Macroinvertebrates Across Various Vegetation Sites Along The Chatanika River

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Introduction

- Fish within river ecosystems, especially when young, rely upon macroinvertebrates to grow; Health of the macroinvertebrate populations directly affect how well fish are able to survive (Ndatimana 2022). Macroinvertebrates can thus be used as a tool to help determine the health of ecosystems.
- Climate change and overfishing has had drastic effects on fish populations, causing decline in their numbers and health (Barange 2014).
- The diversity and quantity of macroinvertebrate life was assessed along the Chatanika River in four sites of varying vegetation, substrate types and sun exposure.

Question

- Do macroinvertebrates vary depending on the nearby vegetation, substrate composition, and sun exposure?

Methods

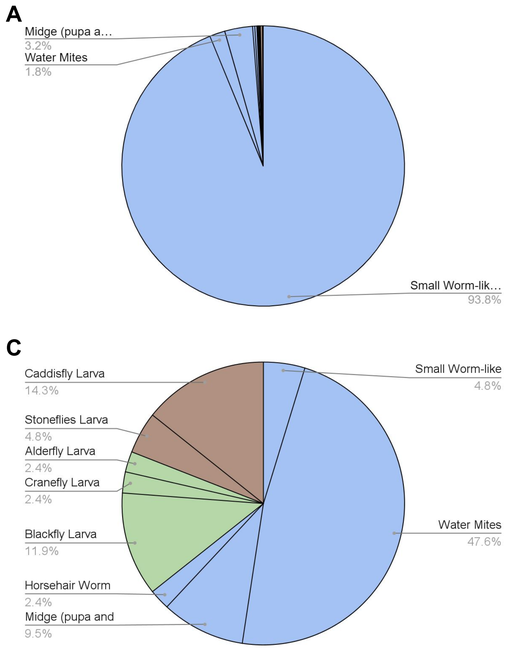
Figure 1: Aerial view of the 4 sampling sites (A,B,C,D) along the Chatanika River.

- 4 sites along the Chatanika River at the UAF Bonanza Creek LTER with varying conditions (vegetation and sun exposure) were identified
- A transect was used to measure 10m parallel to the river; markers were placed at the 0m, 5m, and 10m marks
- Macroinvertebrate samples were collected 3m from each marker by submerging a D-net to the bottom, manually disturbing substrate within a 30x30 cm space in front of the D-net for 1 minute, took two lateral steps and repeated the process.
- Water temperature and pH were collected following the GLOBE Hydrosphere Protocol and water depth was measured using a transect.
- The D-net was flushed with water to gather the collected macroinvertebrates in a bucket.
- Macroinvertebrates were identified using a pipette and petri dishes either out in the field or under dissecting scope.

Figure 2: Koen Kohrt holding the D-net while Rosendo Silva disturbs the substrate

Figure 3: Identifying macroinvertebrates on site

Results



	Site A	Site B	Site C	Site D
Dominant Vegetation	Shrubs and Trees	Grasses	Grasses	Mosses and Trees
Sun Exposure	No Sun	Full Sun	Partial Sun	No Sun
Substrate Description	Muddy and Rocky	Rocky	Rocky	Rocky
Mean Temperature (°C)	15.7	16	15	15
Mean Water Depth (cm)	20.2	21.6	49.3	103.5
Total Macroinvertebrate Count	1251	53	42	100

Figure 4: The presence of tolerant, somewhat sensitive and sensitive macroinvertebrates in sites A-D. These classification are based upon the STROUD's Protocol.

Table 1: Dominant vegetation, sun exposure, substrate description, mean temperature, mean water depth, and total macroinvertebrate count in sites A-D.

- Site A had the highest macroinvertebrate count but the majority are classified as tolerant species.
- Sites B, site C, and site D are composed of a larger percentage of sensitive and somewhat sensitive macroinvertebrates than site A.
- Sites B and site C experienced some or complete sun exposure, and contained approximately half the amount of macroinvertebrates than site D that experienced no sun exposure.

Figure 5: Stonefly (Order: Plecoptera)

Figure 6: Midge larva (Order: Chironomidae)

Figure 7: Mayfly (Order: Ephemeroptera)

Figure 8: Water Mites (Order: Trombidiformes)

Discussion

- Sites B, C and D, contain a wider range of sensitive and somewhat sensitive macroinvertebrates. These are sites that include shrubs, trees and partial sun exposure but minimal mud. The slight variations to the surrounding environment may potentially be influencing the diversity of species present. Macroinvertebrates rely on organic material to survive and in turn provide food for local fish. (Missouri Department of Conservation)
- The difference in total macroinvertebrates found in the shady area (site D) are about twice as many macroinvertebrates compared to sites B and C. This potentially represents the likelihood of feeding grounds for fish in sunny areas.
- Grayling and salmon fry have a diet that consists of stonefly, mayfly, and caddisfly (Alaska Department of Fish and Game). The grayling fish eats almost anything that moves while salmon have a more specific diet that makes them a species more likely to be affected by climate change.
- Site A was the only muddy and shady site and it contained a high level of tolerant macroinvertebrates. Tolerant macroinvertebrate species are less likely to be consumed by grayling and salmon fry. Climate change has been identified as increasing erosion which results in muddy substrates. (Climate Hubs U.S. Department of Agriculture)

Future Directions

- Collecting samples across the river would allow to better assess the impact of depth and current on macroinvertebrates
- Expanding the distance between sampling sites to gain a wider view of the macroinvertebrate diversity of the Chatanika River
- Conduct a study that focuses on the comparison between mud substrates versus rocky substrates along the Chatanika River
- Conduct a replicate study on the same sites to assess how the macrodiversity changes over time

Figure 9: Leila Shubair identifying macroinvertebrates in lab

Figure 10: Koen Kohrt, Rosendo Silva, Leila Shubair (left to right)

Figure 11: Leila Shubair, Koen Kohrt, and Rosendo Silva collecting samples.

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