



Effect of Human Activity Upon Ant Diversity at The Stony Brook School

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Abstract

Ants are considered a crucial species to ecosystem stability due to their ability to decompose organic waste and supply nutrients to plants. To examine the effects of human activity on ant biodiversity, ant samples were collected from two sites near the dining hall and two sites in groves at the Stony Brook School. The authors anticipated that areas near the dining hall are characterized by higher biodiversity in the species of ants compared to the area in a more natural setting due to their attraction to the smell of food, although no significant relationship between human activity and species richness could be established.

Introduction

Ants are social insects of the Formicidae family, with an estimated number of over 20 quadrillion individuals, with over 12,000 known species [1]. Ants are involved in a variety of processes with ecological significance, including aeration of soil, dispersion of seeds, and decomposition of organic waste. These ecological processes help to maintain the ecosystem in balance [2]. As such, ants may serve as an indicator of ecosystem status, resulting in great scientific interest in research on ant biodiversity in ecosystems. The purpose of this research is to assess the effects of human activity on ant biodiversity by comparing ant biodiversity in pre-determined regions: two locations in close proximity to the Kanas dining hall, and two locations among clusters of trees with minimal human activity.

Materials and Methods

Sample Collection & Preparation

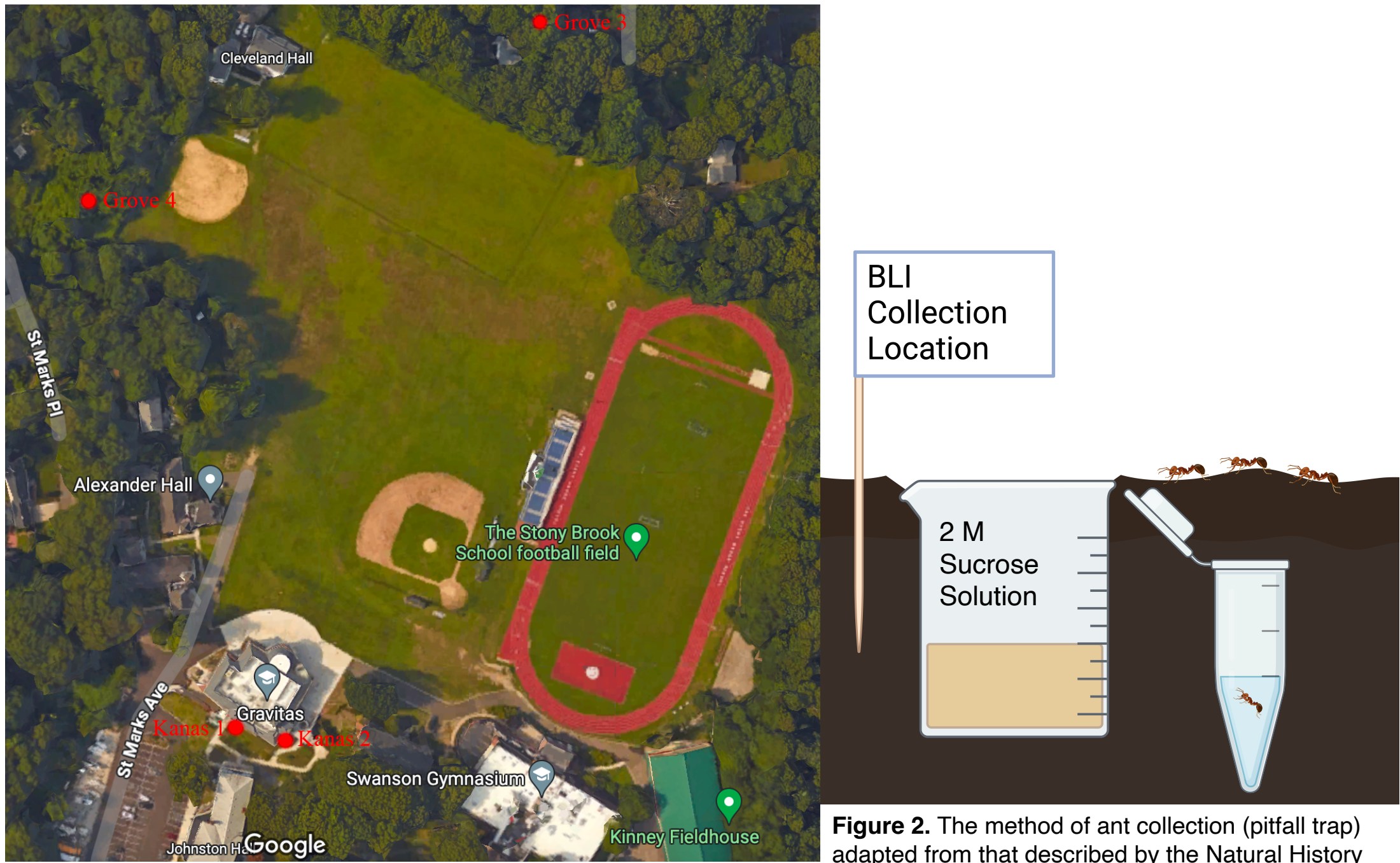


Figure 1. A map containing the locations of each collection location on the Stony Brook School campus.

Figure 2. The method of ant collection (pitfall trap) adapted from that described by the Natural History Museum. Samples were stored in ethanol. Created with Biorender.com.

DNA Isolation

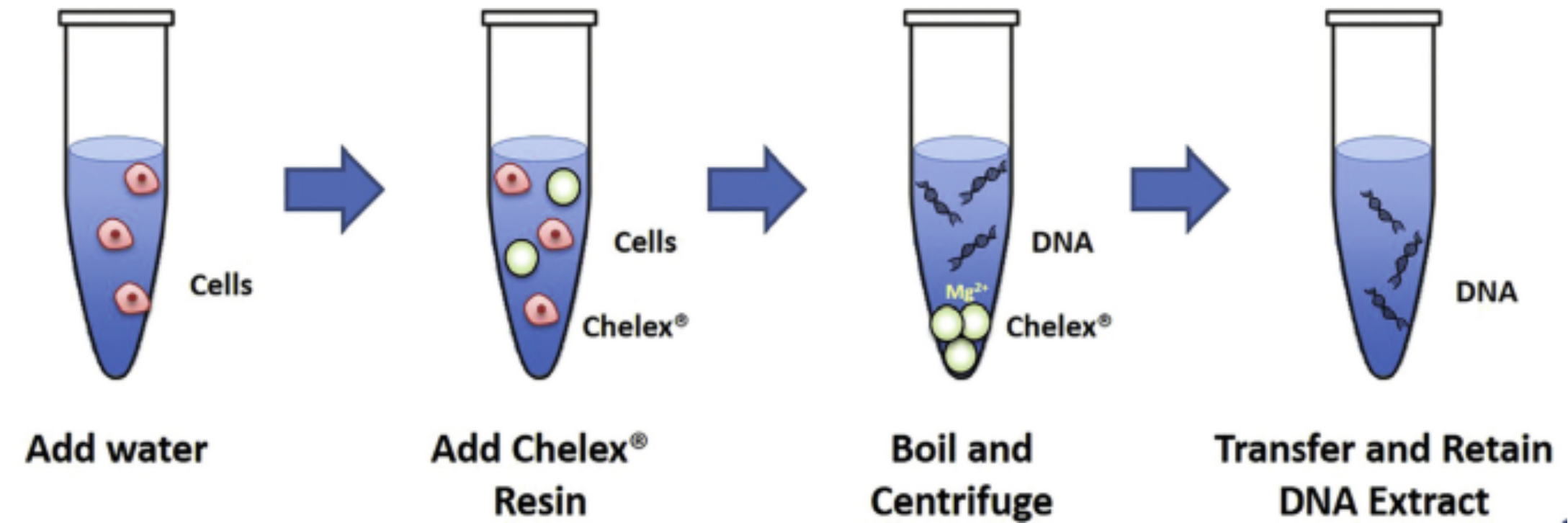


Figure 3. Chelex resin was used for DNA isolation, following standard protocol as described by the Cold Spring Harbor Laboratory DNA Learning Center "Using DNA Barcodes to Identify and Classify Living Things" booklet. Image from "DNA Isolation by Chelex Method" (Gautam).

