

A Comparative Biodiversity of East River Park versus Stuyvesant Cove

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Abstract

Biodiversity, which is determined by species richness and abundance in an area, is notably crucial for the sustainability of plants, tertiary organisms, and the overall environment. The purpose of this project was to determine and compare the level of soil invertebrate diversity in Stuyvesant Cove and East River Park. The hypothesis was that Stuyvesant Cove Park was more biodiverse than East River Park because of its decreased foot traffic. Traps were set up from Sept-Nov '19 in both of the parks to capture the invertebrates for classification. DNA barcoding could not be completed; however, taxonomic data indicated that nine different taxa were represented in Stuyvesant Cove and fourteen taxa in East River Park. This experiment is essential for the general understanding and implication of biodiversity especially as New York City considers drastic changes to the landscape of East River Park in the East Side Coastal Resiliency Plan

Introduction

Biodiversity refers to the variety of life on Earth at ecosystem, species, and genetic levels. It is essential to sustain a high standard of biodiversity in all locations, not just traditional 'wild' places like rainforests and undeveloped land. Soil urban biodiversity is important to make sure parks stay healthy and can continue offering residents a breath of fresh air, among other environmental perks. Insects help keep soil healthy by aerating and decomposing dead organic matter, thus keeping plant life healthy. Two such park areas are East River Park (40.71285, -73.97606) and Stuyvesant Cove (40.73191, -73.97375), as shown in Figure 1. These two locations were chosen because of their proximity to the author's academic institution (40.71852, -73.97591). Examining and quantifying the insect life that is present in the park can help shine light on the rich biodiversity these urban greenspaces on the environment.

It was thought that Stuyvesant Cove would have more biodiversity than East River Park because Stuy Cove has limited access to the public, whereas anyone can walk through East River Park. The study was conducted from Sept-Nov '19 with analysis in the following months. Whole bugs were taken as samples so identifying features would remain intact for taxonomic identification.

Materials & Methods

To collect the samples, simple traps were created from plastic bowls, wooden skewers, and 10% soap/salt solution. These were planted in the two locations and left for two days before retrieval. Collections took place seven times at East River Park between late September and early October and three times at Stuyvesant Cove in September. Once all the traps had been collected, taxonomic identification took place using dissecting microscopes and a reference chart. This data was cataloged by the number of taxon identified in each location from each collection site. Subsequently, statistical calculations such as the Kolmogorov-Smirnov test and Shannon's Index were performed to quantify and compare the biodiversity of the sites. DNA isolation and PCR was successfully performed on nine different insects, and confirmed with

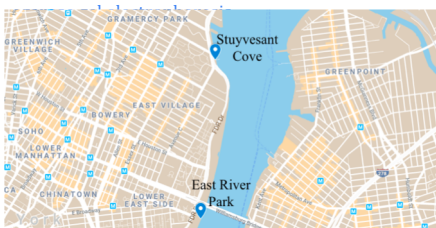


Figure 1: Location of the two parks



Figure 2: Traps set up in East River Park

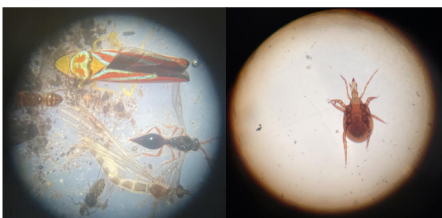


Figure 3: Insects collected on the microscope

Results

We hypothesized that East River Park would have more biodiversity than Stuyvesant Cove. Invertebrate collection and identification was performed from East River Park than Stuyvesant Cove. Data was tallied in the spreadsheet as described in the methods section and calculations were completed. 485 bugs of fourteen taxon were found in East River Park. 120 bugs of nine taxon were found in Stuyvesant Cove. Shannon's Index was calculated and found to be 1.9113 for East River Park and 1.7344 for Stuyvesant Cove. The Kolmogorov-Smirnov test was also performed. The Dmax was found to be 0.061597938 and the Dcrit value 0.13846753. Therefore, the null hypothesis was accepted at 95% confidence interval. The biodiversity of Stuyvesant Cove Park and East River Park are not significantly different from each other.

For ERP	H'	1.9113	For Stuy Cove	H'	1.7344
	exp(H')	6.7618		exp(H')	5.6656
	H' max	2.7081		H' max	2.1972
	J'	0.7058		J'	0.7894

Table 1: Calculations for the Shannon's Index and statistical measures.

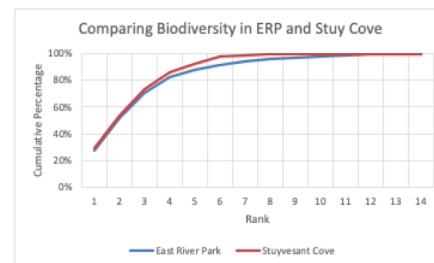


Figure 4: Graph comparing the cumulative percent that each species contributes to the two locations

Null hypothesis: The biodiversity of site 1 does not differ from site 2			
Alternative hypothesis: The biodiversity of site 1 is different from site 2			
Given H'(Site 1) ≠ H'(Site 2)			
Dmax	0.061598	K(0.05)	
Dcrit	0.138468	1.3581	
If Dmax > Dcrit, then reject Ho (null)			
Conclusion: Accept Ho (null).			

Table 2: Statistical testing of the biodiversity of the two sites.

Discussion

Stuyvesant Cove was expected to have more biodiversity than East River Park (ERP) because of the greater foot traffic in the latter. Stuy Cove was expected to be more biodiverse because the site is closed to pedestrians with limited access. Collections took place seven times at East River Park and three times at Stuyvesant Cove Park. There were 485 insects collected at ERP and 120 collected at Stuy Cove. That averages out to 69 bugs per collection day at ERP and 40 bugs per collection day at Stuy.

However, the combined number of insects collected, 605, show an amazing array of invertebrate presence in the two locations. One particularly abundant day, September 27th, saw over 150 bugs collected from 10 different taxa. Statistical analysis indicated that the biodiversity of the two sites are not significantly different from each other based on the samples collected in this project.

ERP has experienced disturbances in the past that impacted invertebrate biodiversity. In 2013, Hurricane Sandy swept through the area and flooded the park. The quick restoration of green space, supported by efforts of the community and organizations like the Lower East Side Ecology Center, have allowed invertebrate life to flourish. The park is threatened once more, this time with plans related to the East Side Coastal Resiliency Plan.

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Acknowledgements

We would like to thank the Cold Spring Harbor Laboratory, the Pinkerton Foundation, the Lower East Side Ecology Center, and Emily Curtis-Murphy (Stuyvesant Cove Park).