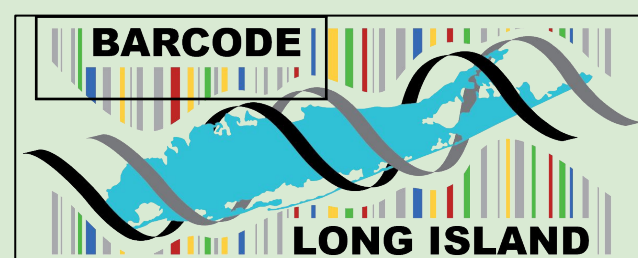


Comparing the Biodiversity of Aquatic Invertebrates in a Human-Made Pond at Friends Academy vs a

Natural Pond at Shu Swamp

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Abstract

Our research question was “Is there a difference in the level of aquatic invertebrate biodiversity in human-made bodies of water in comparison to that of natural bodies of water?” In this study, aquatic invertebrate communities from a human-made pond at Friends Academy in Locust Valley, NY and a natural pond at Shu Swamp in Mill Neck, NY were compared. Species abundance was documented and species diversity was determined using DNA barcoding. Surprisingly, our results indicated that human-made ponds contain more aquatic invertebrate biodiversity compared to natural ponds, despite having established ecosystems. We found that the human-made pond had a more diverse range of species than the natural pond. However, due to our limited sample size and quality of our samples, we can not generalize our results to other ponds.

Introduction

Biodiversity is described as the variety of species in a specific area. Ponds are extremely important to our ecosystems; they are habitats which support more biodiversity than large bodies of water (McGovan, 2022). Not only are ponds a home to numerous plants and animals, endangered species also live in ponds. (McGovan, 2022). Habitats with greater biodiversity are more stable. Ponds have often been created with the intent to conserve local environments. In previous research, human-made ponds were found to have similar levels of aquatic invertebrate biodiversity to natural ponds (Whiteson, 2009). Thus, we believe that there would be equal levels of aquatic invertebrate biodiversity between human-made ponds compared with natural ponds. On the other hand a discussion about the environmental friendliness of human-made ponds are brought up; research has shown that man made ponds provide nutrients, control mosquito populations, and conserve water (Fontana, 2020). While pond building has its ecological benefits, research shows the building process does not. Many ponds were built into existing ecosystems disturbing them. Although the man made pond we collected from was meant for decorative purposes, it fostered an ecosystem. Our intent was to find out if it was a diverse ecosystem compared to that of a natural ecosystem.

Table 1

Results

Location:	ID:	Identification:	Shu Swamp	CJQ-011	<i>Aeshnidae Aeshna umbrosa</i>
Friends Academy	CJQ- 001	<i>Ephydriidae Ochtera mantis</i>	Shu Swamp	CJQ-012	<i>Asellidae proasellus</i>
Friends Academy	CJQ-003	<i>Dytiscidae Copelatus glyphicus</i>	Shu Swamp	CJQ-013	<i>Lymnaeidae Ladislavella elodes</i>
Friends Academy	CJQ- 005	<i>Helophilus Syrphidae fasciatus</i>	Shu Swamp	CJQ-014	<i>Dytiscidae Neoporus undulatus</i>
Friends Academy	CJQ- 007	<i>Coccinellidae psyllobora vigintimaculata</i>	Shu Swamp	CJQ- 017	<i>Asellidae Caecidotea</i>
Friends Academy	CJQ-008	<i>Delphacidae Muellerianella laminalis</i>	Shu Swamp	CJQ- 019	<i>Asellidae Caecidotea communis</i>
Friends Academy	CJQ-009	<i>Carabidae Pterostichus diligens</i>	Shu Swamp	CJQ-020	<i>Crustaceans asellidae</i>
Friends Academy	CJQ- 010	<i>Mosquito Aedes vexans</i>			

