The Effect of Monk Parakeet Feces on the Invertebrate Biodiversity

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Abstract

Our group worked toward using DNA barcoding to identify invertebrates in Seaman's Neck Park and Wantagh Park on Long Island. Studies have found that increases in nitrogen, phosphorus, and potassium increases nutrients in the soil composition. It was observed that the species located within a bog changed due to changes in the soil composition. (4) Our objective was to determine was if monk parakeet feces had an effect on the ecosystem. We had hypothesized that the nutrient levels in the soil would change, due to the introduction of feces to the area, and therefore, will be a change in the diversity of the species found in the areas with and without invasive birds. We have come to the conclusion that our hypothesis was partly supported. The presence of monk parakeet feces increased the nutrient levels in the soil in both Seamans Neck and Wantagh Park. There did not appear to be a significant difference in the number of different species present in the area without bird feces than the area with bird feces.

Figure 1: Map of Seamans Neck Park

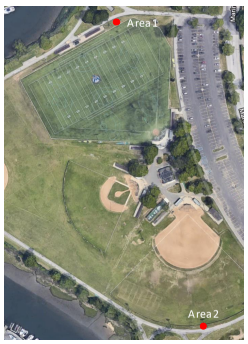


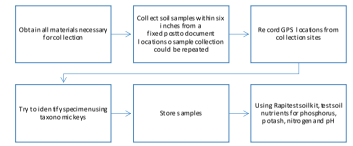
Figure 2: Map of Wantagh Park

Introduction

We had hypothesized three statements: That nutrient levels in the soil would be increased, that there will be a positive effect on vegetation and therefore more species will be dependent on that vegetation, and that there will be a change in the species composition in the areas with and without invasive birds. Since bird droppings increase the nutrients present in soil, it is predicted that there will be a positive effect on vegetation and therefore more will be species dependent on that vegetation. We predict that there will be an increase of biodiversity in areas with bird droppings compared to areas without bird droppings.

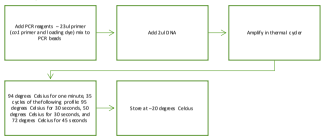
Methods and Materials

Collection, Documentation and Soil Analysis

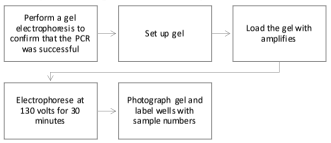


Isolation of DNA

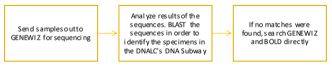
Amplification of DNA



Analyze using Gel Electrophoresis



Analysis



Results

Figure 3: Seamans Neck Park Collection Data

Area	Time	Collector	Lattitude	Longitude	Habitat
1 – control	5/1/18	Darah	40.6492	-73.4900	well-maintained grass area with no feces present
2 – monk	5/1/18	Darah	40.6495	-73.4913	well-maintained grass area with monk parakeet feces present

Figure 4: Wantagh Park Collection Data

Area	Time	Collector	Lattitude	Longitude	Habitat
1 – control	5/14/18	Melanie	40.6448	-73.5113	well-maintained grass area under a tree with no feces present
2 – monk	5/14/18	Melanie	40.6451	-73.5110	well-maintained grass area with monk parakeet feces present

Figure 5: Samples from Seamans Neck Park and Wantagh Park

Sample #	Collection Area	Common Name	Genius Species	Image
PAS 002	SNP 2	Pill bug	Armadillidium vulgare	
PAS 004	SNP 2	Ground Beetle	Harpalus affinis	
PAS 006	SNP 2	Sun Beetle	Amara aenea	
PAS 011	SNP 1	Sun Beetle	Amara aenea	
PAS 024	WAN 1	Cornfield Ant	Lasius neoniger	

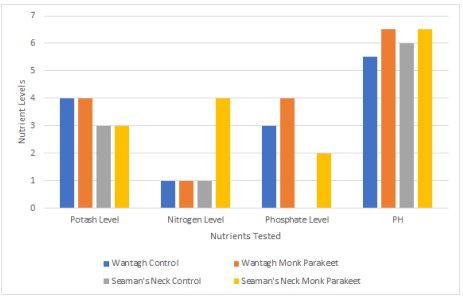


Figure 6: Soil Nutrient Levels in Seamans Neck Park and Wantagh Park

Wantagh Park locations had increased amounts of potash. Seamans Neck Park monk parakeet location had the highest nitrogen level. Wantagh Park monk parakeet area had the highest level of phosphate. Both monk parakeet locations had a pH of 6.5. Both control locations had a pH of 6.

Figure 7: Barcode of samples

Using DNA Subway, we created a barcode that shows how closely related the organisms are. PAS 024 was classified as Lasius Neoniger, commonly known as a cornfield ant. PAS 002 was classified as Armadillidium Vulgare, commonly known as pill bug, confirmed using BOLD. PAS 004 was classified as Harpalus Affinis, commonly known as ground beetle. Both PAS 011 and PAS 006 are classified as Amara Aenea, commonly known as a sun beetle.

Figure 8:Philogenetic tree of samples

GENWIZ, BLAST, and BOLD are all databases that we had used in other to classify the organisms that we collected. These databases are more reliable for determining the species of the organism because aside of identifying the organisms taxonomically (a method that often encounters issues because of slight differences between the organisms or based on what state of their life they are in), it reads their DNA and matches it up to organisms already in the system. If no match is found, that most likely means that a new species has been discovered and is called a novel sequence.

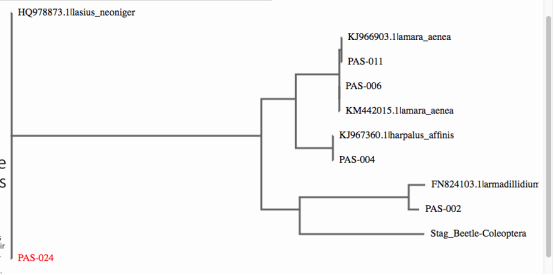


Figure 9: Monk Parakeet

Discussion

Our hypothesis of having monk parakeet feces present increasing the amount of essential nutrients in the soil was supported. The areas containing the feces, unlike we had hypothesized, did not definitively contain the biodiversity being that we limited samples. We found that the control areas of the parks that were sampled had nutrient differences when compared to the areas with Monk parakeet feces present. As shown in figures 3 and 4, the control area for Seaman's Neck Park had K3 (potash) sufficient, N1 (Nitrogen) deficient, P0 (phosphorus) deficient, and had a PH of 6. The control area of Wantagh Park was found to be K4 (potash) surplus, N1 (Nitrogen) deficient, P3 (phosphorus) sufficient, and had a PH of 5.5. The area with bird feces present in Seaman's Neck Park was found to be K3 sufficient, N4 surplus, P2 adequate, and had a PH of 6.5. The area with bird feces present in Wantagh Park was found to be K4 surplus, N1 deficient, P4 surplus, and had a PH of 6.5. This shows that the areas with bird feces had an increased amount of nutrients.

References

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Resources

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