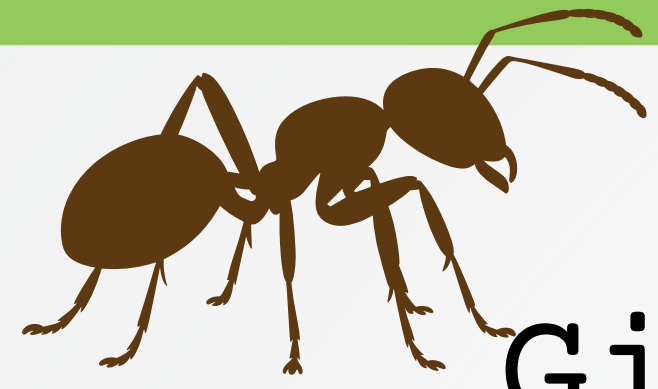




Contrasting Ant Diversity in Natural and Suburban Areas



Gianna Fitzpatrick, Jimmy Tobin, Casey Clark
Wantagh High School

Abstract

Our team was interested in the disparities between the DNA sequences of wild and suburban ant species. 10 ant samples were collected from the Twin Lakes Preserve in Wantagh, and 10 more were collected from a suburban backyard in Wantagh. In order to test these samples, we conducted a study in which we isolated the DNA of ants, amplified it, confirmed amplification through gel electrophoresis, and then sequenced the COI gene in order to identify its species. After sequencing, we used that information to compare the species diversity of the area as well as the how closely related individual ants were. Out of the 20 samples our team collected, 4 were successfully sequenced. Because the four samples were all collected from the suburban backyard, comparison between suburban and wild ants was not possible. All four samples were found to be *Tetramorium caespitum* ants. While our goal for comparison was not possible, we did learn important information about the species diversity in areas that are affected by human manicuring and building.

Introduction

Our team was interested in finding the disparities between ant biodiversity in suburban and wooded areas, and more specifically, between a private suburban backyard and Twin Lakes Preserve, a woodland area located in Wantagh, NY. Our hypothesis was that there would be large variance, with more biodiversity in woodland areas. The most major reason as to why we predicted a variance of ants between habitats is that ant nests have distinctive mounds, and in human-occupied areas that receive lots of mowing, these mounds can be disturbed, causing certain ants to feel threatened enough to relocate, perhaps to less tended to areas like the woods (Saeed, 2024). Contrarily, Twin Lakes has natural, native plants growing around two freshwater lakes, with dry, dead timber in some open areas as well as more tree-dense areas. However, both environments have clear similarities too. The natural predators of ants in the environments are roughly the same, where birds such as ravens and sparrows who dine on ants ("28 animals that eat ants: Natural ant predators (Mammals, birds, insects)"). Thus, this left us to put our hypothesis to the test ourselves.

Materials and Methods

We began by collecting the ants through luring them into a solo cup that had cookies in it. Once collected, we preemptively assumed the ant species through using the I-Naturalist App. In order to test our hypotheses, we conducted a study in which we isolated the DNA of 20 ants by grinding them into fine powder and centrifuging them in a Chelex solution. We then amplified the COI gene through PCR, confirmed this amplification through gel electrophoresis, and then sent the DNA to be sequenced at an external laboratory (Cold Spring Harbor) in order to identify its species on DNA Subway and thus analyze it and its relation to other local species. MUSCLE sequencing was performed, and the PHYLIP NJ tool was used to create a phylogenetic tree including our samples.

Results

Out of the 20 samples our team collected, only 4 were successfully sequenced. All four samples were found to be *Tetramorium caespitum* ants. Because the four samples were all collected from the suburban backyard, comparison between suburban and wild ants was not possible. Of our samples, DCP-015 and DCP-018 were most closely related, as were DCP-016 and DCP-017. All of our samples were equally evolutionarily related to the database *T. caespitum* and showed no differences from the database sample in the MUSCLE alignment.

