

Invertebrate Biodiversity Relative to Road Proximity

¹Alexa Friedman, ²Sarah Gallen, and ³Fella Kaissar

¹Ethical Culture Fieldston School

Introduction

- Invertebrates are defined as a group of organisms that do not develop a backbone/vertebral column. (Britannica 2024)
- Invertebrates in urban environments are highly susceptible to habitat disruption and extermination. This study focuses on a singular threat to invertebrate diversity-busy roads
- This study was conducted in New York City, specifically Randall's Island. Randall's Island has multiple biomes such as a salt marsh, freshwater wetlands, and wildflower meadows
- We predict that as we collect invertebrates incrementally further away from the road that the invertebrate biodiversity will increase and there will be a wider variety of species found.

Materials and Methods

Collecting Samples: We collected a maximum of 8 organisms at each site. We placed the first quadrat closest to the road and moved ten-meter increments away. 1.5 mL tubes filled with ethanol were used and labeled by number for each quadrant.

DNA Extraction: Samples were ground up, lysis solution was added, and then samples were centrifuged. Silica resin and wash buffer were added. Supernatant was transferred to a fresh tube.

DNA Amplification: Invertebrate COI primer was used and cycled in a PCR machine.

Gel Electrophoresis: 2% agarose solution was placed into a chamber with 5 µL of the newly amplified DNA. Next, the gels were run.

DNA Sequencing and Analysis: Once the DNA had been sequenced, DNA subway was used