Gene Amplification & Gel Electrophoresis

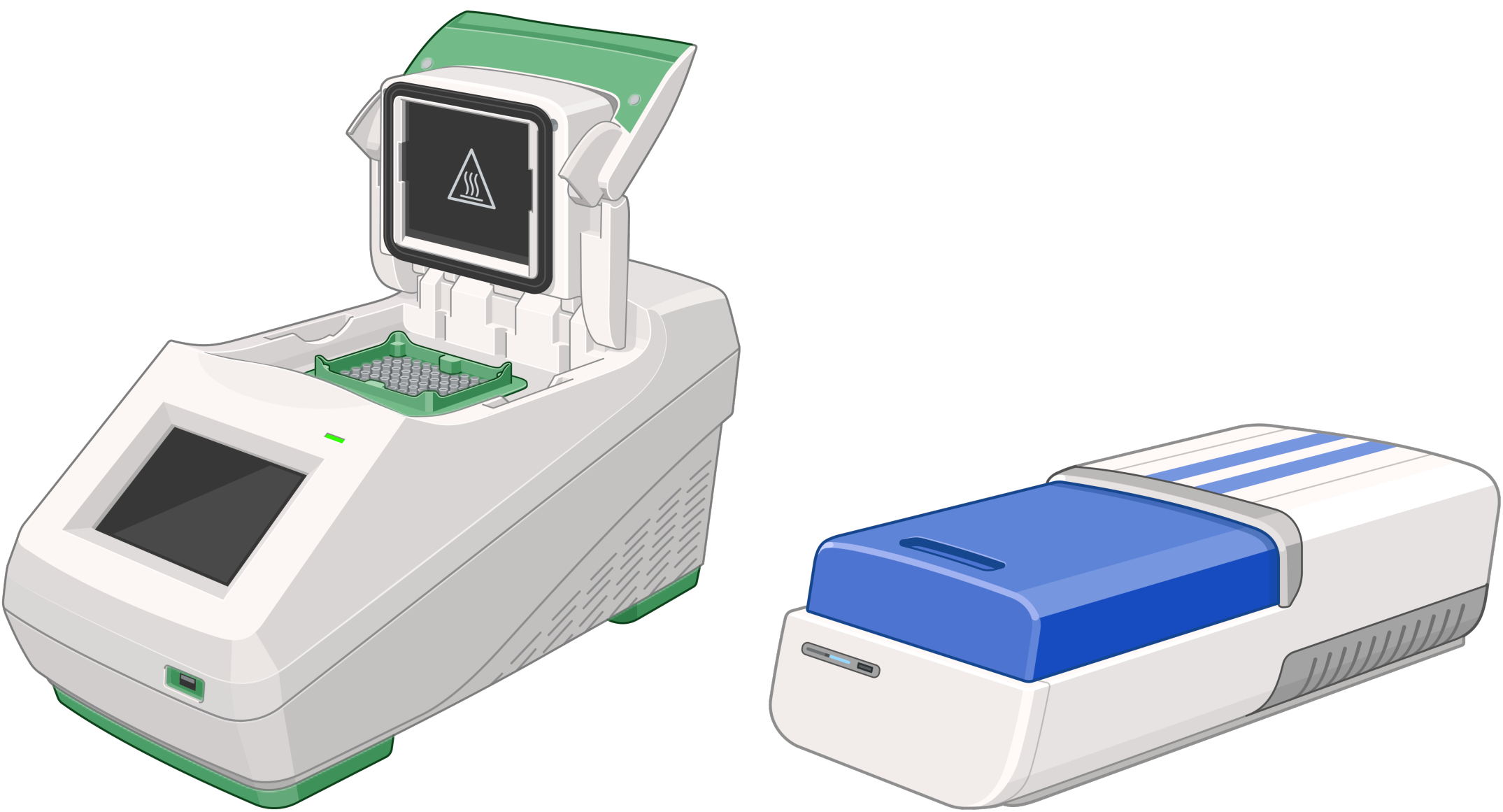
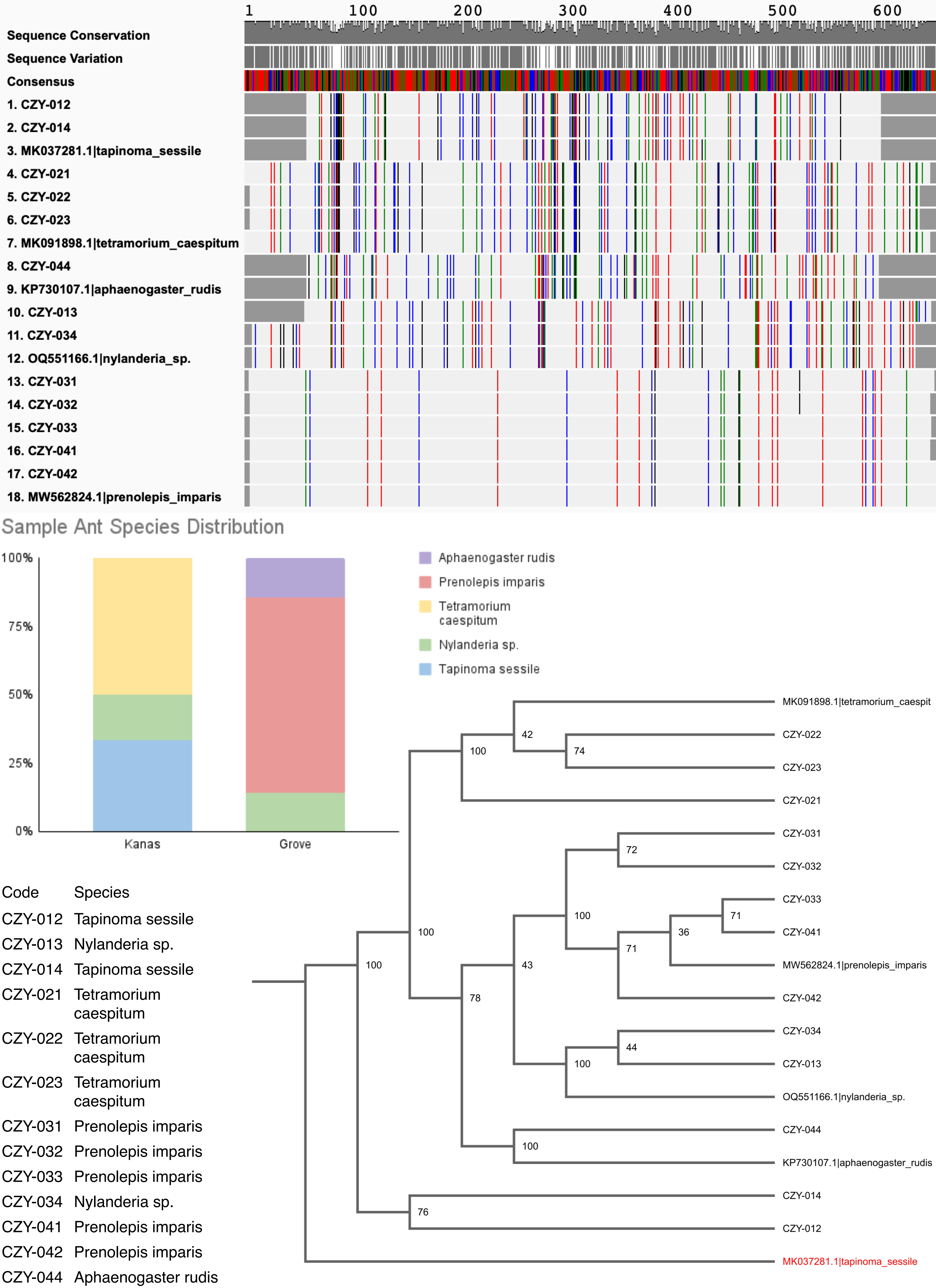


