Effects of Human Disturbance on Amphibians and Macroinvertebrates in Gully Brook

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ABSTRACT

- Impervious surfaces, such as roads and buildings, are known to have severe impacts on waterways. Urban waterways are at risk of being degraded, potentially impacting other areas that are linked to outside the city.
- The objective of my study was to assess the impacts of urban disturbance on the biodiversity of macroinvertebrates and amphibians. In Hartford, the third largest city in Connecticut, we surveyed multiple points in Gully Brook along a human disturbed gradient. We quantified species richness and functional richness.
- The most important result is that there was less biodiversity in the more human disturbed areas. Regardless, we found species that represent different functional groups, which is why we should restore and protect these urban waterways.

INTRODUCTION

- **Problem**
  - Urban development negatively impacts local waterways.[1]
  - The pollution that accumulates in water does not just stay in one place; it flows down the current, polluting other bodies of water before getting absorbed into the ground.
  - Macroinvertebrates and amphibians are very sensitive to changes, so having or missing certain species can determine the water quality.
- **Research Question**
  - How does human disturbance affect macroinvertebrates and amphibian biodiversity (species richness and functional richness)?
- **Importance**
  - Human developments are increasing in CT[1] and in many parts of the world. Research and understanding of urban impact on freshwater systems can be applied to other areas in the world.
- **Predictions**
  - Biodiversity will increase with less disturbance.

BIODIVERSITY

There are many ways to calculate biodiversity, such as counting the number of species (species richness), but not all species are the same. For example, macroinvertebrates have different feeding roles: shredders or collectors (important for decomposition), scrapers (herbivores important for regulating plant abundance), or predators (carnivores).[2]

Would 2 communities with the same species richness have the same diversity?

By calculating the number of feeding groups (functional richness), we can better understand variation in biodiversity.

Community 1
Number of species = 4
Number of feeding groups = 1

Dragonfly Larvae Predator | Back Swimmer Predator

Leaches Predator | Biting Midges Predator

Community 2
Number of species = 4
Number of feeding groups = 4

Aquatic Sow Bugs Shredder | Mayflies Scrapers

Damselfly Larvae Predator | Aquatic Worm Collector

MATERIAL AND METHODS

We determined the number of types of organisms of macroinvertebrates and amphibians, and the number of functional feeding groups of macroinvertebrate along an urban stream, which was more disturbed on one end and less disturbed on the other (Fig. 2).

Study Area and Organisms

- The study stream is Gully Brook, located in Hartford, CT (the third largest city in Connecticut) (Fig. 2).
- Gully Brook is situated in an urban area near Kenney State Park.
- At the location, we sampled seven sites along the stream from more disturbed to less disturbed areas (Fig. 2).
- At each site, we surveyed for all amphibian and macroinvertebrate species.

Data Collection and Analysis

- We visited seven sites in November 2015.
- Each site was surveyed once.
- We searched for amphibians by visually looking and flipping logs and rocks.
- For macroinvertebrates, we used the dip-net to gather the debris we kicked from the bottom of the stream. This method was also used to collect tadpoles (Fig. 1).
- When the debris was collected in the net, we put it in a bucket with clear water, sifted through it with our hands to find the different species, and sorted them into an ice tray (Fig. 1).
- We identified them to the type of organism they were.
- We calculated the number of types of organisms and the number of functional feeding groups at each site.

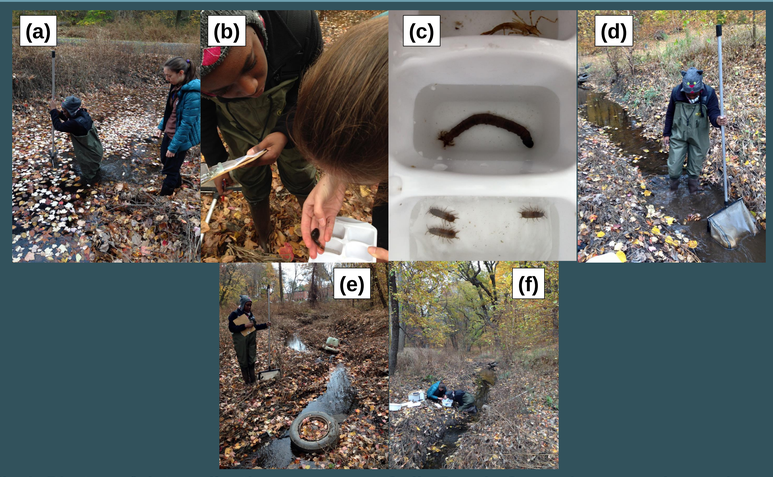

Fig 1. Photos of data collection process at Gully Brook. Surveying macroinvertebrates in both deep and shallow parts of brook with C. Macklem (a, d). Sorting samples into the ice cube trays (b, c). One end of the gradient was disturbed and the other end was less disturbed (e, f).

RESULTS

Although the patterns of species and functional richness were similar, they were not identical. There were some sites where multiple species fulfilled the same role, so there was lower functional richness. Figure 2 shows sites on the less degraded side to have more species richness and functional richness.

Fig 2. The two maps show the amount of species richness (top) and functional richness (bottom) of macro-invertebrates indicated by size of circles. The starred sites in the purple map are where we found amphibians.

We only found green frogs (*Rana Clamitans*) in different stages of their life (Fig. 3). At the site with a red star, we found a green frog that was missing its front fingers, had a growth on its chin, and had a parasite stuck to it.

Fig 3. Only green frogs (*Rana Clamitans*) were found in Gully Brook, but there were tadpoles of various sizes and adult frogs. One individual (lower right corner) was deformed.

CONCLUSIONS

- This study provided baseline data for an important urban waterways.
- Even though we worked in a small site, the changes were noticeable as we moved to less disturbed areas.
- Because we found reproducing amphibians and macroinvertebrates from a variety of functional groups, my study shows the importance of urban waterways and the need to restore and protect them.

REFERENCES

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