Comparing the Biodiversity of Aquatic Macroinvertebrates in Saltwater vs Freshwater at Garvies Point

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Abstract

Aquatic macroinvertebrates can be defined as any animal without a backbone and can be seen without use of a microscope. Most commonly, the term applies to water bound insects and larva, along with some molluscs and worms. They can be found in both saltwater and freshwater and provide a view into workings and general health of an ecosystem. We collected around 20 samples from the pond and beach at Garvies Point. The measure of the water's pH and salinity was recorded as well. It was our prediction that we would find organisms such as flatworms, stoneflies, mayflies and the larva of larger insects. We predicted we'd find more macroinvertebrates in the freshwater because bugs and insects like mosquitoes tend to live around and lay eggs in freshwater. To identify the aquatic macroinvertebrates we used DNA barcoding to look at their CO1 gene which can identify species because the gene is different for every organism. We were successfully able to identify six of our samples. All of our identified samples were from freshwater. We found that our results can indicator important factors in the environment from which they came. For example, we found a one spotted waterlouse, which can survive in low oxygen levels, indicating that the oxygen levels of the pond it was found in might be low. We also found springtails, which can indicate the quality of the solid within their habitat. Most importantly, we found biodiversity in the freshwater from which we collected our samples.

Introduction

Aquatic macroinvertebrates can be found in both saltwater and freshwater. Some commonly found in saltwater are starfish, urchins, clams, scallops, anemone's, sea sponge, sea cucumbers, shrimp, fan worms, octopuses and lobsters. Macroinvertebrates found in freshwater include larva of many kinds of insects as well as types of shrimp and tadpoles. The purpose of our project is to compare the macroinvertebrates found in the ocean to the macroinvertebrates found in the pond at Garvies point. We expected to find a greater biodiversity and greater amount of macroinvertebrates in freshwater, due to the thought that stagnant pond water may house the larval forms of many different kinds of insects combined with the worms, snails and other creatures that live there full time, thus giving greater biodiversity. We also predicted we would find less biodiversity in the saltwater.

Materials & Methods

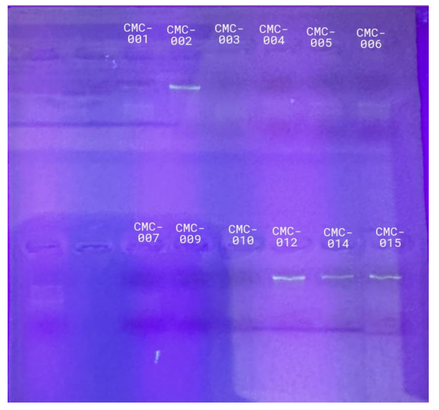
We collected our samples from saltwater and freshwater and Garvies Point Preserve. We then preserved our samples in ethanol until we were ready to extract our sample's DNA. We amplified the CO1 gene from our sample's DNA through Polymerase Chain Reaction (PCR). We then used gel electrophoresis to determine if our DNA extraction was successful. The DNA was then sequenced and we used DNA subway to identify the species of our samples.

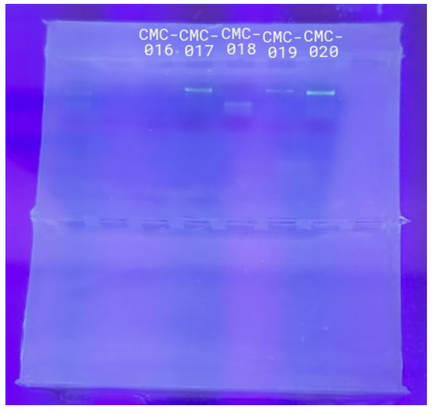
Results

CMC-002 - *Tomocerus* Springtail, 0 mismatches
CMC-012 - *Orthocladiinae* Orthoclad, 4 mismatches
CMC-014 - *Daphniidae* Water Flea, 18 mismatches
CMC-015 - *Tomocerus* Springtail, 1 mismatch
CMC-017 - *Daphniidae* Water Flea, 22 mismatches
CMC-019 - Inconclusive
CMC-020 - *Proasellus* One-Spotted Waterlouse, 4 mismatches

CMC-014
Daphniidae

CMC-002
Tomocerus





These are our gels showing that samples 2, 12 14, 15, 17, 18, 19, and 20 were successful.

Discussion

Originally, we had set out to compare the biodiversity of saltwater vs freshwater however, our only successful samples were freshwater samples so we can only analyze the biodiversity of freshwater macroinvertebrates. Of the 20 samples collected, six samples were successful in DNA amplification and in DNA sequencing. One of which ended up being a one spotted waterlouse. The one spotted waterlouse is a species that can tolerate low oxygen levels and can be found in stagnant waters. In our samples, we also found an orthoclad. Orthoclads tend to live in flowing freshwater environments. They burrow into sediment, creating tubes for them to live in. Along with our other samples, we also got DNA from the Water Flea, a small crustacean that makes up a large part of freshwater plankton. Water Fleas act as a base in the food chain where they are prey to a wide variety of other animals such as fish. The Springtails are considered as ecosystem cleaners because they recycle dead materials called detritus. Springtails also indicate the quality of soil according to the reproduction of their species.

We believe that the small size of some of our samples impacted our results and got us less then what we would have hoped, and such an occurrence could have been a result of the lack of DNA in those samples or a mistake in the experiment. Our results could have also been possibly impacted by the potential that due to the samples we were working with it was possible we did not pick up anything living at all However, the macroinvertebrates we did uncover through our study could be used as bioindicators of the health of our local freshwater environments and further studies could be conducted on a larger scale across more locations to better understand the freshwater aspect.

References

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