Environmental Factors Affecting Biodiversity in Hudson River Estuary Habitats

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Research Question: What are the differences in population of aquatic animals in the river, cove, and the creek?

Hypothesis: We predict there are differences in the aquatic animal population in the cove, river, and the creek due to varying habitat structure, vegetation, and water quality.

Study Sites

The Creek: Rocky, Not Tidal, Some Vegetation

The Cove: Muddy, Rocky, Tidal, Most Vegetation (Water Chestnut)

The River: Rocky, Tidal, Lacking Vegetation

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Intro: We began our research to investigate the environmental effects between the Enderkill Creek, the Cove, and the River in relationship to the species caught. We obtained information on the fish diversity, plant diversity, and water quality at the three habitats. We set out to observe what environmental factors effect the diversity of aquatic species to assess the health of each habitat as well as any conservation methods that would improve the three sites.

Methods:

Aquatic Species Diversity:

Cove and River:

The materials required for the Cove and River Diversity analysis are: seine net, waders, Clearwater's Key to Common Hudson River Fishes , buckets. To gather the species diversity from these sites, we pulled the seine net through the edge of the Cove or River, and then identified and counted all of the aquatic animals caught. When finished with processing we released all animals back where they were caught.

Enderkill Creek:

The materials required for the Enderkill Creek Diversity analysis are: buckets, gloves, waders, dip nets, electroshocking backpack, and the Clearwater's Key to Common Hudson River Fishes. To gather the species diversity from this site, we entered the Creek with our electroshocking backpack, dip nets, and buckets to catch eels, and any other aquatic animals shocked. Then, we identified and counted the species, and released them back where they were caught.

The data in Figure 1 portrays the differences between the amount of species variation using the Simpson's Biodiversity Index; in contrast to the total number of aquatic animals caught at each location. Figure 1: Diversity of Species (blue line) in contrast to the total number of aquatic animals (orange bars) caught at each location (River, Creek, Cove).

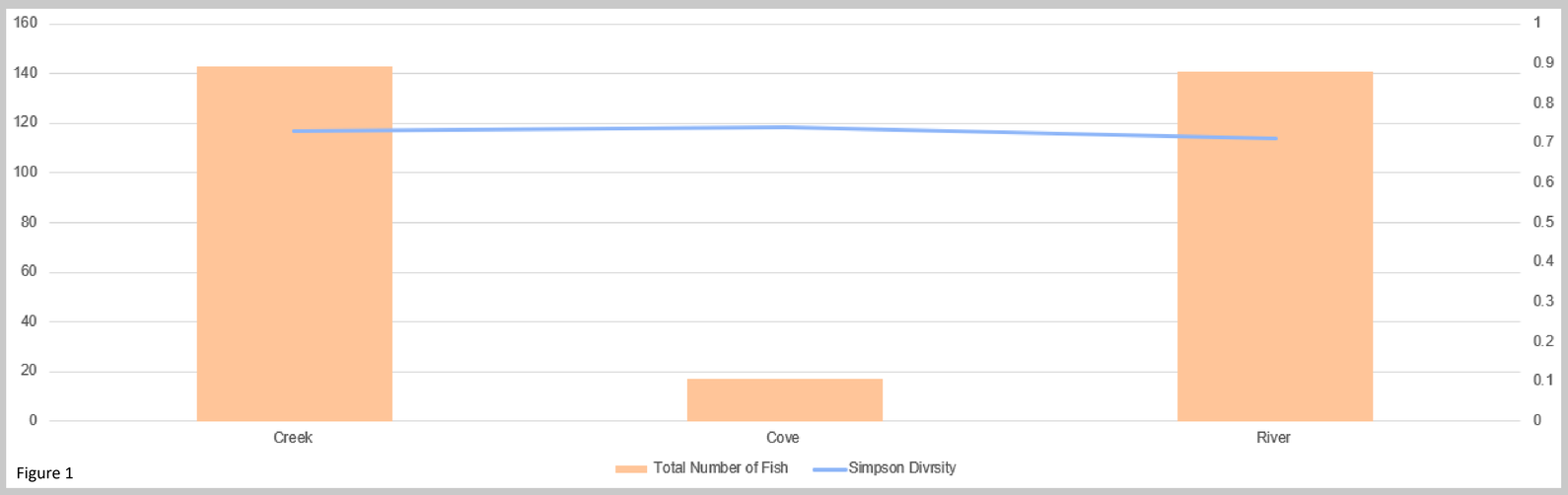
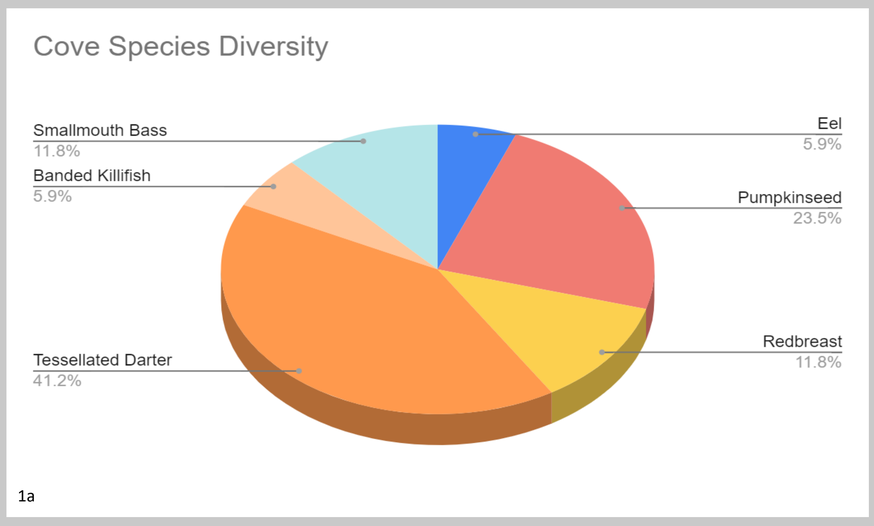


