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Ant Biodiversity in Central Park

Gillian Atienza¹, Megan Berdan¹, Zoë Veltri¹, and Annie Kloimwieder¹

¹Marymount School of New York



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 confirmed the PCR by gel electrophoresis. We then 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.
 - Ants are led by queen or queens, who lay thousands of eggs.
 - Worker 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.

Results

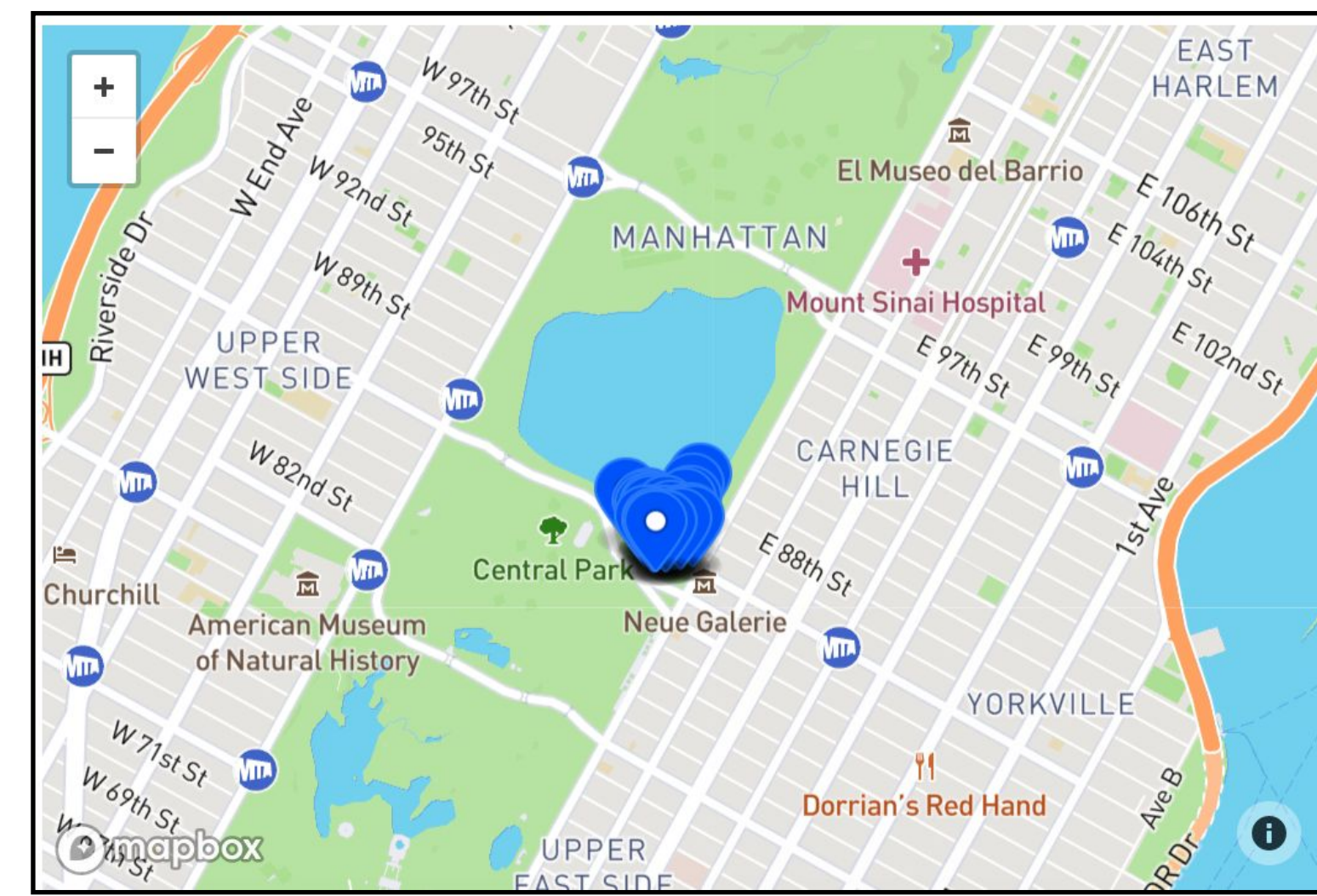


Figure 1. Sample Locations in Central Park. This figure shows a map of Central Park with the locations where samples were collected on or near the Bridle Path.

