Barcode Long Island

Wood boring beetles prevalence and diversity in different enviroments on Long Island

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Abstract

Within nature, beetles can be found in rotting wood or plants, carrion, fungi, and feces. There are many species of wood-boring beetles that live in the Northeastern region of America and kill trees. Our goal was to observe how the prevalence of wood-boring beetles varies between our Stony Brook and Southampton collection sites and how the different environments of the collection sites affect the biodiversity of beetles. We collected the beetles by setting up Lindgren funnel traps, and then assessed the biodiversity of beetles by counting the number of unique beetle species at each site. In the end, our results point to the fact that there are more wood-boring beetles in the deciduous forest site, but due to an insufficient amount of data, we are unable to determine whether the biodiversity of beetles was affected by the different collection environments.

Introduction

Our project focused on wood boring beetles and our research question was whether wood boring beetles were more prevalent and had a lower rate of biodiversity in our Stony Brook School collection sight which was a highly wooded environment considered to be a the deciduous forest, or a house of one of our members from South Hampton, which is in a lowly wooded area. We hypothesized that the Stony Brook School collection site would have a greater ammount of wood-boring beetles as they primary live in wooded areas, but the South Hampton site would have a greater ammount of biodiversity of other types of beetles as the less wooded areas do not face the harmful effects of the wood-boring beetle. Through the process of sample collection, DNA extraction using the Chelex bead method and barcoding of DNA using DNA subway, we find out the answers to our questions above.

DNA Barcoding is helpful for the disciplines of Ecology, Evolution, and Zoology as it allows the scientific community to classify both known and novel organisms with one or few gene regions. Our project allows the scientific community to receive more barcodes of previously barcoded mosquitoes and allows scientists to track the beetle population and species in different regions of Long Island. Determining whether the beetles we collected were wood-boring or not has major implications for the health of the environments on Long Island, as these beetles infest and feed on trees, boring tunnels through the wood that disrupts the flow of nutrients within the tree. These beetles contribute to tree mortality on a large scale, alter the composition of forests, and reduce habitats available for wildlife. Woodboring beetles can even cause large scale issues like increasin the chance for a forest fire, as once trees die from the beetle, they become large dry objects, which is the perfect fuel for a fire. Understanding the location and ecological impact of these beetles on Long Island is crucial to the preservation of Long Islands natural landscape.

Methods and Materials

Sampling/Collection devices and locations.

Lindgren Funnel Trap:
The Lindgren Funnel Trap is a vertical series of black funnels designed to mimic a tree trunk. It is set up between two trees, near the bushes, baited with diluted 90% ethanol to simulate trees natural odors which will attract beetles.

We collected from 2 main sites:

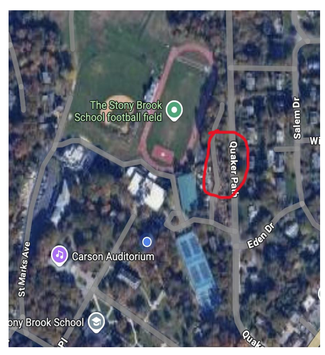
- **Site A:** Chapman Pkwy, Stony Brook, NY 11790 (On School Grounds)
  Latitude: 40°92'26" N
  Longitude: 73°12'97" W

Site B: 37 Millfarm Lane, backyard (John Duggal's property), inland, Southampton
Latitude: 40°54'14" N
Longitude: 72°22'42" W

From Site A, there were 9 samples collected, and from Site B there were 0 samples collected.

Experimentation:
For experimentation, we used **DNA Isolation using the Chelex Bead protocol** (Courtesy of Cold Spring Harbor DNALC/BNL).
After sample collection, **gel electrophoresis chambers with agarose gel** were used to determine which beetle DNA samples were viable to send for sequencing. We had 7 samples viable for sequencing.
We also used **PCR (Polymerase Chain Reaction)** to amplify the DNA extracted from each beetle sample.

Our Collection Sites:
South Hampton (above)
Stony Brook School (below)

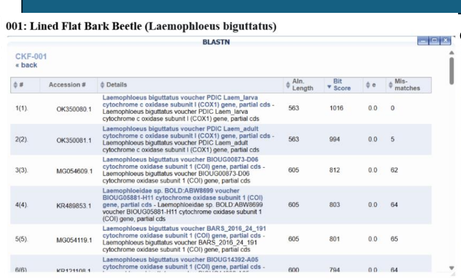


Data processing:

We used the **Blue Line** on the DNA Subway website to analyze and compare the beetle DNA sequences.

