Ant Biodiversity in Central Park

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Abstract

We collected ants from both shady and sunny areas along the Bridle Path in order to analyze the biodiversity of ants in different microenvironments within Central Park. We extracted DNA from the ants using Chelex, amplified the DNA by PCR, and sequenced the DNA and identified the different ant species using BLAST. We hypothesized that we would find more biodiversity of ants in damp areas because that is where ants tend to thrive and create their colonies. Our results supported our hypothesis as we found more ant biodiversity in damp and shady areas.

Introduction

- Central Park is 843-acre park and a sanctuary from city life in New York City, made up of a diverse composition of organisms.
- Ants, a social organism and part of the formicidae family, are most commonly found in forests, housed in communities underground, or in trees.
- Some ants are led by queen or queens, who lay thousands of eggs.
- Work ants are wingless females whose purpose is to forage for food and ensure the safety of the colony through protection of queen's offspring and fortification of nests.
- Male ants mate with the queen to assure long-term survival of the colony.
- An entirety of an ant's lifespan is relatively short, since they only live for several weeks to one year.
- More than 10,000 ant species are present around the world.
- Some of the common ant species that inhabit North America are the Argentine, sugar, and carpenter ants.
- Ants biological diversity can be studied through the sequencing of their DNA.
- We hypothesized that we would find more biodiversity of ants in damp areas because that is where ants tend to thrive and create their colonies.

Materials and Methods

- 30 samples collected from sunny and shady regions along the Bridle Path in Central Park
- DNA was extracted using Chelex, amplified by PCR, and sent to Azenta for sequencing
- The sequences were analyzed using BLAST in order to identify the species.

Results

![Figure 1. Sample Locations in Central Park. This figure shows a map of Central Park with the locations where samples were collected on or near the Bridle Path.](image)

![Figure 2. Distribution of Species Found at Central Park. Out of all of the samples that were analyzed, the majority of samples found were small honey ants (8/19). The least common species found was the poinerine ant (1/19).](image)

<table>
<thead>
<tr>
<th>Latin Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. reyi</td>
<td>E. reyi</td>
</tr>
<tr>
<td>A. pseudosetosa</td>
<td>A. roveetle</td>
</tr>
<tr>
<td>N. longicornis</td>
<td>N. longicornis</td>
</tr>
<tr>
<td>P. imparis</td>
<td>P. imparis</td>
</tr>
<tr>
<td>C. hominivora</td>
<td>C. hominivora</td>
</tr>
<tr>
<td>P. pennsylvanica</td>
<td>P. pennsylvanica</td>
</tr>
</tbody>
</table>

Table 1. Latin and Common Names of Identified Species.

<table>
<thead>
<tr>
<th>Species</th>
<th>Sunny Areas</th>
<th>Shady Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. longicornis</td>
<td>1 (1)</td>
<td>2 (1)</td>
</tr>
<tr>
<td>P. imparis</td>
<td>8 (8)</td>
<td>2 (8)</td>
</tr>
<tr>
<td>P. pennsylvanica</td>
<td>4 (4)</td>
<td>1 (1)</td>
</tr>
</tbody>
</table>

Table 2. Simpson's Biodiversity in Sunny versus Shady Areas.

- The ants were found in a variety of areas on the Bridle Path in Central Park with major differences regarding whether the area was sunny or shady. Simpson’s Biodiversity (1/D) was used to calculate the biodiversity of ants specifically in the areas that were shaded and the areas that were sunny.

<table>
<thead>
<tr>
<th>Simpson's Biodiversity (1/D)</th>
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<tr>
<td>Sunny Areas</td>
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<td>Shady Areas</td>
</tr>
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![Figure 4. Neighborhood Joining Phylogenetic Tree.](image)

Discussion

- Investigated how ant biodiversity is affected by sunny versus shady habitats by collecting ants in Central Park.
- Our hypothesis was supported by our results.
- The shady areas had the most biodiversity by Simpson’s Biodiversity Index (Table 2).
- A majority of the ants were found in shady and damp regions.
- Damp soil is often more nutrient dense, which contributes to more diverse ant populations.
- Identified ant species from shady areas were:
  - P. imparis
  - N. longicornis
  - Typically establishes their nests in damp and shady places
- N. longicornis
  - Known as the Robust Crazy Ant
  - Native to the Caribbean and is spread by human activity
- To increase reliability of the experiment and results:
  - Increase the number of samples
  - Collect samples from other areas around Central Park
  - Visit less disturbed areas of the park that have a more leaves and foliage to enhance biodiversity

References

[Ant Invasion Determined by Weather - Rain and Drought.](https://www.preventivepestcontrol.com/ant-invasion-determined-by-weather-rain-drought/)

![Ants are relentless in their out beyond their natural habitat.](image)

![Ant Biodiversity in Central Park](image)

![Figure 3. Distribution of Ant Species Found in Central Park.](image)

![Table 2. Simpson's Biodiversity in Sunny versus Shady Areas.](image)

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Acknowledgements

Thank you to Zoë Veltri for helping to collect samples at Central Park. Thank you to Marymount School of New York for allowing us to work on this project. We would also like to thank our Science Research class for their support. Thank you to Magnolia Butler, Ella Villacorta for helping us collect samples in Central Park, Manhattan.

Credits

- [Image 1](image)
- [Image 2](image)
- [Image 3](image)
- [Image 4](image)
- [Image 5](image)
- [Image 6](image)

Visit less disturbed areas of the park that have a more leaves and foliage to enhance biodiversity.