Distribution of Ant Species Found

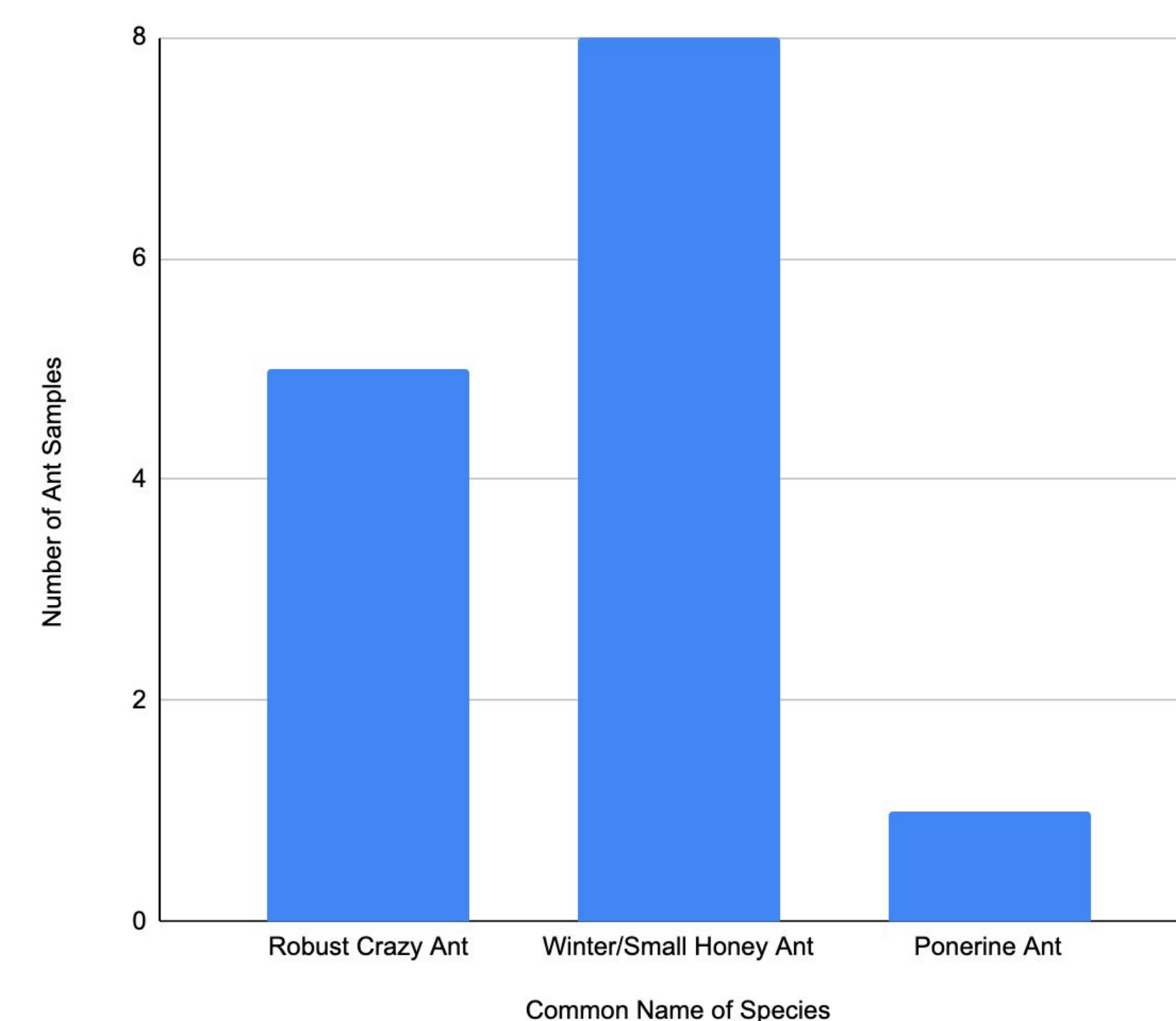


Figure 2. Distribution of Species Found at Central Park. Out of all of the samples that were analyzed, the majority of samples found were small honey ants (8/19). The least common species found was the ponerine ant (1/19).

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.

Latin Name	Common Name
1. <i>Earota reyi</i>	1. <i>Earota reyi</i>
2. <i>Acrotona pseudo tenera</i>	2. Rove Beetle
3. <i>Nylanderia</i>	3. Robust Crazy Ant
4. <i>Prenolepis imparis</i>	4. Winter or Small Honey Ant
5. <i>Cochliomyia hominivorax</i>	5. New World Screw-Worm Fly
6. <i>Ponera pennsylvanica</i>	6. Ponerine Ant

Table 1. Latin and Common Names of Identified Species. This table contains all of the species identified, including those which were not ants (rove beetle, new world screw-worm fly, and *Earota reyi*).