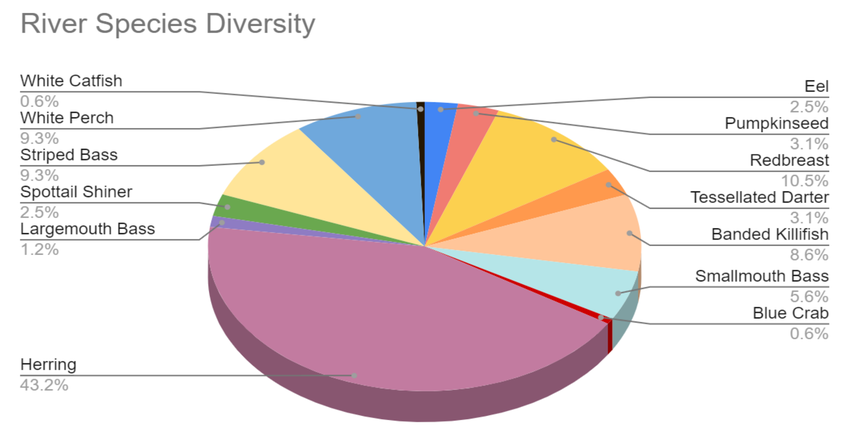
Figure 1

Results:

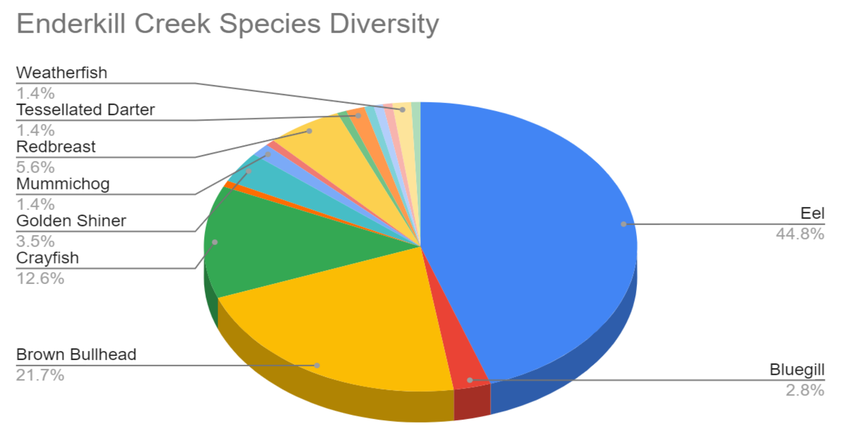
Our research indicates that environmental observation informs effects on biodiversity. We acknowledge some of the caveats of our study, such as the differences between the number of species of aquatic animals we caught, versus the total number of individuals that were caught. By comparing these we could examine how environmental factors would impact population, as well as diversity, while examining our samples from each area we tested. It is known that the amount of SAV in the habitat affects the amount of dissolved oxygen (Conover, David O; Estuaries 27.4 (2004): 659–669). It was found that the River location with high levels of SAV also had higher DO, which affects the aquatic species diversity of that site. The pH level did not drastically vary at each site, therefore it was not a determining factor of species variation. As seen in **Pie Chart 1** there were less fish caught in the Cove compared to both the Enderkill Creek and the River. We found higher numbers of specific species (eels, herring, and tessellated darters), depending on which sample site (Creek, River, Cove) respectively. However, we ran a Simpsons Biodiversity Index to calculate biodiversity based on Species Richness and Species Evenness (Findlay et al., Estuaries and Coasts 37, 1233–1242 (2014)). We graphed the Biodiversity index compared to the total individual caught as seen in **Figure 1.** All the sites had a similar Simpsons Biodiversity Index despite the fact that there is a varying amount of aquatic animals caught at each site. This means even though each habitat has varying environmental factors they are capable of supporting similar amounts of biodiversity.



1a



1b



1c

Pie Chart 1 depicts Aquatic Species Diversity over the Cove (1a), River (1b), and Enderkill Creek (1c). These charts illustrate that there more eels found in the Enderkill Creek (1c) location than in any other habitats presented. Furthermore, the river (1b) contained more heiring compared to the other sites (1a and 1c). However, pie chart 1a (Cove Species Diversity) indicates that there were less aquatic animals compared to animas found in the river and creek (1b and 1c respectively).

Discussion:

It seems that some of the environmental factors we tested did have an impact on the levels of fish populations as well as the variation within the species present.

There are many factors we could be more careful to acknowledge while testing in the future. Some examples of these include reducing sample error, testing the areas we sampled from for longer periods of time, as well as testing more areas to see if the results are consistent throughout. All of these would lead to more concise findings and make them easier to tie together for a more refined conclusion. With our findings it seems as though the areas we tested with more water flow generally had larger amounts of species as well as diversity within the number of species caught. While there are more environmental factors that we were unfortunately unable to test for or include in our research, we were able to see how the factors we did test for seemed to impact the populations of aquatic life.

References:

Conover, David O. "Interannual and Long-Term Variation in the Nearshore Fish Community of the Mesohaline Hudson River Estuary." Estuaries 27.4 (2004): 659–669. Web.

Findlay, S.E.G., Strayer, D.L., Smith, S.D. et al. "Magnitude and Patterns of Change in Submerged Aquatic Vegetation of the Tidal Freshwater Hudson River." Estuaries and Coasts 37, 1233–1242 (2014). https://doi.org/10.1007/s12237-013-9758-1