



Ant Biodiversity in Randall's Island

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Introduction

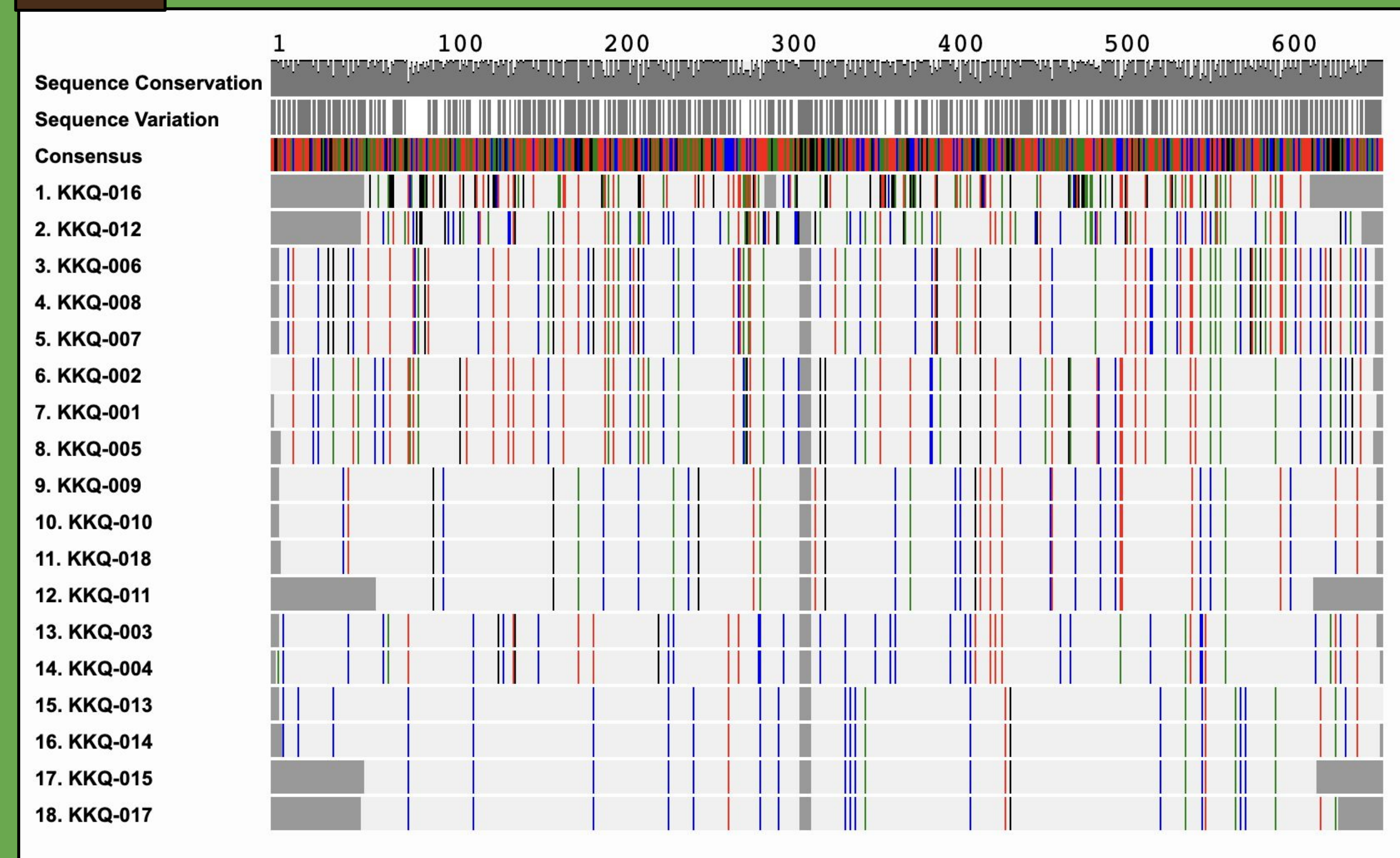
- There are more than 20 quadrillion ants in the world, and 1.2 billion of them live in NYC (Tracy 2024)(Menninger 2015).
- Over 12,000 different ant species exist (Types of Ants, What They Eat & Where They Live” 2024).
- NYC has also been introduced to some of the most damaging invasive species.
- We asked: What proportion of ants in New York are invasive? How diverse are the set of species of ants on Randall's Island and the habitats they dwell in?
- Ants live in soil, leaf litter, decaying plants, and many more habitats. They eat leaves, seeds, small insects, nectar, and honeydew (“Ants | National Wildlife Federation” 2024).
- Habitats we tested: Areas with soil, wooded, grassy, rocky, and salt marsh areas.
- Based on our research, we expected a great variety in species of ants in the various habitats.

