Ant Biodiversity in Westchester County, NY

Haley Hamers[1], Maura McCormack[1], Peter Popov[2], Aishwarya Punnoose[1]
Mentors: Dr. Oxana Litvine[1], Mrs. Stacy Unkenholz[1]
1- The Ursuline School, 1354 North Avenue, New Rochelle. NY 10804
2- Dutchess Community College, 53 Pendell Rd, Poughkeepsie, NY 12601

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Abstract

- Ants (Family *Formicidae)* are known to be one of the most abundant organisms on earth.
- They're important in:
  a. organic decomposition
  b. the dispersion of seeds
  c. serving as a food source for many species
- To better understand the biodiversity of ants in Westchester County, we used iNaturalist, DNA barcoding with DNA Subway and field guides.
- The results were not as diverse as expected, and showed that the most common species of ants found were the invasive Crazy Robust Ants (Nylanderia Bourbonica), which are known for their destruction of native species of invertebrate and competitive nature.
- The second most common species were the Funnel Ants, which are native ants known for their damaging behavior, such as weakening soil structure.

Introduction

Insect species (especially ants) constitute the greatest number of the world's organisms.

- Ants (Family *Formicidae*) → two-thirds of all insect biomass[1]
- While often considered pests, most are beneficial to the decomposition of organic matter.[2]

DNA barcoding and iNaturalist are prevalent in identifying species.

- Gel electrophoresis → utilized to identify new or currently invasive species
- iNaturalist → used to upload data about organisms for further scientific investigation
- Both used to learn species behavior and preserve biodiversity worldwide[3]

New York is currently facing many ecological threats.

- Habitat loss and invasive species → Wiping out and replacing crucial species, especially invertebrates[4]
- Identifying frequent ant species in Westchester can help scientists learn which ant species threaten Westchester, and which to protect and cultivate.

Aim

- To explore the biodiversity of ants in Westchester County using different species identification methods.

Goals

- Identify native/invasive ant species in Cranberry Lake Preserve.
- Investigate the variety of ant species
- Compare the accuracy of iNaturalist, field guides, and DNA barcoding (using Gel Electrophoresis).

Materials & Methods

30 ant samples were hand collected from Cranberry Lake Preserve, photographed and identified

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Placed into small tubes of ethanol to euthanize them and refrigerated until they were taken to DNALC.

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Extracted and dried for 10 minutes, then placed in Chelex tubes with 100 µL of Chelex, and grounded for 2 minutes using clean pestles.

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Tubes were placed in an aluminum foil-covered pot with punctured holes (allowing the mixture in the bottom to be positioned below the water surface)

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Tubes were left in hot water for 10 minutes to aid DNA extraction and used to amplify the DNA

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Tubes were left with DNALC to be placed in electrophoresis chamber and sequenced

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Sequences were downloaded and trimmed in DNA subway for BLAST analysis

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Results

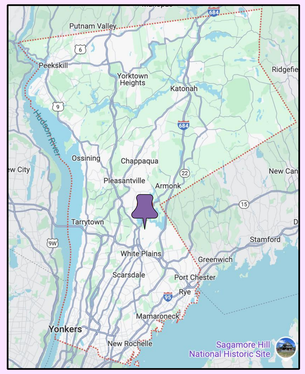

Figure 1: Cranberry Lake Preserve on a map of Westchester County

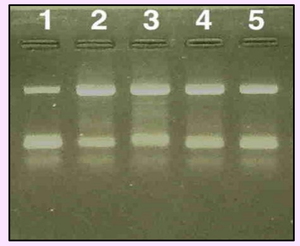

Figure 2: First 5 samples of species results from Cranberry Lake Preserve

Sample	iNaturalist	Field Guide	DNA Barcode Analysis (DNA Subway)	Coordinates
1	Myrmicine Ants *Myrmicinae Formicidae*	Fire Ant *Solenopsis*	Robust Crazy Ant *Nylanderia bourbonica*	41.077873, -73.756728
2	Myrmicine Ants *Myrmicinae Formicidae*	Fire Ant *Solenopsis*	Robust Crazy Ant *Nylanderia bourbonica*	41.077873, -73.756728
3	Thief ant *Solenopsis molesta*	Texas carpenter ant *Camponotus texanus*	Funnel Ant *Genus Aphaenogaster*	41.077491, -73.756620
4	Myrmicine Ants *Myrmicinae Formicidae*	Fire Ant Solenopsis	Robust Crazy Ant *Nylanderia bourbonica*	41.077491, -73.756620
5	Collared Ants *Aphaenogaster*	The Wood Ant *Formica rufa*	Robust Crazy Ant *Nylanderia bourbonica*	41.077873, -73.756728

Table 1: Example of identification (5/30) utilizing iNaturalist, Field Guides, and DNA Subway

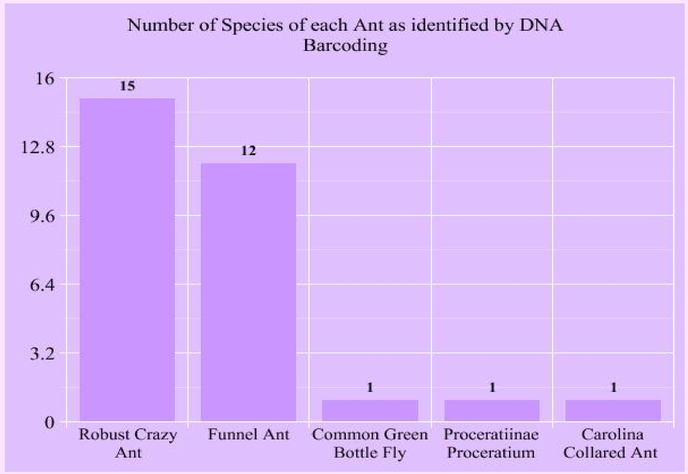

Table 2: Table of each ant (30/30) identified through DNA Barcoding

Discussion

- Most of the ants were not specified using iNaturalist and not the correct genus when using a field guide. This shows that further development is needed regarding the accuracy of iNaturalist in identifying species, especially smaller and harder to photograph invertebrates.
- Cranberry Lakes did not have a biodiverse selection of ants, as there were only two main species of ants analyzed from the samples. Further research needs to be conducted on the variety of ants in other Westchester preserves, and how it is affecting the ecological balance.
- Majority of BLAST results were *Nylanderia bourbonica*, a highly invasive ant in North America, showing the threat of that ant to other species in Westchester.

References

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Acknowledgements

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