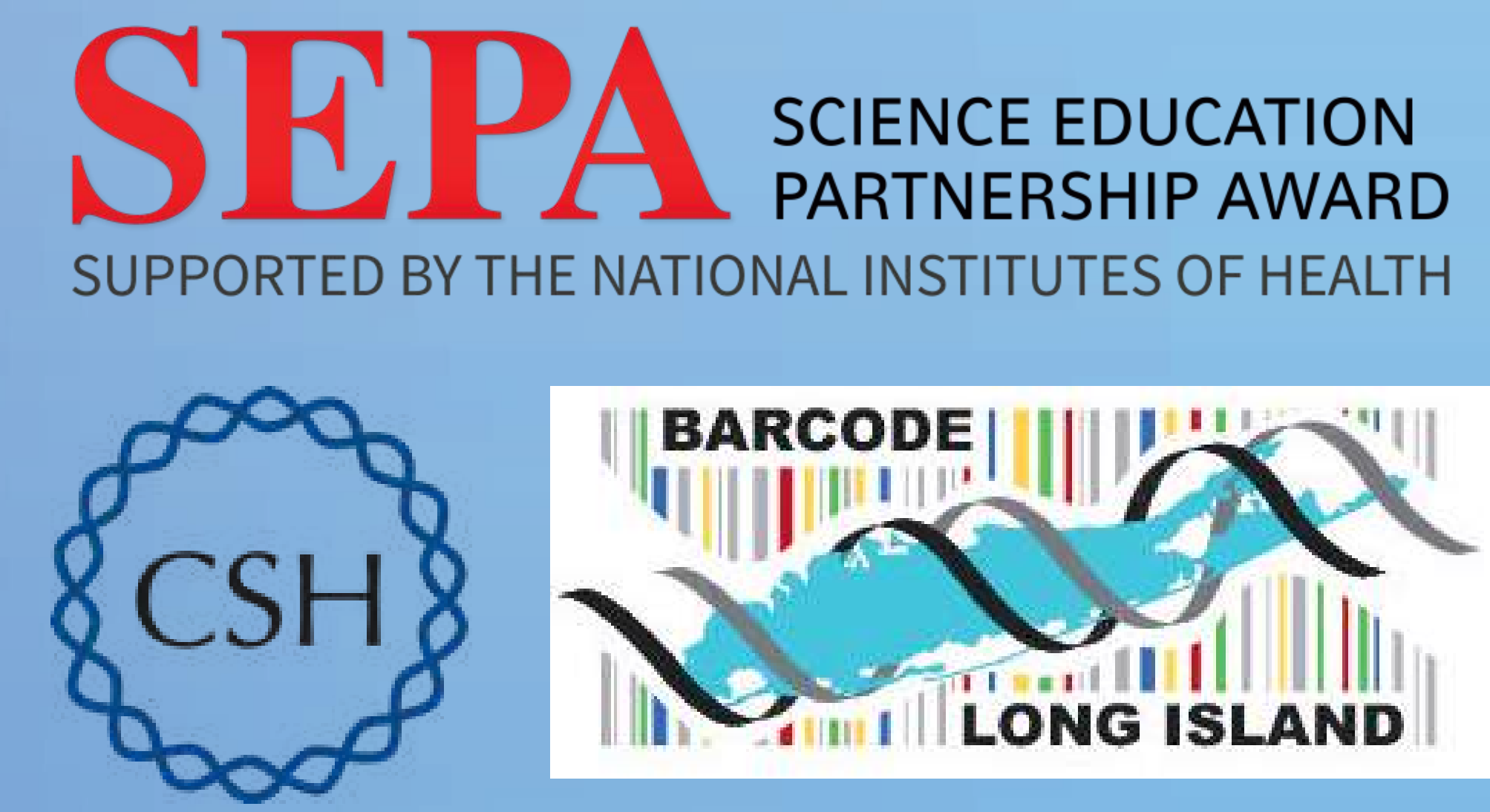




INVESTIGATING THE BIODIVERSITY OF ANTS NEAR WANTAGH ELEMENTARY SCHOOLS USING DNA BARCODING

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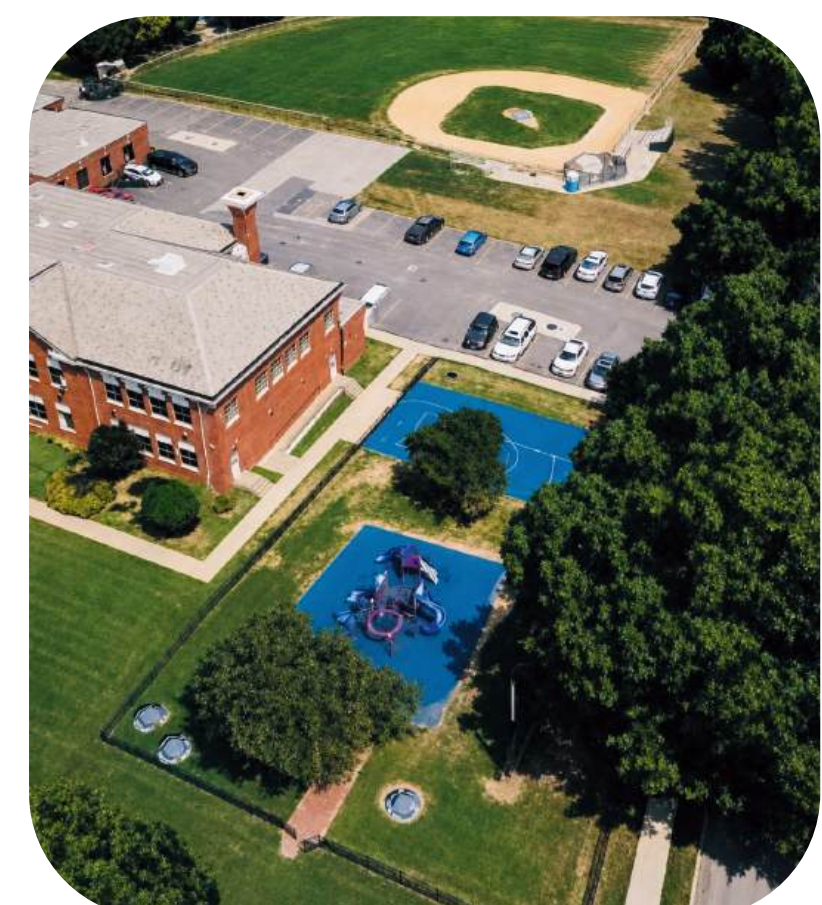


Abstract

Ants were collected from Wantagh Elementary, Forest Lake Elementary, and Mandalay School to study biodiversity in different environments. Ants were trapped using food bait and plastic cups, then frozen for preservation. Because many ants looked physically similar, DNA barcoding of the COI gene was used to identify species differences. Results showed that some species, including *Tetramorium caespitum*, *Lasius neoniger*, and *Prenolepis imparis*, were found at multiple schools. This showed that many ant species could survive in similar suburban environments across Wantagh. DNA barcoding helped identify species more accurately and improved understanding of local ant biodiversity.

Introduction

The diversity of ants in the areas by Wantagh Elementary School, Mandalay School, and Forest Lake Elementary School represented the biodiversity of Wantagh. The areas by Forest Lake Elementary School is very wooded, having lots of trees and different animal species, the Mandalay School area is close to both aquatic and wooded areas, and Wantagh Elementary School was more suburban and the least wooded. The difference in the environment surrounding these elementary schools may impact ant diversity which otherwise have similar human activities. Because of the role that ants play in many different ecosystems, being aware of how human activity impacts ants is crucial for protecting these ecosystems (Parker & Kronauer, 2021). Based on their surrounding areas, each elementary school is expected to have different species of ants present. Ants like acrobat ants, carpenter ants, little black ants, odorous house ants, pavement ants, and pharaoh ants should be commonly found in the Forest Lake Elementary School, Mandalay School, and Wantagh Elementary School areas (Arrow Extermination Company, n.d.). People could crush ant hills and destroy them since they play games outside by their schools which can allow the ants to go to new and different places and have to adapt to new places. Therefore, we wondered what is the diversity of ants that were based on the locations of elementary schools in Wantagh? We hypothesize that there will be a big diversity of ants from each of the elementary schools.