Species	Sunny Areas	Shady Areas
	<i>Nylanderia</i> (1)	<i>Prenolepis imparis</i> (8) <i>Nylanderia</i> (4) <i>Ponera pennsylvanica</i> (1)
Simpson's Biodiversity (1/D)	1.0	2.1

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.

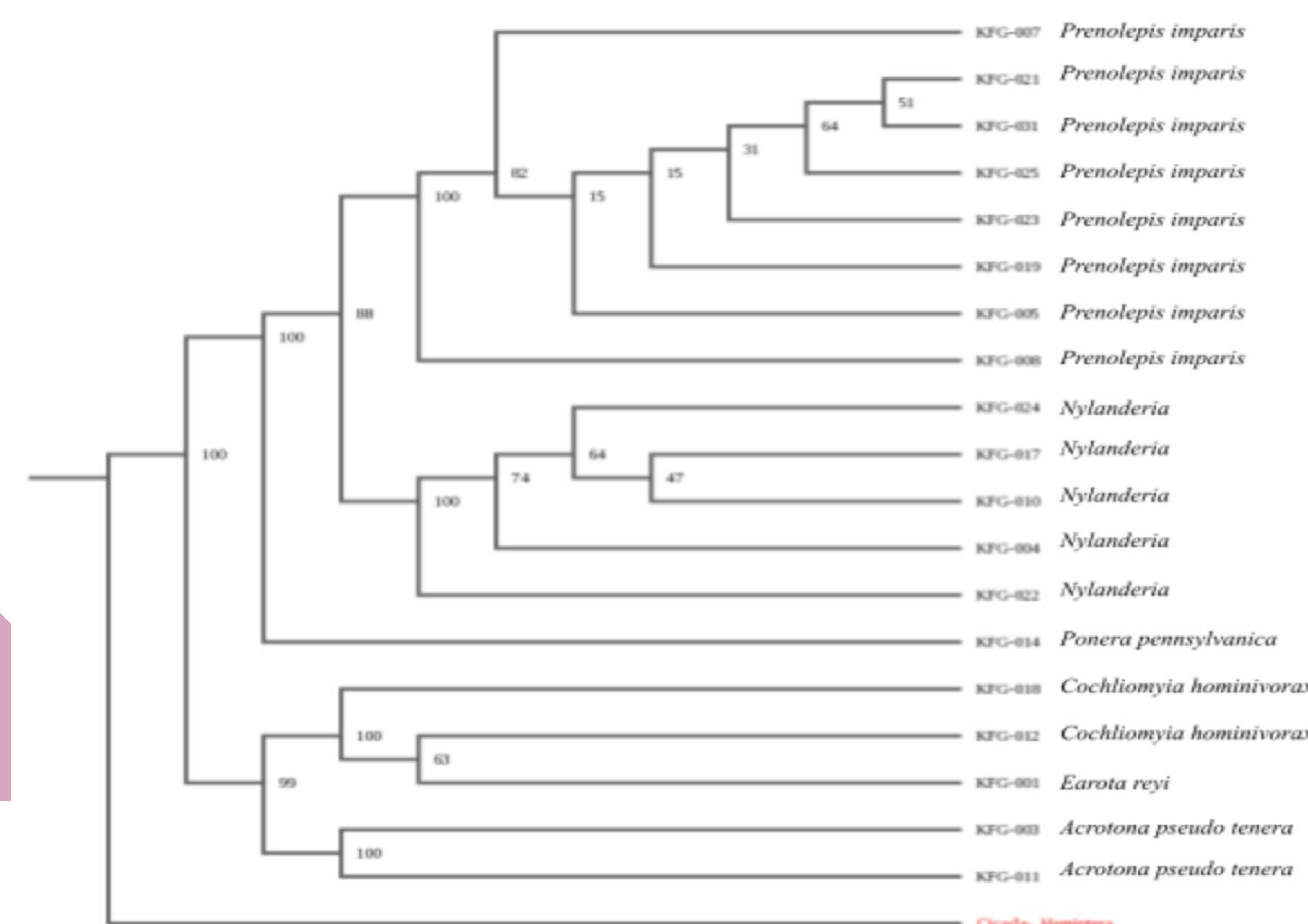


Figure 4. Neighborhood Joining Phylogenetic Tree. The phylogenetic tree depicts the evolutionary relationship between the various species that were identified. The species that is in red is the species that has the least genetic similarity to the other species listed.

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:
 - Prenolepis imparis*
 - known as the Winter or Small Honey Ant
 - Typically establishes their nests in damp and shady places
 - Nylanderia*
 - 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

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