PERCENTAGE OF NATIVE VS INVASIVE AQUATIC SNAIL SPECIES IN VAN CORTLANDT PARK

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Funded by the Thompson Family Foundation

Abstract

Every organism within an ecosystem fulfills a specific niche defining its symbiotic relationships that regulate populations within their niches to stabilize the ecosystem. The presence of invasive species disrupts ecosystems by destroying these relationships, as invasive populations occupy the niches of native populations. The diversity of aquatic snails in Van Cortlandt Park was analyzed to examine the effect of invasive populations on native populations. Aquatic snails were collected from bodies of water in Van Cortlandt Park and were analyzed through DNA. 68.4% of the samples were of a native species, while 31.6% were invasive, indicating the presence of invasive aquatic snail populations is not significantly detrimental to the survival of native populations in Van Cortlandt Park.

Introduction

- Invasive species introduced to an ecosystem occupy the niches of native populations
  - Invasive populations grow exponentially by monopolizing resources to outcompete, kill, and replace native organisms destroying the food web and altering biodiversity, greatly disrupting homeostasis and harming the ecosystem (Invasive Species n.d.)
- Van Cortlandt Park is a diverse ecosystem, including 650 acres of natural woodland and 75 acres of freshwater wetland including Van Cortlandt Lake and Tibbett's Brook (Van Cortlandt Park, n.d.)
- Purpose was to investigate the percentage of native vs invasive aquatic snail species in Van Cortlandt Park through the analysis of the DNA sequences of collected samples classified using DNA barcoding
- It was hypothesized that more than 50% of the specimens collected would be of an invasive species

Results

Sample ID	Scientific Name	Common Name
XSJ-001	*Cipangopaludina japonica*	Japanese Mystery Snail
XSJ-002	*Cipangopaludina japonica*	Japanese Mystery Snail
XSJ-003	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-004	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-005	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-006	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-007	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-008	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-009	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-010	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-011	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-012	**Unidentified**	
XSJ-013	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-014	**Unidentified**	
XSJ-015	*Cipangopaludina japonica*	Japanese Mystery Snail
XSJ-016	**Unidentified**	
XSJ-017	*Cipangopaludina japonica*	Japanese Mystery Snail
XSJ-018	**Unidentified**	
XSJ-020	**Unidentified**	
XSJ-021	*Physella acuta*	European physa
XSJ-022	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-023	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-024	*Helisoma anceps*	Two-Ridge Rams-Horn
XSJ-025	*Physella acuta*	European physa
XSJ-027	**Unidentified**	
XSJ-029	**Unidentified**	
XSJ-030	**Unidentified**	

Table 1. Classification of Collected Aquatic Snail Samples. This table contains the scientific and common names identified by BLAST analysis of the DNA barcode of aquatic snail samples. Samples were collected from Tibbett's Brook and Van Cortlandt Lake in Van Cortlandt Park.

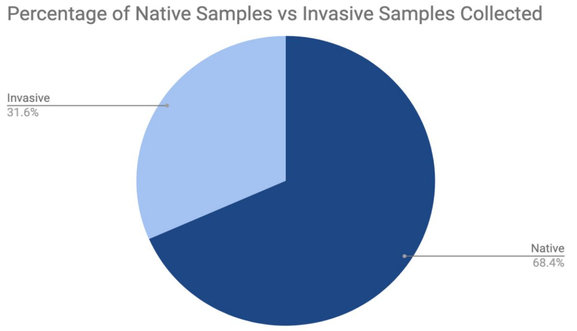

Figure 1. Percentage of Native Samples vs Invasive Samples Collected. This pie chart displays the percentage of native vs invasive samples collected. Samples were identified by BLAST analysis of the DNA barcode of aquatic snail samples.

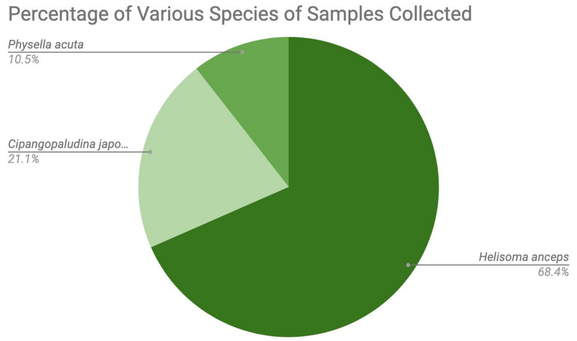

Figure 1. Percentage of Various Species of Samples Collected. This pie chart displays the percentage of samples of each of the collected species: *Helisoma anceps*, *Cipangopaludina japonica*, and *Physella acuta*. Samples were identified by BLAST analysis of the DNA barcode of aquatic snail samples.

Materials and Methods

- Thirty snails were collected from Van Cortlandt Lake and Tibbett's Brook in Van Cortlandt Park
- DNA from the samples was isolated and amplified using PCR
- PCR products were analyzed using gel electrophoresis
  - 27 samples were sequenced
  - 19 samples were successfully identified

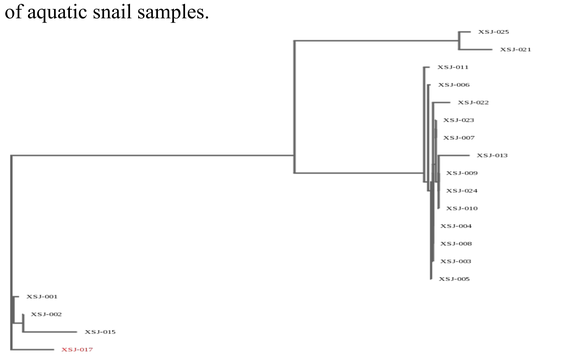

Figure 3. Phylogenetic Analysis of Sequencing Results. Shown here is the maximum likelihood phylogenetic tree, which displays the evolutionary relationships between the identified species. The species highlighted in red is a genetic outlier and therefore has the least genetic commonalities with the rest of the species.

Discussion

- Thirty aquatic snails were collected from Van Cortlandt Lake and Tibbett's Brook
- The results did not support the hypothesis
  - 31.6% of samples were invasive, while 68.4% were native
  - Native and invasive aquatic snail populations are coexisting in the same ecosystem
- Results indicated that currently the native and invasive populations are coexisting in the same ecosystem.
- *Helisoma anceps* was the only native species identified
- Invasive species identified were:
  - *Cipangopaludina japonica*
    - Native to bodies of freshwater in Japan, Taiwan, and Korea
  - *Physella acuta*
    - Globally invasive of unknown origin, inhabits warm, shallow freshwater
- Diversity within the samples may not accurately represent the aquatic snail biodiversity in Van Cortlandt Park
  - Samples were collected in similar environments, increasing the probability of collecting samples of the same species
- Procedure could be improved by expanding collection methods to increase the likelihood of finding snails of different species

References

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Acknowledgements

Thank you to Alex Bryne, John Butler, Annie Kloimwieder, and Howard Waldman for assisting in specimen collection. Thank you to Annie Kloimwieder for teaching the material involved and her assistance in conducting the experiment and editing the summary report and poster.