

BIODIVERSITY OF BENTHIC INVERTEBRATES ALONG HALLS MILL CREEK

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Sediment samples from three sites along Halls Creek were collected for inspection of benthic invertebrates. Sediments were collected from two opposite shores. Two samples were collected from each site. Halls Mill Creek, so far a healthy stream, is being degraded slowly by increased residential and commercial developments around its headwater. Benthic invertebrates were chosen as a candidate because they are a bottom dwelling organisms. Any substrate change or any toxic chemical deposited in the bed of stream will affect its abundance. It is short lived organism and the effect of any pollutant can be seen in shorter period. Biodiversity was correlated with water quality of the stream.

Keyword: benthic invertebrates, biodiversity, sediment

Introduction

The Dog River Watershed contains most of the Mobile area. Its tributaries run through wetlands, forests, and residential and commercial areas. Urbanization is increasing at a rapid rate. Poor construction plans, inadequate funds, and a lack of public awareness have caused the deterioration of water quality. Increased amount of trash, high sedimentation and natural vegetation loss have been seen in past few years. Halls Mill Creek, one of the tributaries of the Dog River Watershed, is of interest in this study because it is being loaded with pollutants like sediments and nutrients. This is mainly due to increasing residential and commercial development in West Mobile where its headwaters are located.

One way to assess water quality is to study biodiversity, especially benthic invertebrates. Biodiversity encompasses all of the species, food chains, and biological patterns in an environmental system as small as a microorganism or as large as a landscape or a geographic region (Paoletti, 1999). Benthic invertebrates or benthos are animals that live on river and lake bottoms. Many of these inhabitants are immature

stages of insects such as mayflies, stoneflies, caddisflies and midges. Other types of animals include aquatic earthworms or bristle worms, roundworms, snails and leeches (<http://www3.gov.ab.ca/env/water/SWQ/faqs04.cfm>). They perform many important functions such as decomposing organic matter and nutrient cycling, and they are a food source of many fish species. Because they burrow into the sediment, are short lived, and have varying tolerance to the environmental conditions, they are good indicators of the quality of an aquatic habitat. The variety and abundance of benthic invertebrates in a river reflects the type of habitats the river provides. The species and community structure change directly with water quality. For instance, some species of benthic invertebrates like stonefly and mayfly are pollution intolerant; dragonfly and isopods are mildly tolerant to pollution; and worms, leeches and midge flies are tolerant to pollution (Rideau Valley Conservation Authority) (Figure 1). The distribution and abundance of benthic invertebrates are affected by various physical factors like salinity, dissolved oxygen, water temperature, and pH. Nutrient enrichment has an indirect effect on these organisms. Toxins produced by harmful algae and pesticide runoff can be lethal to these organisms.

Assessment of water quality by sampling biological communities in the field is a promising approach that requires expanded use of ecological expertise (Karr, 1991). The use of biodiversity indicators in habitat quality assessments has gained increasing importance in the recent years (Paoletti, 1999). Understanding linkages between organisms and their abiotic environment is a critical step in developing predictive models regarding the structure and function of ecosystems (Hart and Finelli, 1999). In the case of Halls Mill Creek, this research will also provide information about distribution and

ecology of the benthic invertebrates. The data can be used for water quality monitoring and further research.

