The Effect of Runoff on Ant Biodiversity

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Abstract

A hill's runoff might change the ant biodiversity depending on the ants' location on the hill, for it may increase or decrease the ant population. The goal was to discover how the hill's runoff affects the ant population on the two locations on the hill. In order to do so, we needed to figure out the biodiversity differences by collecting the ants on different parts of the hill. We created traps out of containers and with bait to lure and trap them. We expected to find collected water at the bottom of the hill, along with more ant biodiversity than the top, for we predict that the environmental conditions are better where the water collects.

Introduction

Ants…

- **Till soil, reduce invasive species, disperse seeds, and more.**
- **They're classified as formicidae**
- **Live everywhere except the arctic biome**
- **Can be found in or on the ground, mounds, leaf litter, or decaying plants**

Using the researched information, we can conclude that ants are an incredible and an important species to exist and should continue to be kept this way. We choose this topic because not a lot of studies have been done on ants so our team decided to help and provide additional information with the studies we've done on this topic of How the runoff along a sloped hill affects the biodiversity of ants?

Figure 4 ant sample 13

Figure 5 ant sample 10

Results

The results of our taxonomic identification showed a difference between the two locations on the hill.

In our research, we collected twenty samples of ants but lost one before taxonomically identifying them. In total, nineteen ant specimens were taxonomically identified and nine samples genetically identified using gel electrophoresis. The ants were incorrectly taxonomically identified as being either *Aphaenogaster rudis*, *Dolichoderus taschenbergi*, or *Tapinoma sessile*. However, all ants, despite their original location, were the same subspecies, *Prenolepis imparis*, based on their genetic composition. The chart to the right shows the difference between the taxonomic species to the genetically identified species, the common name, and their original location. The metadata table below shows the data results from our soil composition findings.

Metadata Results

Sample # and slope	pH	P	K	N
(Top) #1	6	0	2	1
(Top) #2	6	0	2	0
(Bottom) #1	6	0	2	1
(Bottom) #2	5.5	0	3	0

Methods and Materials

Collected ants by:

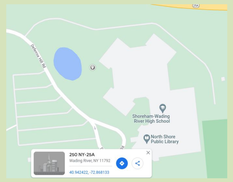
- **Direct forceps use of picking ants from location**
- **Making pitfall traps with different baits like peanut butter, and honey.**

After:

- **We then preserved them in a freezer until needed for identification methods**

Metadata:

- **We collected the composition of four soil samples and found no difference**



- **Ant samples were removed from freezer to a clean microcentrifuge tube, and with the aid of a lysis solution, ground to break up the exoskeleton and tissues, releasing the DNA.**
- **Samples were then spun in a microcentrifuge to remove cellular debris, and supernatant was transferred to a clean tube.**
- **Silica resin was added to bind the DNA, washed twice to remove any remaining impurities, then released from the silica resin with the addition of sterile water.**
- **Purified DNA was then amplified using PCR in a region of the COI (cytochrome C Oxidase subunit I) gene.**
- **After PCR products were analyzed by gel electrophoresis, the samples were sequenced in the COI region, and sequencing results were compared to known species with close relation to the species identified by taxonomic key.**

#	Taxonomic Species	Common Name	Genetic Species	Common Name	Hill location
1	Aphaenogaster rudis	Funnel Ants	Prenolepis imparis	Small honey ant	Bottom
2	Dolichoderus taschenbergi	Unknown	Unknown	Unknown	Bottom
3	Aphaenogaster rudis	Funnel Ants	Prenolepis imparis	Small honey ant	Bottom
4	Aphaenogaster rudis	Funnel Ants	Prenolepis imparis	Small honey ant	Bottom
5	Dolichoderus taschenbergi	Unknown	Prenolepis imparis	Small honey ant	Bottom
6	Aphaenogaster rudis	Funnel Ants	Unknown	Unknown	Bottom
7	Aphaenogaster rudis	Funnel Ants	Unknown	Unknown	Bottom
8	Aphaenogaster rudis	Funnel Ants	Prenolepis imparis	Small honey ant	Bottom
9	Aphaenogaster rudis	Funnel Ants	Unknown	Unknown	Bottom
10	Aphaenogaster rudis	Funnel Ants	Unknown	Unknown	Bottom
11	tapinoma sessile	Odorous House Ant	Unknown	Unknown	Top
12	tapinoma sessile	Odorous House Ant	Unknown	Unknown	Top
13	tapinoma sessile	Odorous House Ant	Unknown	Unknown	Top
14	tapinoma sessile	Odorous House Ant	Unknown	Unknown	Top
15	Dolichoderus taschenbergi	Unknown	Unknown	Unknown	Top
16	Dolichoderus taschenbergi	Unknown	Unknown	Unknown	Top
17	tapinoma sessile	Odorous House Ant	Prenolepis imparis	Small honey ant	Top
18	tapinoma sessile	Odorous House Ant	Prenolepis imparis	Small honey ant	Top
19	Temnothorax longispinosus	Unknown	Prenolepis imparis	Small honey ant	Top
20	tapinoma sessile	Odorous House Ant	Prenolepis imparis	Small honey ant	Top

Figure 3. ant sample

Figure 6 ant sample 20

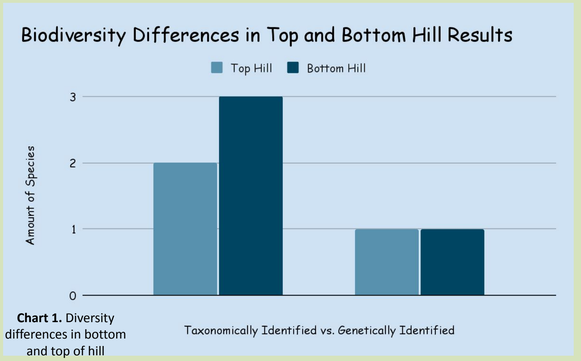


Chart 1. Diversity differences in bottom and top of hill

Discussion

1. We found more ant species at the bottom of the hill, I think there is less at the top because when it rains the runoff strengthens the species' environment
2. We were able to easily able to identify all of the ant species because the ants' color and location helped us identify the ants easier on its own
3. The most difficult part of the process was handling the ants since they were very fragile and easy to misplace.
4. The data's still not entirely clear because the found metadata doesn't fully prove our answer.
5. Metadata showed no soil differences between bottom and top of the hill

Conclusions

We came to the conclusion that the bottom of the hill had no difference in biodiversity the top or bottom. The top and bottom had the one species known as the small honey ant. We were incorrect on our taxonomic identification based on the genetic identification of the ants.

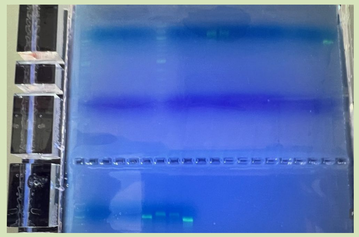


Figure 1. Ant gel ladders.

Figure 2. ant sample 1

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