Diversity Among Freshwater Invertebrates at Caumsett State Park

Samantha Cashton and Jaclyn Corbin

Abstract

Macroinvertebrates, and the diversity among them, are vital to ecosystems, as they can create a healthy environment for other organisms. We hypothesized that we would find notable distinctions and great diversity amongst the different invertebrates within the fresh water. We strived to be able to view the biodiversity within the freshwater environment of Caumsett State Park. An essential tool to collecting our species was our punnett squares because they made identifying exact locations of our subjects easier. We also planned to use DNA Subway to differentiate our species, but our results showed that we were unsuccessful in using is source. After sending our gels to the laboratory and receiving them back, we discovered that our samples did not produce clear results and we were unable to identify what they were. This haltered our study, as we were only able to see one short forward sequence. Since we were unable to go any further with our study, we decided to step back and analyze what prevented us from success. We concluded that our limited amounts of silica resin could be at fault for this, as it is an integral part of preparing the DNA for sequencing. With sufficient quantities of supplies, we believe we could have had more success while sequencing.

Introduction

We tested to see the diversity of aquatic macroinvertebrates at Caumsett State Park's freshwater pond. Macroinvertebrates are vital to ecosystems, as they can create a healthy environment for other organisms. When there is a lack of invertebrates, environments and ecosystems can be harmed. We are also aware that macroinvertebrates can cause bacterial and parasitic disease, so it is important to know the types of macroinvertebrates in our local ecosystems. According to The Annual Review of Entomology's "The Role of Macroinvertebrates in Stream Ecosystem Function," macroinvertebrates have an influential role in nutrient cycles, decomposition, primary productivity, and translocation of materials

Materials & Methods

Materials: Test Tubes, Soil Kit, Collecting Instruments (Buckets, Scissors, Tweezers), pH Kit, Water Kit, Freezer, Gel Electrophoresis Kit, Various Chemicals to Isolate DNA, Centrifuge, Water Bath, Primers to Separate DNA

Methods: We conducted our research at Caumsett State Park in Suffolk County, New York. The latitude was 40.93342222 North and the longitude was 73.45833333 West. This location is a freshwater marsh area. We collected our samples within this ecosystem. The following steps illustrate our approach throughout this research procedure. We used a 1 meter by 1 meter quadrat to isolate the area within the freshwater marsh that we were collecting our samples from. With permission from Caumsett State Park, we collected 13 samples.

We kept the samples frozen in a freezer until we had received the DNA extraction equipment from Cold Spring Harbor Laboratory. PCR and gel electrophoresis was performed to decide which extractions had succeeded and would be able to be sent out by our mentors for sequencing.

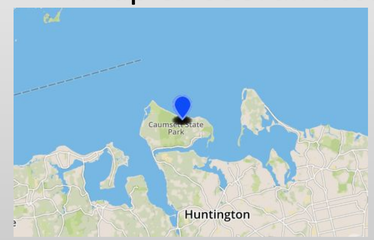
After receiving our sequenced samples from Genewiz, we attempted to use DNA Subway to compare our macroinvertebrate samples with known sequences to identify the samples we collected.

Results

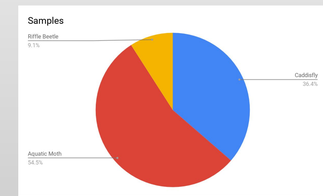
Because none of our samples sequenced well, our only results were based off of a taxonomic key. We used this to conclude that we collected four caddisflies, six aquatic moths, and one riffle beetle.

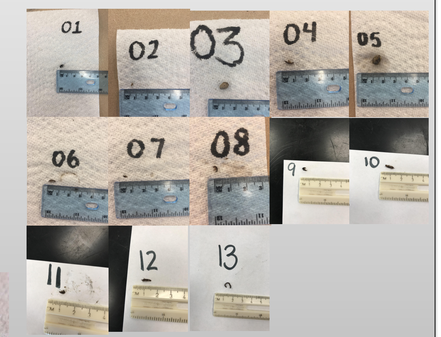
Tables & Figures

Map of Coordinates



Samples





Discussion

The data we collected does not allow us to make any claims about the diversity among freshwater invertebrates on Long Island or even at Caumsett State Park. We could not figure out if our samples aligned with one of MiCorps' categories as we could not identify identify the organisms. While there are many possible reasons for our DNA sequencing failing, including our own human error throughout the preparation and gel electrophoresis processes, we concluded that a major setback that could have contributed to our failure was the lack of silica resin. Silica resin is extremely important in isolating DNA molecules so that PCR can properly occur. Because the silica resin we were supplied with appeared to be expired as it was a powdered texture and was limited in availability, we can't be sure that the DNA sequences were properly isolated. Because our extraction process led to poor results, we had to rely on taxonomic keys, which are less credible compared to Genewiz or DNA Subway; we could make assumptions for species based on physical characteristics, but nothing else.

We do not have enough information to determine the diversity among the populations of these species of freshwater invertebrates, and their impact on the ecosystem. It is likely that there are various notable distinctions between different invertebrate species in the freshwater of Caumsett State Park, however we are not able to elaborate on these differences with the data we collected.

This research could impact the overall field of research by contributing to the work of aquatic macroinvertebrates campaign of the Barcode Long Island project at Cold Spring Harbor. By providing the lab with our data, we are letting them compare our results with the results of others conducting research in the same field.

References

Chadde, J. S. (n.d.). Macroinvertebrates as Bioindicators of Stream Health [Pamphlet].

Metcalfe, J. (1989). Biological water quality assessment of running waters based on macroinvertebrate communities: History and present status in Europe. Environmental Pollution, 60(1-2), 101-139. doi:10.1016/0269-7491(89)90223-6

Wallace, J. (1996). The Role of Macroinvertebrates in Stream Ecosystem Function. Annual Review of Entomology, 41(1), 115-139. doi:10.1146/annurev.ento.41.1.115