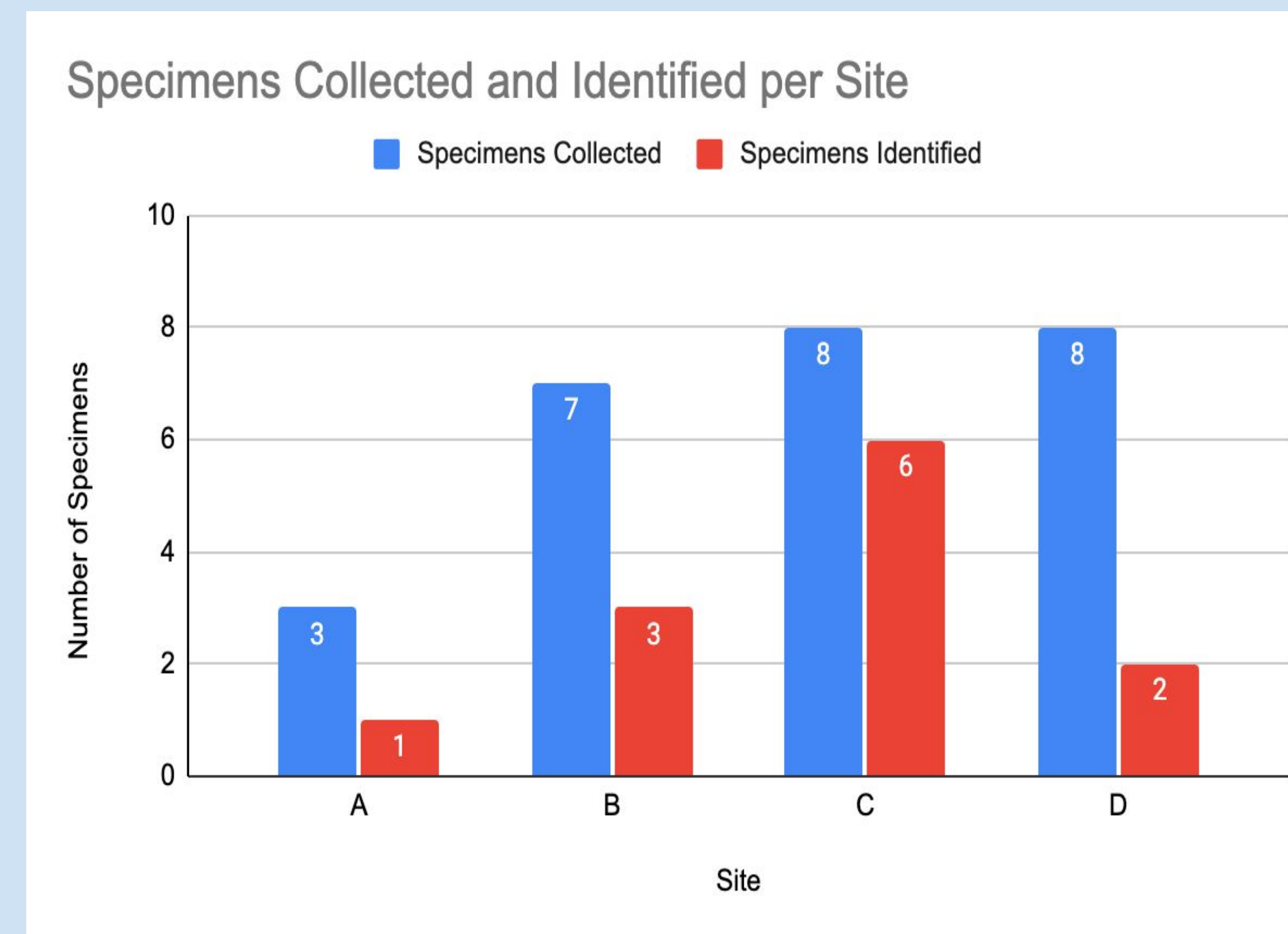
Results

Table 1

Specimen	Species Name	Family Name	Native	Invasive
FRJ-002	Tetramorium caespitum	Formicidae	No (Native to Europe)	Yes
FRJ-008	Philoscia muscorum	Philosciidae	No (Europe)	Yes
FRJ-010	Trachelipus (Genus not Species)	Trachelipodidae	No (Europe)	Yes
FRJ-011	Philoscia muscorum	Philosciidae	No (Europe)	Yes
FRJ-012	Philoscia muscorum	Philosciidae	No (Europe)	Yes
FRJ-013	Philoscia muscorum	Philosciidae	No (Europe)	Yes
FRJ-014	Lygaeus turcicus	Lygaeidae	Yes (Eastern US and Canada)	No
FRJ-015	Lygaeus turcicus	Lygaeidae	Yes (Eastern US and Canada)	No
FRJ-017	Philoscia muscorum	Philosciidae	No (Europe)	Yes
FRJ-018	N/A	Lygaeidae	Yes (Eastern US and Canada)	No
FRJ-021	Lumbricus rubellus	Lumbricidae	No (Europe)	Yes
FRJ-022	Lumbricus castaneus	Lumbricidae	No (Europe)	Yes

