An Investigation of the Biodiversity of Aquatic Macroinvertebrates in Garvies Point using DNA Barcoding

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Abstract

Aquatic macroinvertebrates are invertebrate animals that live in the water and are visible to the naked eye. We will be investigating the effects of pollution on the biodiversity of macroinvertebrates in the pond. Our method of collection will be using normal plastic water bottles and collecting the water in the pond. After collecting the water samples in water bottles, we will go through the water and pick out different macroinvertebrates from the water. In order to address our question of water quality we will also be checking the water samples for their salinity levels, pH levels, dissolved oxygen levels. Different species thrive in different conditions and different levels of these factors. We will use DNA barcoding to identify the species of macroinvertebrates we collected and research what type of conditions those species thrive in. Certain species may only thrive in healthy pond environments of optimal pH, dissolved oxygen, whereas other species might thrive in less optimal conditions (Macroinvertebrate Field Guide,2020.) By doing this research after identifying the species, we can determine if Garvies pond is a healthy environment, or unhealthy environment.

Introduction

How does water pollution affect the biodiversity of the aquatic macroinvertebrates living there? aquatic macroinvertebrates are organisms that will spend some or all of their lives in the water. This project is going to help show us the levels of pollution at Garvies Preserve in Glen Cove by the macroinvertebrates that we find. Some aquatic macroinvertebrates like *Oligochaeta* and *Hirudinea* can live in poor water conditions as they are tolerant to pollution, while others like *Ephemeroptera* and *Palinuridae* wouldn't be able to survive in polluted water. We are hoping to find more macroinvertebrates that are intolerant of pollution than those that are tolerant.

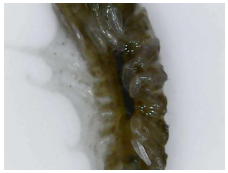
Materials & Methods

We are going to be collecting pond water from Garvies Point in a water bottle and then bring it back to our school after we (hopefully) find a large amount of macroinvertebrates. We will then examine our findings in a petri dish. We will choose 20 macroinvertebrate samples from the water and put each in their own micro test tube. The microtubes will be stored in the freezer until we are able to do DNA barcoding. In DNA barcoding we will be amplifying the COI gene for each of our samples. The COI gene is a part of the mitochondrial DNA and can be used to differentiate between different invertebrates. After the gene is amplified, gel electrophoresis will be used in order to let us know if the extraction was successful or not. If successful, the amplified DNA of each samp,ke will be sent for sequencing and we can then determine the specific species using DNA subway. The pH, salinity, and dissolved oxygen levels of the water will also be tested. To find all of these, we will use pH strips, a conductivity meter and a dissolved oxygen testing kit.

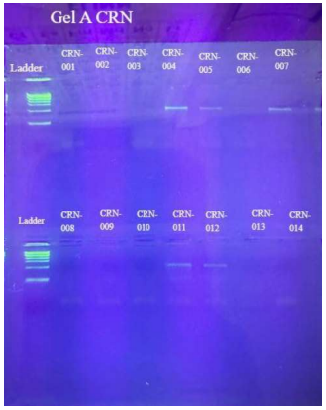
Results

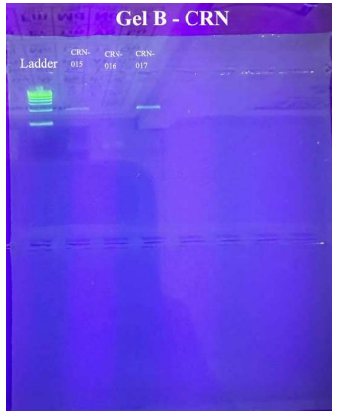
CRN-004 - *Cypridopsis Vidua,* Mussel Shrimp, 36 mismatches
CRN-005 - *Proasellaus SP.*, One-Spotted Waterlouse, 1 mismatch
CRN-007 - *Prosellaus SP.,* One-Spotted Waterlouse, 1 mismatch
CRN-011 - *Cypridopsis Vidua,* Mussel Shrimp, 36 mismatches
CRN-012 - *Prosellaus SP.,* One-Spotted Waterlouse, 1 mismatch
CRN-015 - *Prosellaus SP.,* One-Spotted Waterlouse, 1 mismatch
CRN-017 - *Prosellaus SP.,* One-Spotted Waterlouse, 1 mismatch

CRN-017



CRN-012





Discussion

Out of 17 samples, we successfully extracted 7 samples with DNA. 5 of the samples were *Proasellus SP.*, and two were *Cypridopsis Vidua*. We only had two different species, meaning that the biodiversity of the water was low. *C. Vidua* is a very common ostracod, known as a mussel shrimp. This species is known to be pollution resistant compared to other species, meaning there is a chance the water could be polluted since this species would not be affected by it. Th other species found *Proasellus SP,* commonly known as the one spotted waterlouse is even more pollution resistant than the mussel shrimp. This further supports the idea that the water has a chance of being polluted since the only two species found are know to be resistant. This could also mean that less pollution resistant species could not survive, and maybe that's why we didn't have any other variety. A follow up study could be checking the water for different contaminants with a water test. Our study may not have been completely accurate due to the fact that we collected during early spring, and doing a summer study could have resulted in a higher biodiversity.

References

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