Table 1: Location and species of the various samples collected

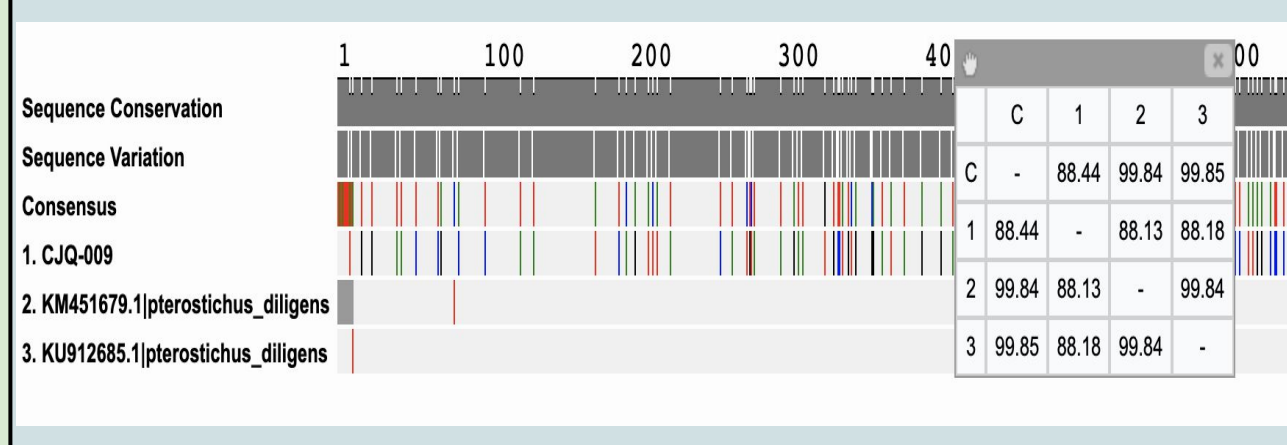
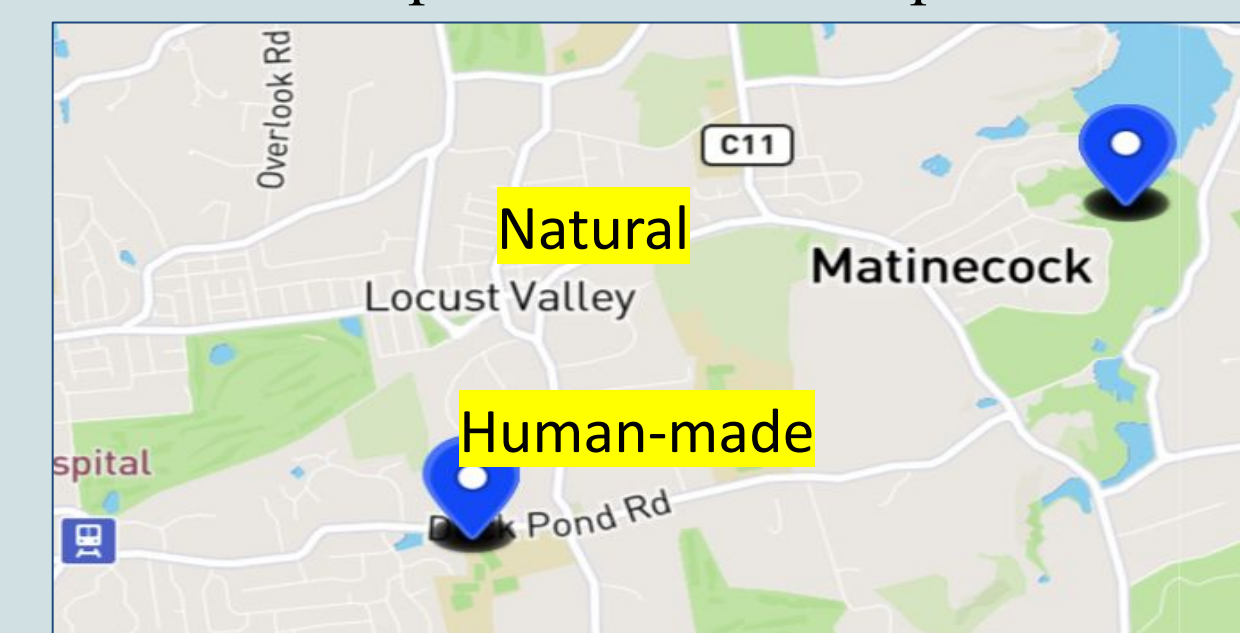