Figure 4. The target gene was amplified through PCR using a BioRad thermocycler, then ran through a gel. Created with Biorender.com.

Results



Discussion and Future Directions

Due to insufficient sample size, no conclusion may be made regarding the difference in ant biodiversity between areas with and without human activity. However, the presence of the same ant species within each area (Kanas 1 - *Tapinoma sessile*, Kanas 2 - *Tetramorium caespitum*, Grove 1 - *Prenolepis imparis*, Grove 2 - *Prenolepis imparis*) suggests that certain collection locations were predominantly occupied by a colony of ants, indicating that to fully assess ant biodiversity, there should be more collection locations.

References

1. Ants, facts and information. (2011, May 10). Animals. <https://www.nationalgeographic.com/animals/invertebrates/facts/ants>
2. Ants Are Ecologically Beneficial. (n.d.). Yard and Garden. Retrieved May 26, 2024, from <https://yardandgarden.extension.iastate.edu/encyclopedia/ants-are-ecologically-beneficial>
3. How to make a pitfall trap to catch insects and other minibeasts. (n.d.). Retrieved May 26, 2024, from <https://www.nhm.ac.uk/discover/how-to-make-pitfall-trap-to-catch-insects.html>
4. Gautam, A. (2022). DNA Isolation by Chelex Method. In A. Gautam (Ed.), DNA and RNA Isolation Techniques for Non-Experts (pp. 79–84). Springer International Publishing. https://doi.org/10.1007/978-3-030-94230-4_10

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