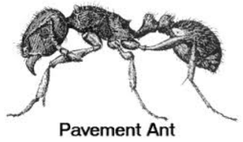
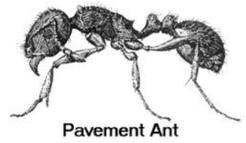




Bioindicators in Ants Colonies

By Raj Ghayalod and Evan Paulson




Question: An genetic surveys into ants on the east end of Long Island provide us with a superior understanding of the dispersion and species richness of ant colonies throughout Long Island. Could this data be of use as bio indicators while also gaining insight in the myrmecological biodiversity of ants on Long Island?

Abstract:
Can genetic surveys into ants on the east end of Long Island provide us with a superior understanding of the dispersion and species richness of ant colonies throughout Long Island.Ants promote cycles like the carbon and nitrogen cycles by consuming decaying organic matter. In North America several low growing flowers in the genus' Diamorpha,Paronychia, Polygonum is partly pollinated by ants. Through the ants eating nectar and other substances from the flower and collecting pollen on the hairs of their bodies For these reasons and many more it would stand to reason a deeper understanding of ants would be beneficial for the incite it would provide for both nature of super organisms, a structure where many multicellular organisms act like cells to keep the structure maintained, and also the wide scale effects ants have on the environment around them.

Hypothesis: Through research of the genetic composition of ants within long island, we hope to gain a superior understanding of the patterns of diversion ant colonies. Ant colonies have a positive effect on the environment through removal of waste and organic decomposition. Our data can be used as a form of bio indicator for other researchers trying to apply these capabilities.

Introduction:

Throughout the contiguous United States ants serve many important ecological functions such as pollination, continuation of several important different cycles, predation on many common pest and non-pest insect species, as well prolonged mutualism with many different insect species. Ants promote cycles like the carbon and nitrogen cycles by consuming decaying organic matter. In North America several low growing flowers in the genus' Diamorpha, Paronychia, Polygonum is partly pollinated by ants. Through the ants eating nectar and other substances from the flower and collecting pollen on the hairs of their bodies.

Despite these important ecological functions, ants also are interesting in non-functional ways. Ants, being the only super organism outside of humans to achieve near cosmopolitan biological status, also being the only known super organism, which goes to war and creates vast empires or mega colonies, multiple interconnected colonies with different queens that cooperate. Many different ants have developed a mutualistic relationship with aphids similar to what humans have with milk cows. Ants groom and protect herds of aphids in exchange the aphids produce honeydew a sweet sugar filled excretion that the ants eat. For these reasons and many more it would stand to reason a deeper understanding of ants would be beneficial for the incite it would provide for both nature of super organisms, a structure where many multicellular organisms act like cells to keep the structure maintained, and also the wide scale effects ants have on the environment around them.

Methods:

Construction of the trap (DNA barcoding 101 Method)

Collect water bottles of uniform volume. This project used Gatorade bottles. Drill hole on the bottom of the water bottles. Cut the bottle in half invert then rejoin the halves. Place dry, brown sugared oatmeal into the interior of the bottom half of the bottle. Tape the two halves together and make sure it's sturdy. Once rejoined and sturdy

Placing the trap (DNA barcoding 101 Method)

Take an ant trap to any non developed area. The wooded areas surrounding residential homes and deer trails were used in this project. Look around in a 10 foot diameter. Pick an area with loose sediment that is at least 7-8 feet near an ant hill or similar structure. Submerge the trap ⅔'s way into the sediment. Leave it there for 48 hours. Remove the trap from the ground

Examining of the Ants (DNA barcoding 101 Method)

Using a dissecting microscope with a phone harness detailed photos of ants were taken in the following steps. Place a single ant onto a petri dish. Place the dish under the microscope. Put the IPhone to the camera app. Focus the microscope. Once focused use the magnify the phone to gain greater detail. Take pictures of the ant's top, bottom, head, and abdomen. Now extract a hind leg from the ant with forceps. Place the extracted hind leg into a separate container

Isolating DNA from the Ants (DNA barcoding 101 Method)

Add specimen tissue sample into a tube. Add lysis solution into the specimen tissue tube. Grind the mixture. Place the solution into a incubator at 65 Celsius. Place this solution into a centrifuge for 1 minute. Transfer supernatant to fresh tube. Add silica resin. Mix. Incubate for 5 minutes at 57 Celsius. Place into centrifuge for 30 seconds. Remove supernatant. Add wash buffer. Vortex it using your hand. Place it into the centrifuge for 30 seconds. Remove Supernatant. Add wash buffer. Vortex it using your hand. Place into a centrifuge for 30 seconds. Remove the remaining supernatant. Add dH2O. Mix by pipetting in and out. Place incubator for 5 minutes in 57 Celsius. Place in Centrifuge for 30 seconds. Transfer supernatant to fresh tube. Store at -20 Celsius

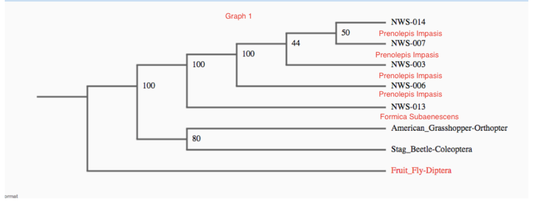
Amplify DNA Of Ants by PCR (DNA barcoding 101 Method)

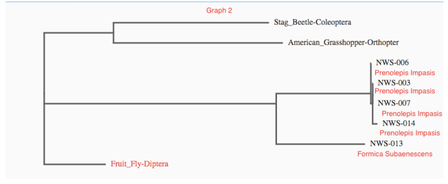
Add a primer mix (COI primers (LCO1490/ HC02198) to a separate tube. Take out supernatant from storage. Use a pipet to extract the DNA. Place the DNA into the primer mix. Add mineral oil (if necessary). Amplify the DNA in a thermal cycler. Store the solution in -20 Celsius

Analyzing PCR Ant Products (DNA barcoding 101 Method)

Prepare PCR sample with loading buffer. Load the amplified ant solution into the loading well. Use a DNA ladder to compare your sample to when you run the gel. Run the gel. Visualize the gel, using a fluorescent light. Take digital pictures

Results:





Discussion: The results found within are significantly similar to each. This shows that there is a meaningful genetic link between the samples we collected and other local species. The outlier in our data (NWS-013) is interesting because although the collection methods were the same the shear diversity of different ants and the large number of colonies caused our outlier. This was not expected as we were collecting in the same area.

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