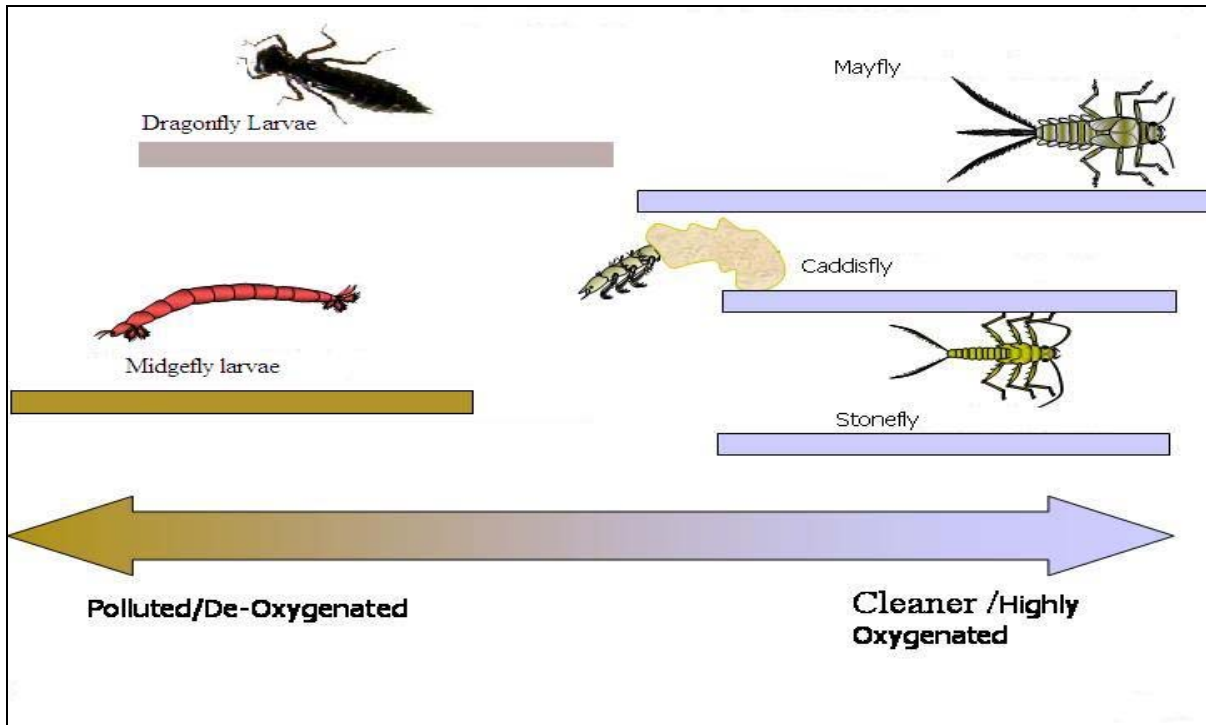


Figure 1 Different pollution tolerant-intolerant benthos

Research question

What benthic invertebrates are found in Halls Mill Creek and how do they vary in different sites?

Methods

Sediment samples from three selected sites on Halls Mill Creek (HMC) were collected (Figure 2).

