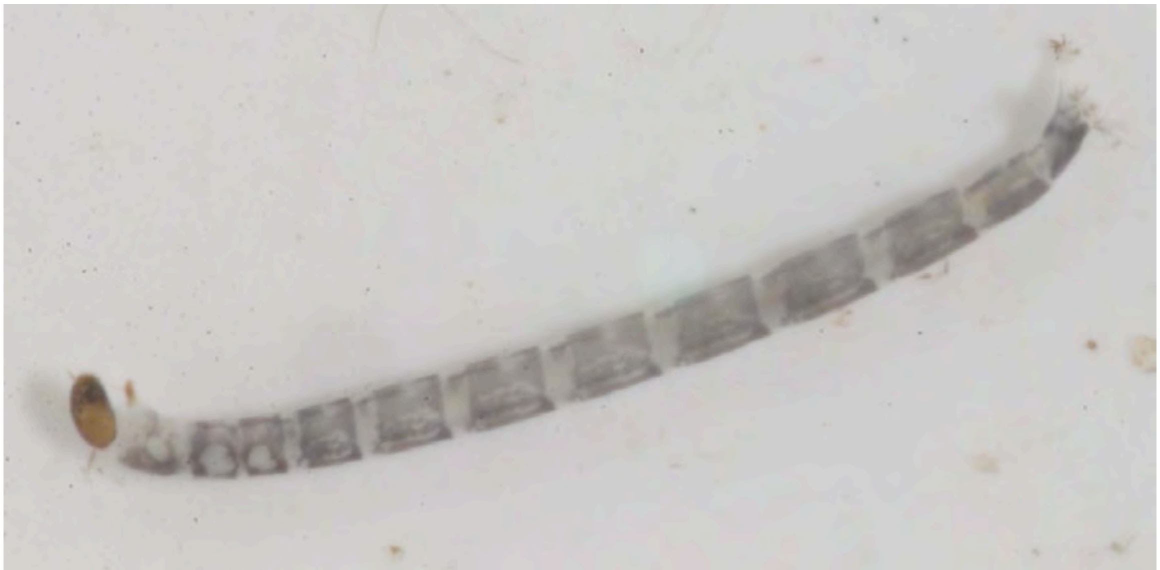

Figure D: Chironomid

Figure E: Damsel Fly, Dorsal

Figure F: Damsel Fly, Ventral

Figure G: Damsel Fly, Adult

Figure H: Damsel Fly 1, Dorsal

Figure I: Mayfly 1, Lateral

Figure J: Mayfly 2

Figure K: Riffle Beetle, Dorsal

Figure L: Riffle Beetle, Ventral

table 1

Pool	Riffle
Black Fly larva	Black Fly larva
Caddis fly larva #1	Caddis fly larva #1
Caddis fly larva #2	Caddis fly larva #2
Damsel fly larva	Damsel fly larva
Mayfly adult	Mayfly adult
Mayfly larva #1	Mayfly larva #1
Mayfly larva #2	Mayfly larva #2
	Riffle Beetle
	Chironomid larva

table 2

Riffle Beetle larva
Flattened and dark
Three pair segmented legs on thorax
No gills
Tufts of hairs at apex of abdomen

table 3

Flatworm
No head capsule, legs, or sclerotized parts on body

table 4

Mayfly 1	Mayfly 2
Six pairs of lateral abdominal gills	One pair of basal lateral abdominal gills
Fore femur long and slender	Fore femur chubby

table 5

Caddisfly Larva 1	Caddisfly 2
White body with few scattered hairs	Dark body, densley hairy
Head long: black bands at base of legs	Short hairs
Posterior margin of pronotum	All three notal plates are sclerotized
Only pronotum sclerotized	

table 6

Chironomidae*	Simulidae*
Lateral thoracic gills are absent	Lateral thoracic gills are present
Ventral proleg on first thoracic segment is present with gills	Ventral proleg on first thoracic segment lacks gills
Apex abdomen contains gill fillaments	Apex abdomen possesses adhesive sucking pad
***both fly larva sclerotized head capsule with eyes no segmented thoracic legs**	

Table 7

	Riffle 1	Riffle 2	Riffle 3	Average	Pool 1	Pool2	Pool3	Average
Flow Rdg 1 (cm/sec)	50.00	175.00	50.00		29.00	35.00	17.00	
Flow Rdg 2 (cm/sec)	70.00	170.00	na		37.00	36.00	na	
Flow Rdg 3 (cm/sec)	65.00	50.00	100.00		48.00	40.00	17.00	
Flow Rdg 4 (cm/sec)	125.00	50.00	75.00		49.00	48.00	55.00	
Avg. Flow Rdg (cm/sec)	77.50	111.25	75.00	**87.92**	40.75	39.75	29.67	**36.7**
Depth 1 (cm)	44.00	38.00	30.00		80.00	66.20	66.00	
Depth2 (cm)	56.00	68.00	na		83.00	53.00	na	
Avg Depth (cm)	50.00	53.00	30.00		81.50	59.60	66.00	
Length (cm)	425.50	600.00	583.00		595.00	507.00	539.00	
Width (cm)	219.00	250.00	320.00		424.00	537.00	390.00	
Temperature (degrees F)	na	na	na		75.00	74.00	76.00	
Avg Depth (cm)	50.00	53.00	15.00		81.50	59.60	66.00	
Length (cm)	425.50	600.00	583.00		595.00	507.00	539.00	
Width (cm)	219.00	250.00	320.00		424.00	537.00	390.00	
Temperature (degrees F)	na	na	na		75.00	74.00	76.00	