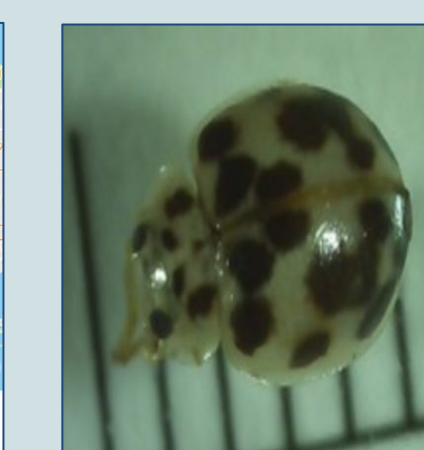
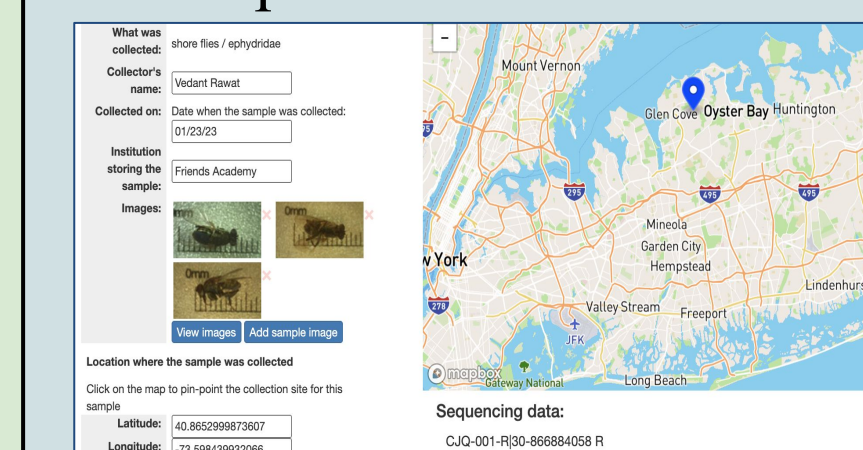
Figure 1: A MUSCLE of sample CJQ-009 and its top blasts. These samples did not have the best similarity. There was no 98-100% match with any documented sequences.

Materials & Methods

- We collected 10 aquatic invertebrates from a human-made pond at Friends Academy and 10 from a natural pond at Shu Swamp.



- We stored the invertebrates, and we preserved them with ethanol.
- Later, we documented the species in the Barcode Sample Database



- Then, we extracted and isolated the DNA with the silica extraction protocol. PCR amplified a portion of the CO1 gene.
- Gel electrophoresis was conducted to determine if we successfully amplified the CO1 gene.
- We then sent our samples to be sequenced, and we analyzed them using the DNA subway

Discussion

Our study suggests that the human-made pond exhibited higher biodiversity of aquatic invertebrates compared to the natural pond. It is important to acknowledge the limitations of our study. Our sampling was limited to a specific geographic area and a relatively short time frame. It is possible that different results may be observed in other regions or over longer periods. The presence of numerous specimens within the same genus the natural pond suggests a dominance of particular species, potentially indicating ecological imbalances or environmental factors favoring specific organisms. In contrast, the human-made pond showcased a more diverse range of species, highlighting the potential of artificial habitats to support and sustain diverse aquatic invertebrate communities.

- The discovery of a ladybug in the natural pond with a range spanning from Washington to Oregon implies a broader distribution of this particular species. This finding aligns with previous work indicating the ability of certain species to adapt and colonize diverse habitats.
- The identification of a beetle in the human-made pond that matched a beetle from Europe raises questions about the introduction of non-native species. This could signify the potential for human-made ponds to serve as pathways for the introduction of invasive species, which can have detrimental effects on native ecosystems.
- The presence of the diving beetle (Sample CJQ-009) in the human-made pond did not match 100% with any known specimens introduces an element of novelty to our findings. This result suggests the possibility of undiscovered or undocumented species in the human-made pond.



Reference and Research Paper

THANK YOU!

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