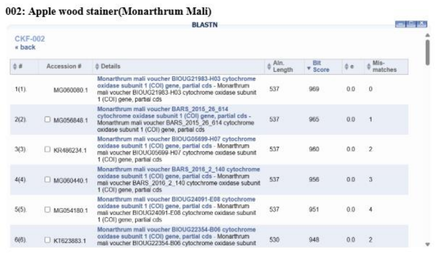
Results

001: Lined Flat Bark Beetle (Laemophloeus biguttatus)

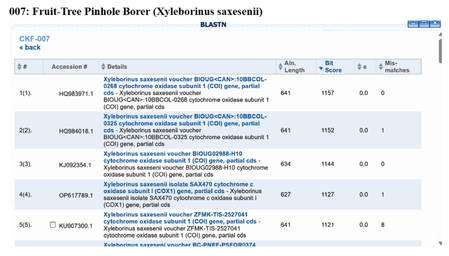


004: Apple Wood Stainer (Monarthrum mali)

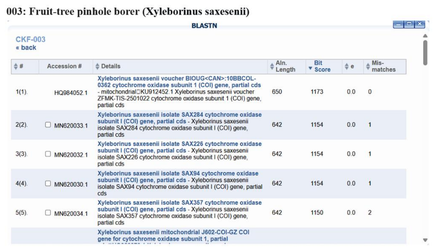
002: Apple wood stainer(Monarthrum Mali)



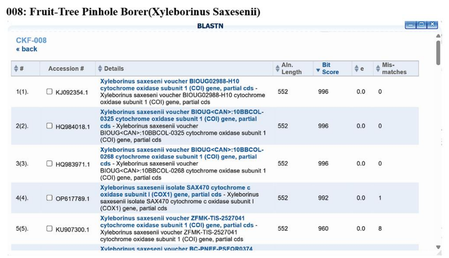
007: Fruit-Tree Pinhole Borer (Xyleborinus saxesenii)



003: Fruit-tree pinhole borer (Xyleborinus saxesenii)

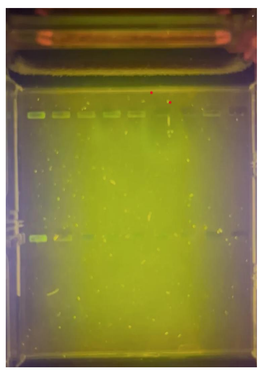


008: Fruit-Tree Pinhole Borer(Xyleborinus Saxesenii)

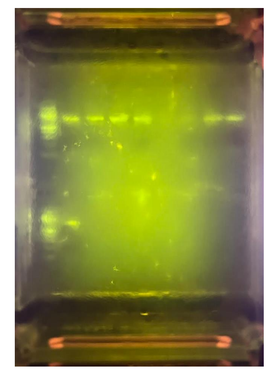


Gel Electrophoresis

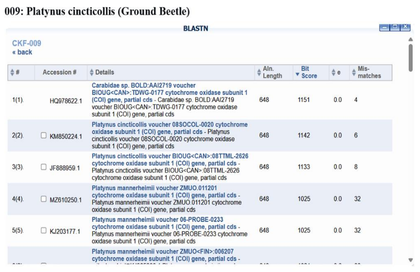
Start



Completed

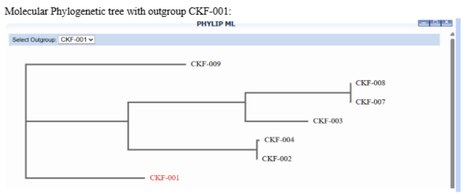


009: Platynus cincticollis (Ground Beetle)

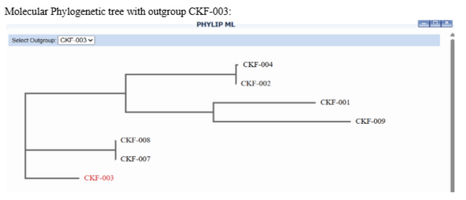


DNA Barcode:

Molecular Phylogenetic tree with outgroup CKF-001:



Molecular Phylogenetic tree with outgroup CKF-003:



References/ Acknowledgements

References:

Thank you to Mrs. Davey for mentoring our project through the review phase of the proposal.
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Thank you parents who allowed us to capture beetles on your property.
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Thank you to all the group members who worked on the project.

Discussion/Future Directions

Discussion: Despite having the same setup in the Southampton and Stony Brook School collection site, there was a far greater amount of wood-boring beetles, and other species of beetles from the Stony Brook School collection site. This was most likely, as stated in the hypothesis, due to the increased presence of trees and plants that wood-boring beetles feed on(pine, eucalyptus, etc.). This being said, even though more wood-boring beetles were found at the Stony Brook School collection site, the biodiversity of the wood-boring beetles in the two sites cannot be determined because our Southampton collection site did not collect any specimens.

Future Direction: In the future, a more ideal time to collect samples would be in the summer or early fall(late May to September) rather than from early to late March. This would increase the sample size in both of our collection sites as those are the primary months for beetle activity. Having a larger sample size would allow for a more accurate comparison of whether or not there is a greater prevalence of wood-boring beetles in the Stony Brook School collection site, and if the biodiversity of the beetles in the Stony Brook School site is different from that of the South Hampton site.