Materials and Methods

- We had 15 minutes for each ant search; this made time a constant.
- We placed ants in containers filled with 95% ethanol and labeled each with the corresponding site. We had a total of 18 samples.
- We ground up the sample and extracted the DNA. The DNA was amplified in a thermal cycler using the CO1 invertebrate primer. Next, we used gel electrophoresis to verify there was DNA (Cold Spring Harbor Laboratory DNA Learning Center 2018). We sent our samples to a lab to be analyzed, and used the data from the lab and the BLASTN program to determine the species of each of our DNA samples.

Results

Figure 1:



This multiple sequence alignment compares the DNA of each sample to identify similarities and differences in their genetic sequences. Each vertical line represents a similar base of DNA between species. The species are aligned in decreasing order of similarity.

Figure 3:

Sample #	Habitat	Species	Alignment Length	Bit Score	e	Mismatches
1	Forest	<i>Prenolepis imparis</i>	654	1180	0.0	0
2	Forest	<i>Prenolepis imparis</i>	654	1180	0.0	0
3	Forest	<i>Lasius alienus</i>	651	1175	0.0	0
4	Forest	<i>Lasius alienus</i>	654	1180	0.0	0
5	Forest	<i>Prenolepis imparis</i>	648	1169	0.0	0
6	Woodchip Trail	<i>Nylanderia</i> sp.	650	1173	0.0	0
7	Rocky Trail	<i>Nylanderia</i> sp.	650	1168	0.0	1
8	Rocky Trail	<i>Nylanderia</i> sp.	650	1173	0.0	0
9	Salt Marsh	<i>Lasius neoniger</i>	651	1175	0.0	0
10	Salt Marsh	<i>Lasius neoniger</i>	651	1175	0.0	0
11	Salt Marsh	<i>Lasius neoniger</i>	555	1002	0.0	0
12	Salt Marsh	<i>Tetramorium caespitum</i>	593	1070	0.0	0
13	Grassy Roadside	<i>Lasius neglectus</i>	654	1180	0.0	0
14	Grassy Roadside	<i>Lasius neglectus</i>	651	1175	0.0	0
15	Grassy Roadside	<i>Lasius neglectus</i>	564	1018	0.0	0
16	Grassy Roadside	<i>Zodariion rubidum</i>	560	1006	0.0	1
17	Grassy Roadside	<i>Lasius neglectus</i>	570	1029	0.0	0
18	Grassy Roadside	<i>Lasius neoniger</i>	650	1173	0.0	0