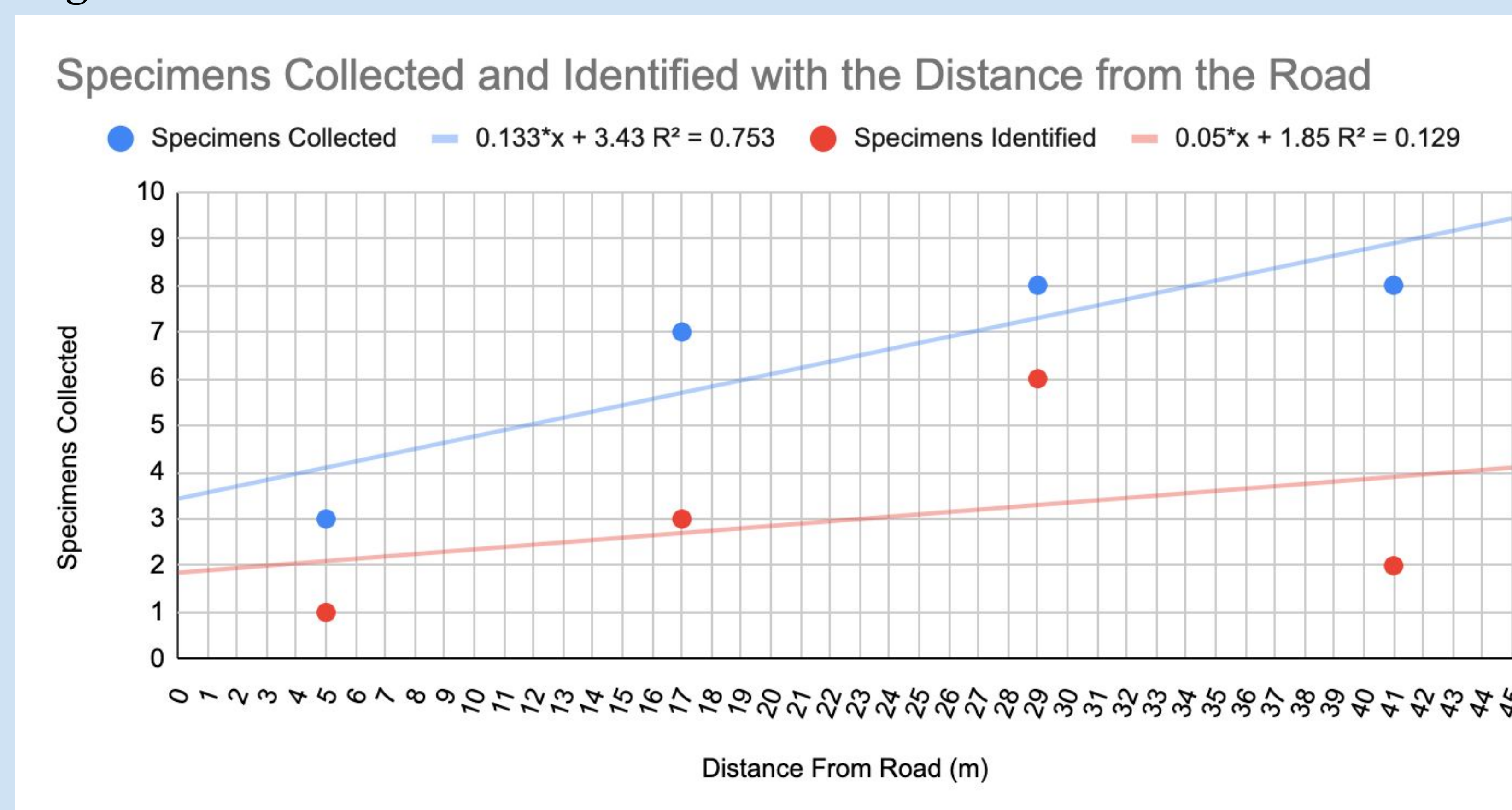
This table shows the data collected from the amplification and sequencing of samples. It shows their identified species, genus, and whether or not they are native to the United States

Figure 1



This figure demonstrates a comparison between the specimens collected at each site and then the number of species matches produced.

Figure 2



This scatter plot shows the number of specimens collected and number of species identified as a function of the distance from the road. Site A=5m from road, site B=17m from road, site C=29m from road, and site D=41m from road

Discussion

- We found only 3 specimens at site A compared to the 7 or 8 specimens found at the other 3 sites. Our data shows that further from the road, there was a higher concentration of invertebrates in the soil.
- The findings from site A revealed that only one sample, the Tetramorium caespitum (Immigrant pavement ant), had ample DNA for sequencing. These types of ants have invasive characteristics. This suggests that site A contains environmental conditions favorable for this species. Specifically, immigrant ants like pavements, as these areas have less vegetation
- Samples FRJ-021 and FRJ-022 were identified as exotic earthworms, specifically, Lumbricus rubellus, an invasive species, that arrived to the US in the 1600s. However, we believe we are the first to note this species in NYC. The presence of these worms could suggest a changing environment, as the only species we found were invasive. To make a more definitive conclusion the sample size should be larger and the method for trapping the invertebrates should be more consistent.

References

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