Wantagh Elementary



Mandalay Elementary



Forest Lake Elementary

Materials and Methods

Ants were collected from different locations around the Wantagh Elementary Schools (Forest Lake Elementary, Mandalay Elementary, and Wantagh Elementary) and nearby outdoor places. We searched near sidewalks, grass, pavement cracks, trees, and other locations where ants were most commonly found. Sugar and small cups were used to attract and collect the ants. After this collection, the ants were put into labeled tubes and frozen to preserve their DNA. To identify these ants, we first observed their physical characteristics using tools to find an organism including iNaturalist. Since many ants looked similar, DNA barcoding was used for more accurate identification. DNA was extracted using chelex from Cold Spring Harbor Laboratory. The COI gene was amplified using PCR and then sequenced for each sample. The DNA sequences were compared using DNA Subway to identify species, and determined similarities between and within species. We used the Nucleotide Basic Local Alignment Search Tool (BLASTn), in order to find the exact type of ants that were used in this project. Then, we used a Multiple Sequence Comparison by Log-Expectation (MUSCLE) which compared the ants that we sequenced in relation with the ants that we had found from the BLASTn process. Finally, we created a PHYLogeny Inference Package (PHYLP), which provided the relationships among these ants.

Figure 1 - *Tetramorium caespitum*

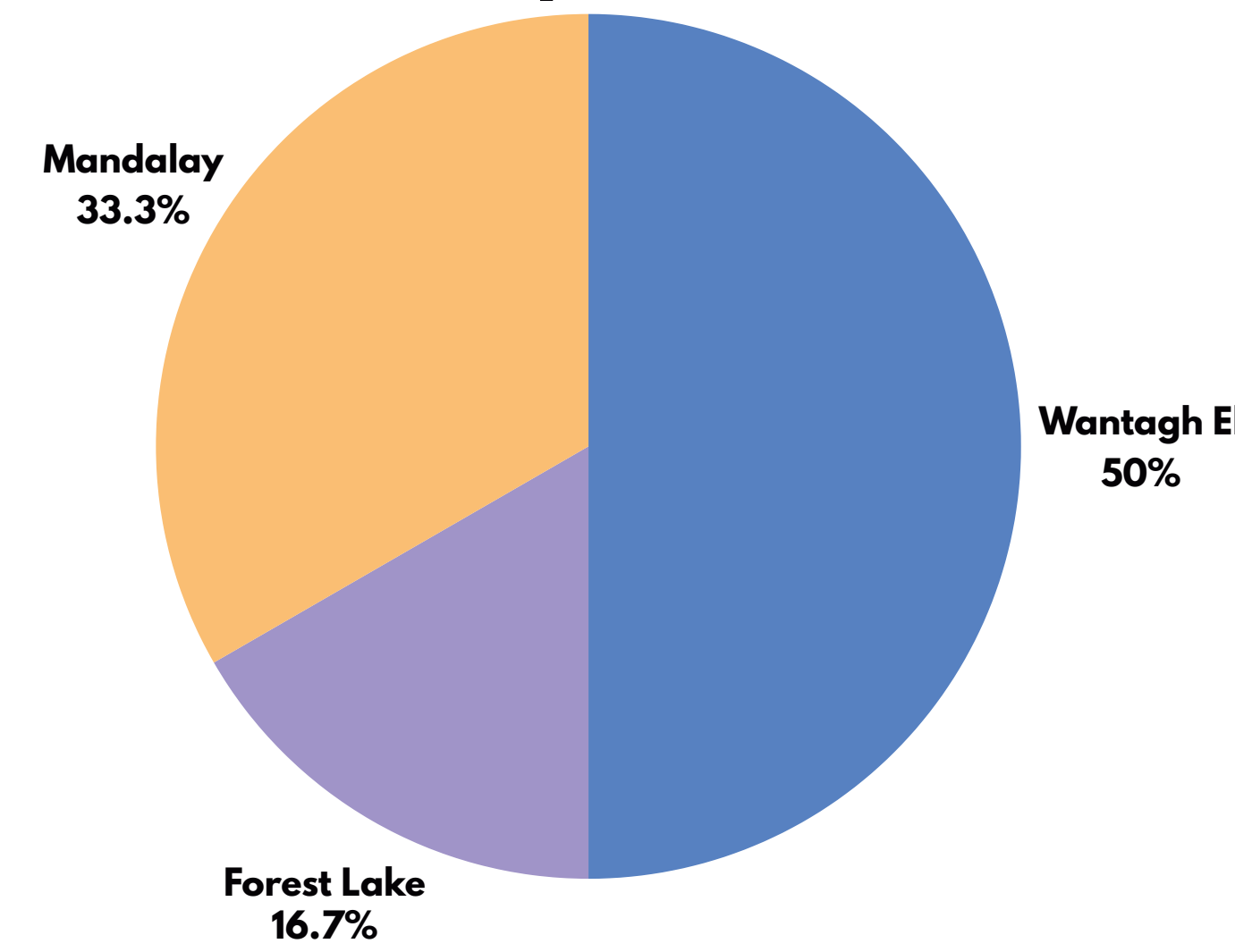


Figure 2 - *Lasius neoniger*

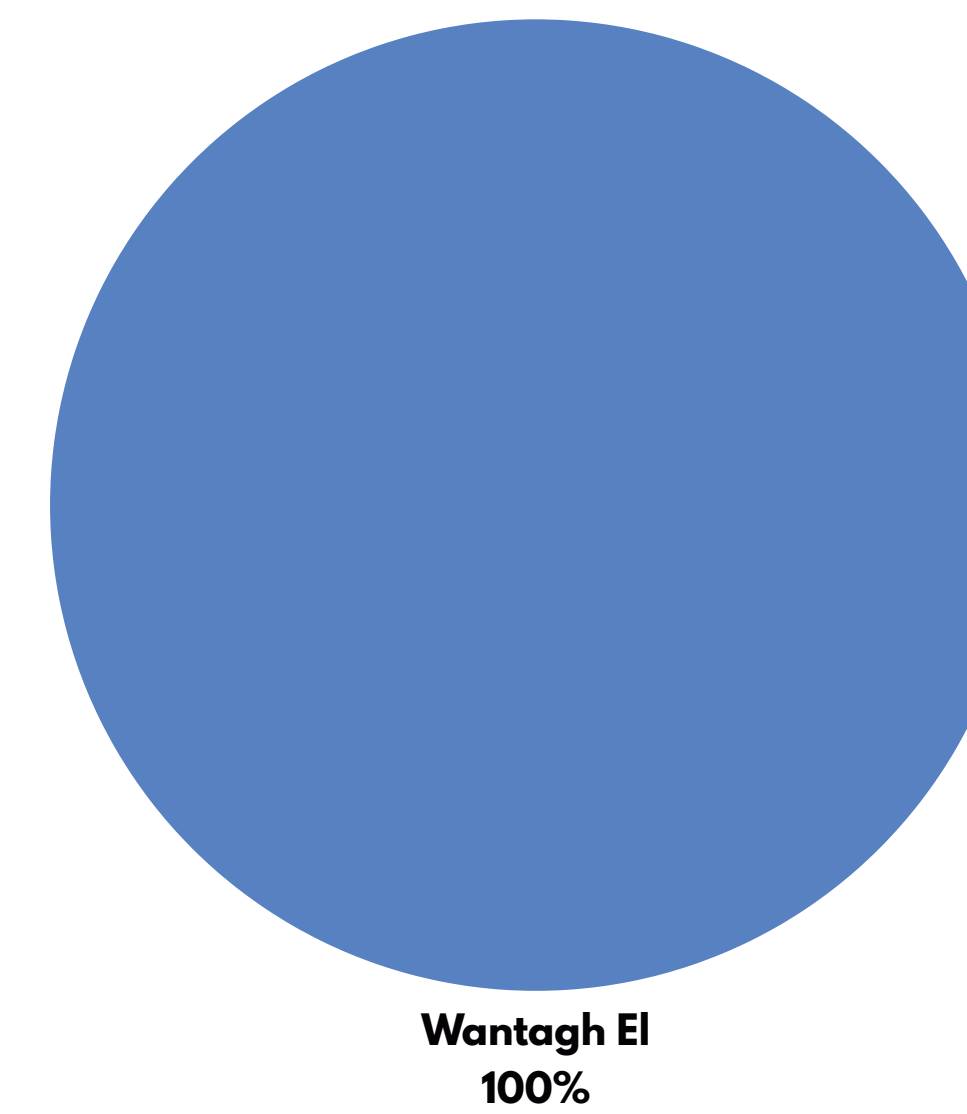


Figure 3 - *Prenolepis imparis*

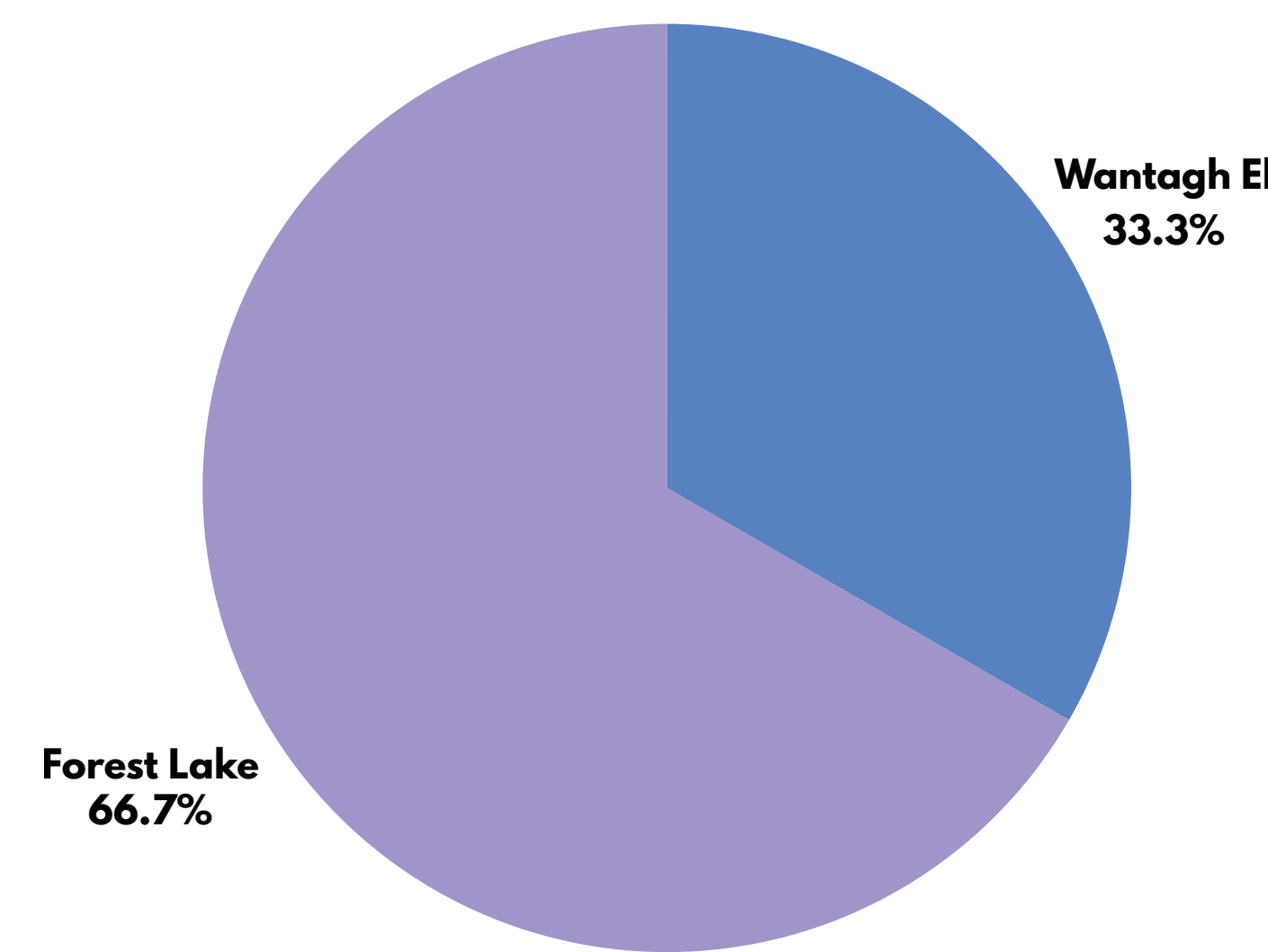
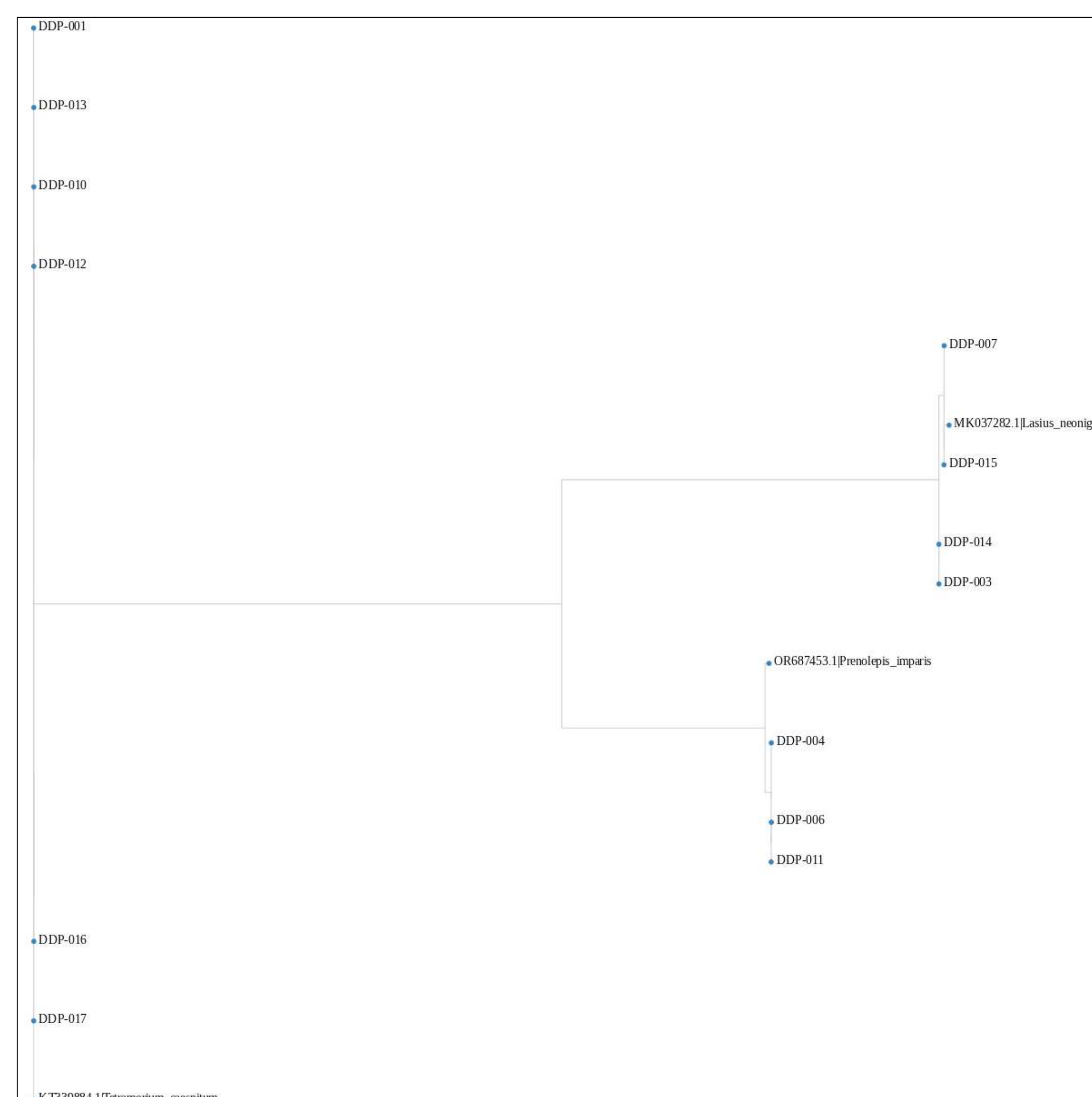