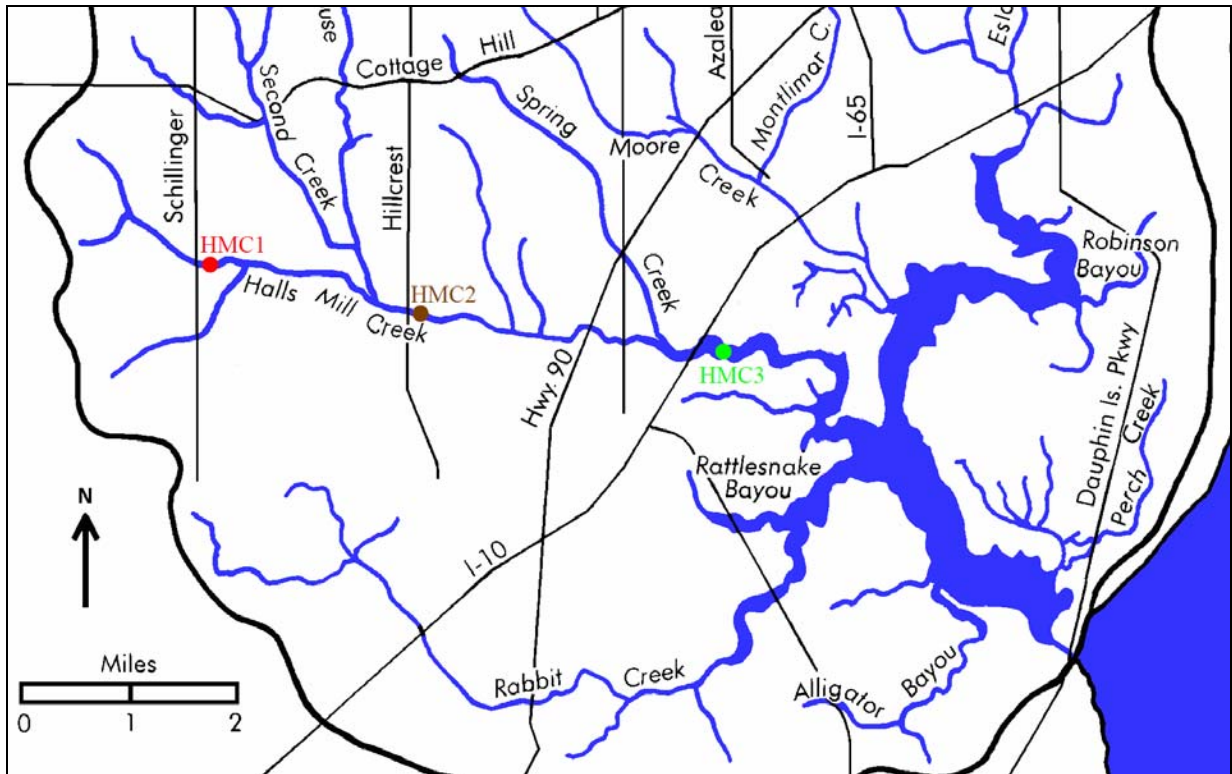


Figure 2 Sites along Halls Mill Creek

(HMC1 N 30° 50.582 W 088° 01.587, HMC2 N 30° 36.632 W 88° 11.375, HMC3 N 30° 36.299 W 88° 08.281)

The sediments were collected from the shoreline using an Eckman's dredge. Physical factors like salinity, dissolved oxygen, hardness, conductivity, alkalinity, and temperature were measured. The samples were collected beginning the third week of March.

Ecotoxicology graduate student at University of South Alabama, Jimmy Coles, assisted with the sample collection.

In the laboratory, sediments were sieved to get rid of fine particles. Visible invertebrates like worms, clams, and leeches were picked out while sieving and preserved in 5ml centrifuge tube with 95% ethanol. All the vials were marked with respective date and site number. These were later identified. The remaining sediment after sieving was stained for at least 24 hours in Rose Bengal diluted at 1g to 500ml of 70% ethanol. The stained samples were looked at under a dissecting microscope the next day. Anything that

was suspected to be an invertebrate was examined under a compound microscope for further identification. Wet mounts of the specimens were made to look at them under a compound microscope. If they were identified as benthic invertebrates a permanent slide was made. The laboratory privilege was provided by Dr. Tim Rice, Biology Department, University of South Alabama.

Results

It was seen that benthic invertebrates do live in Halls Mill Creek. Benthos like oligocheate, leech, clam, midgefly larvae, and amphipods were found. The number varied in different sites (Figure 3). Data collected showed that HMC 1 had comparatively fewer invertebrates than HMC 2 and HMC 3 (Figure 4). It was seen that the highest number of benthos were found at HMC 3. The sample taken from HMC 3 was very organic. The bottom had vegetation while HMC 1 and HMC 2 had no vegetation at the bottom. All the sites had vegetation along their shoreline. The HMC 1 and HMC 2 sample sediment were sandier and HMC 3 was more clayey. HMC 3 was deeper than HMC 1 and HMC 2. HMC 1 and HMC 2 were approximately 2 feet deep; HMC 3 was approximately 4-5 feet deep.