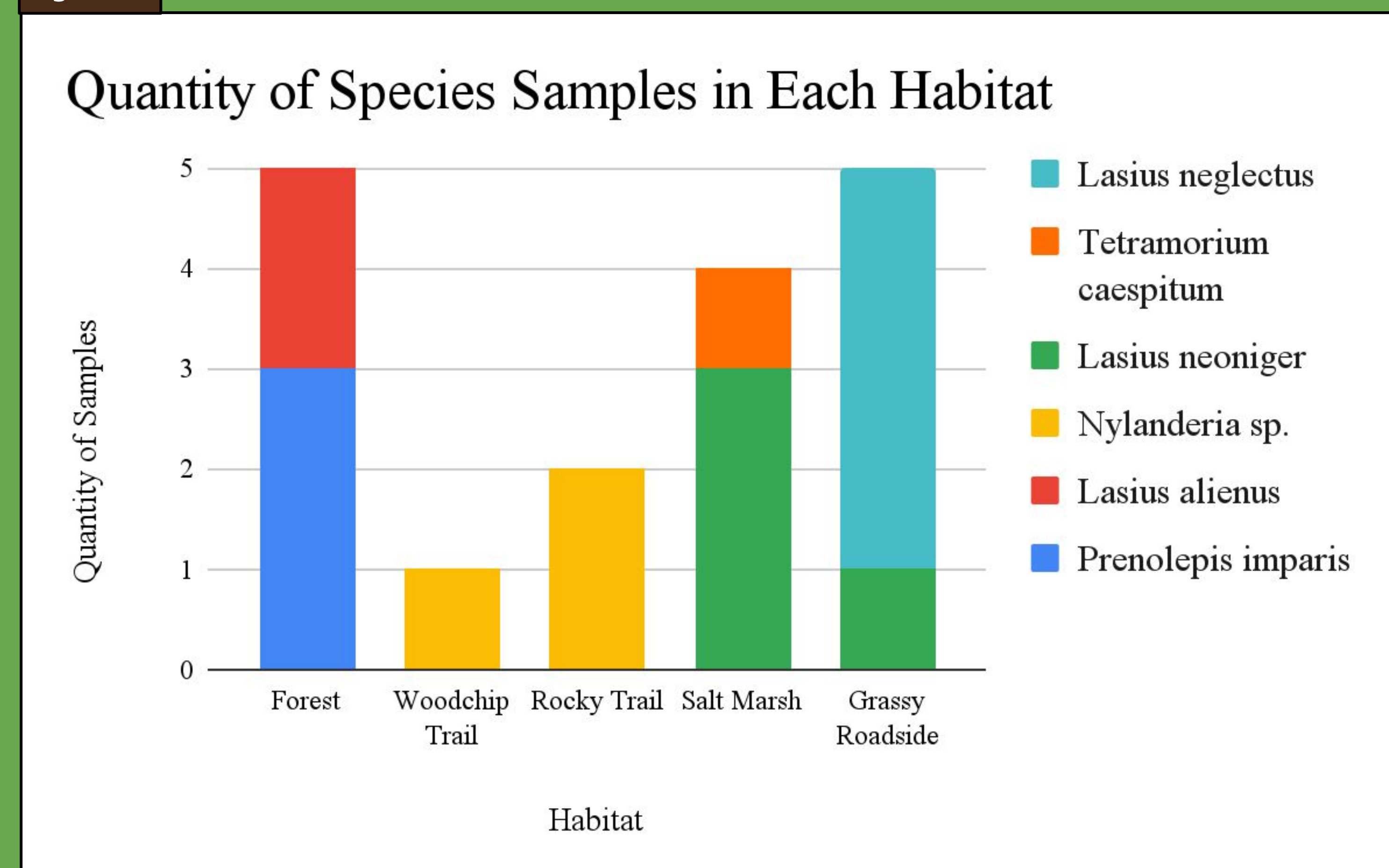
This table demonstrates the original raw data determined from the BLASTn procedure that matched the DNA to its species.

Figure 2:



This phylogenetic tree shows the evolutionary relationships between each sample and an outgroup, which in this case is a dragonfly.

Figure 4:



This figure demonstrates the number of species samples found in each habitat visited at Randall's Island. Each species found is denoted by a certain color, and the number of samples at each site is shown.

Discussion

- This experimental data demonstrates that Randall's Island contains a large biodiversity of ants.
- Out of 5 different habitats, we collected 7 different species, one of which was a species of spider.
- Many aspects of the ant population are unevenly distributed throughout the land.
- The trail habitats had the same species of ants, while the non-trail habitats had a diverse set of ant species.
- Additionally, the habitats with less human contact also had a much greater population density of ants.
- There is a roughly equal balance of invasive and non-invasive ant populations in Randall's Island. From the ant species we found, *Lasius alienus*, *Nylanderia* sp., *Tetramorium caespitum*, and *Lasius neglectus* are all considered invasive in New York, while *Prenolepis imparis*, and *Lasius neoniger* are endemic to this part of the world ("Lasius Alienus | BWARS" 2019) (Williams and Lucky 2019) (Maxcer, Williams, and Lucky 2023) (Trigos-Peral, Abril, and Angulo 2020) (Williams and Lucky 2017) ("Cornfield Ant - Home and Garden IPM from Cooperative Extension - University of Maine Cooperative Extension" 2025).

Acknowledgements

- Mr. Howard Waldman
- Dr. Abigale Koppa

References

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