Figure 4 - Phylogenetic Trees with MUSCLE Data



Results



DNA barcoding showed that only three ant species were present at elementary schools in Wantagh: *Tetramorium caespitum*, *Lasius neoniger*, and *Prenolepis imparis*. However, they were not evenly represented at all three schools. First, 50% of *T. caespitum* was found at Wantagh Elementary, meanwhile 33.3% was found at Mandalay School and 16.7% at Forest Lake (Figure 1). This shows that the *T. caespitum* was more common among the schools that we collected from. On the other hand, the *L. neoniger* was only identified at Wantagh Elementary (Figure 2). Otherwise, 66.7% of the *P. imparis* came from Forest Lake Elementary and 33.3% came from Wantagh Elementary (Figure 3). Wantagh El had all three species of ants, Forest Lake only showed two, and Mandalay had only one. Finally, the phylogenetic tree showed similarities between the DNA sequences of the collected ants (Figure 4). It demonstrates how *T. caespitum* was the oldest ant, which *L. neoniger* and *P. imparis* stem from.

Discussion

The DNA barcoding process showed that some ant species were found at multiple schools instead of being completely different at each location. The species *T. caespitum*, *L. neoniger*, and *P. imparis* appeared in different collection sites, but most were from Wantagh Elementary. Even though the environments around each school were different, many ants were able to survive in similar suburban conditions across Wantagh. It is very surprising how these environments had these ants living there and the diversity they had, since of the people that went to school and played sports there. The project also showed that DNA barcoding was helpful because many ants looked physically similar and were difficult to identify by appearance alone. By examining the COI gene sequences, we were able to identify the species more accurately and better understand ant biodiversity in the different school environments. The MUSCLE data showed us that the ants we found had aligned with and were about exact to the ants that were found from the BLASTn. The phylogenetic tree showed that the *L. neoniger* and *P. imparis* were more closely connected genetically, meanwhile the *T. Caespitum* was not.

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