Results Figures

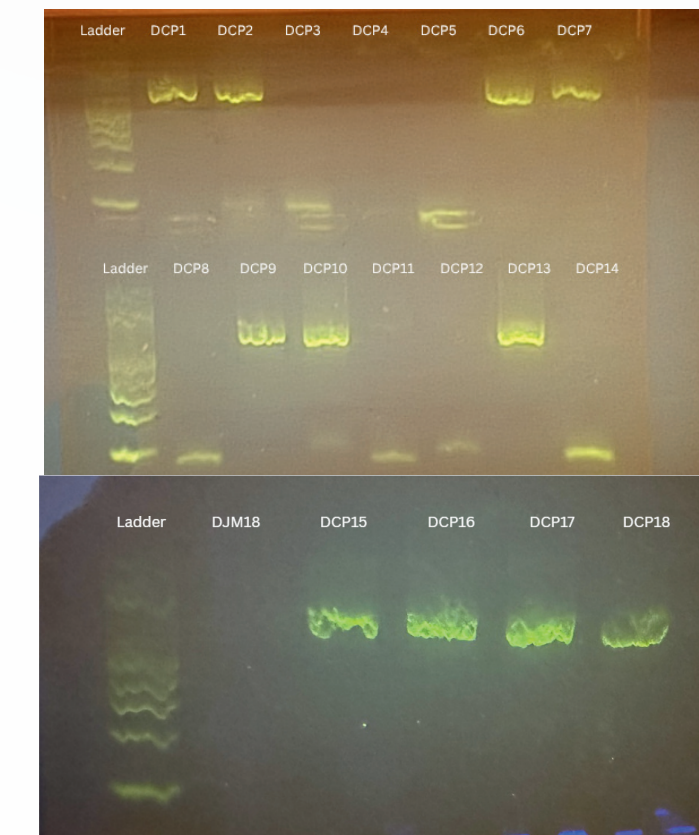


Figure 1: Gel electrophoresis results

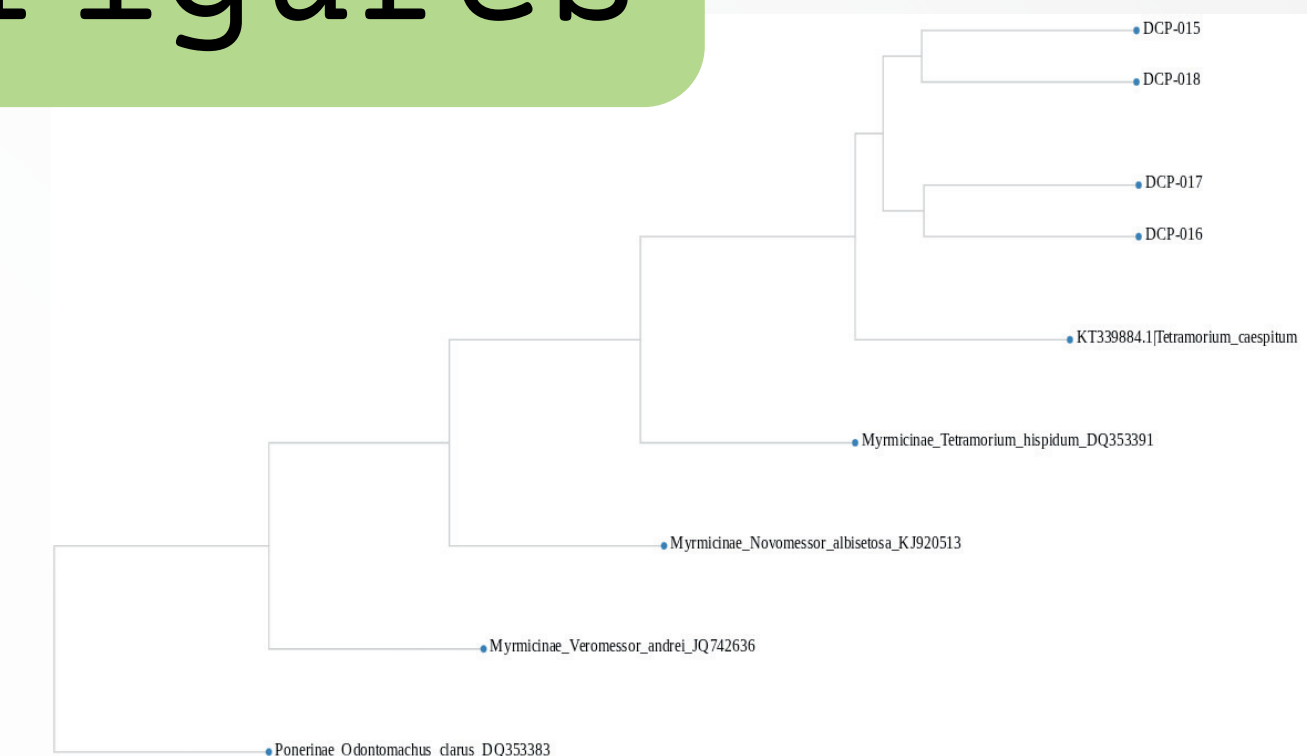


Figure 3: Phylogenetic tree

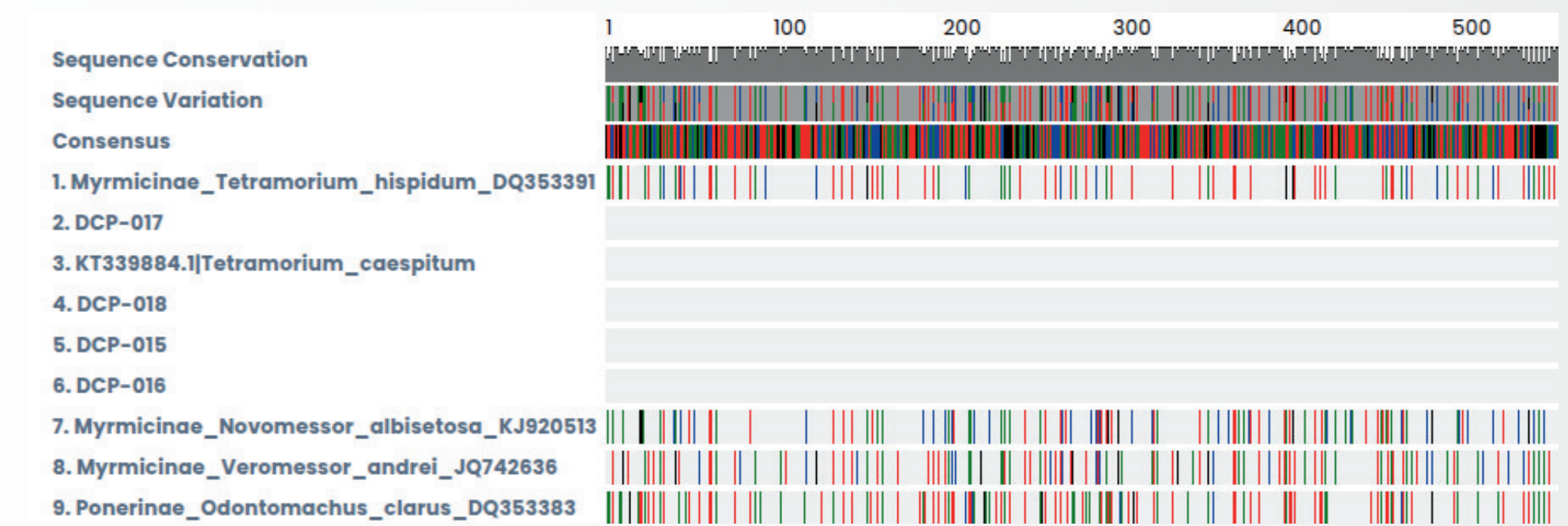


Figure 2: MUSCLE results

Discussion

Despite the fact that only four of our samples were successfully sequenced and they were all in the same location group, we still were able to derive insightful information from this study. We were able to reaffirm prior findings about ants in suburban areas having decreased species diversity, as well as build off of research like that of Hao Brooks, a researcher educated by the University of Tennessee at Chattanooga, and their colleagues, who state that generalist ant species present themselves in larger numbers when an urbanized environment is present (Brooks, et al). New aspects we found though, however, was that full-scale urbanization is not required for generalist species to be encouraged to settle and that only small-scale levels of manicuring/building are necessary to force this mostly homogenous population to develop. However, our study was clearly limited, mostly by the fact that we did not have adequate amounts of sequences samples to compare. In the future, researchers should not only take more samples in order to minimize risk, but select larger ants to isolate DNA from to potentially make sequencing easier.

References | Acknowledgements

28 animals that eat ants: Natural ant predators (Mammals, birds, insects)» the buginator. (2022, January 13). <https://thebuginator.com/animals-that-eat-ants/>
Abi, S. (2024, November 8). Ants in my Plants! Ants of New York City. (2025, July 20). Ant Wiki. https://www.antwiki.org/wiki/Ants_of_New_York_City#
Brooks, H. B., Guzman-Hernandez, I., & Beasley, D. E. (2022). Ant biodiversity in a temperate urban environment. *Bios*, 93(4), 117-123. <https://www.jstor.org/stable/48742453>
Kukla, M. (n.d.). *Tetramorium caespitum*. AntWiki. Retrieved May 26, 2026, from https://www.antwiki.org/wiki/Tetramorium_caespitum

Cold Spring Harbor Laboratory
Casey Clark, Wantagh High School



SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
Supported by the National Institutes of Health