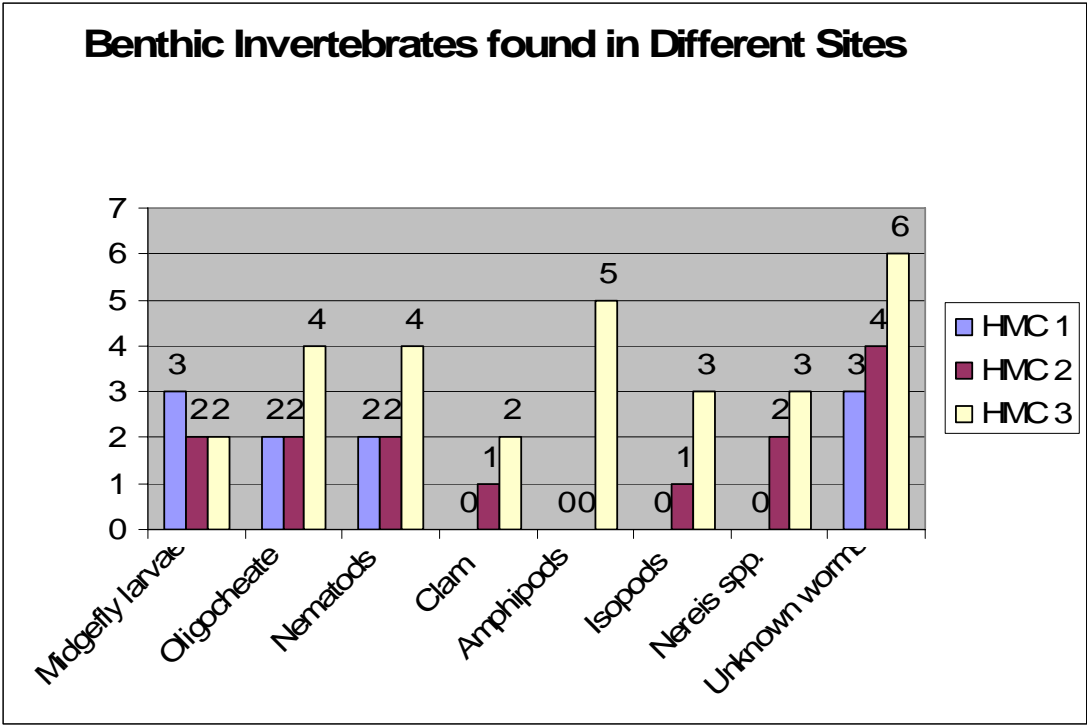


Figure 3

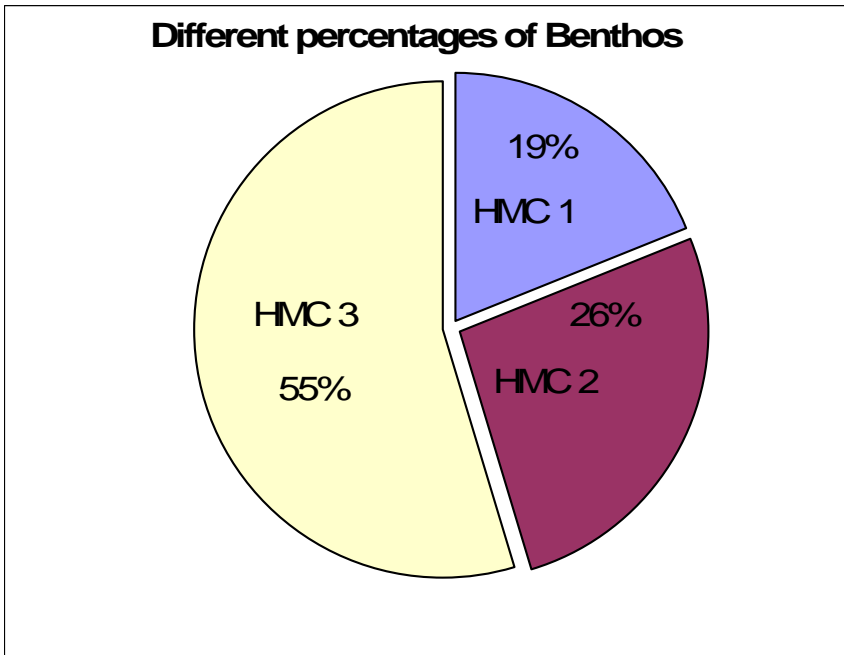


Figure 4

Conclusion and Discussion

From the data collected we can see that though there was diversity in benthic organisms in Halls Mill Creek, there was no population of pollution intolerant species. Thus we can conclude that though Halls Mill Creek is not terribly polluted for benthic invertebrates to live, it is polluted to some degree.

There might have been errors performing the tests which could have altered the results. The worms were very delicate and were crushed so may be two segments of the same worm might have been counted as two worms. Some benthos were too small to pinch and put in the slide. In the process some may have been lost.

The sediment type being finer as went downstream seems obvious because finer particles are carried longer distance downstream than the coarser particles. The abundance of benthos increased as the stream flowed downstream. The richness of benthos in HMC 3 can be explained by the richness of sediment in nutrients and bottom vegetation. The bottom vegetation provides habitat and food. The richness of biological organisms in HMC 3 can be attributed to the creek being estuarine. One thing though should be noted that no stoneflies, dobsonflies, mayflies or mussels, which are pollution intolerant, were found in any of the sites. Dragonfly and isopod which are mildly tolerant to pollution was found in HMC 2 and HMC 3. Midgefly, worms, and leeches are all pollution tolerant invertebrates which were found in all sites.

The project was very time consuming. Sieving and looking the sediment under the microscope took a long time. The given time period was not enough to do additional tests. Further tests like nutrient level should be tested. The biodiversity of benthic invertebrates in other tributaries of Dog River should be looked at so that we can

compare and contrast between the streams. In future we should also carry out the same experiment on the same streams to see difference overtime.

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