CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Titus M. Patton

Project Number

S1213

Project Title

Effects of Ocean Acidification on Primary Consumers in a Marine Ecosystem

Abstract

Objectives/Goals

Oceans make up seventy percent of our world#s surface, and contain some of the most diverse ecosystems. The ocean also serves as a gigantic carbon #sponge#, absorbing humanities excess carbon dioxide. Within fifty years at the current rate of global CO(2) production, our oceans may become too acidic for those ecosystems to continue to thrive. This is do impart to Ocean Acidification, which is the increase in atmospheric CO(2) dissolving into the ocean reacting with hydrogens creating bicarbonate. Bicarbonate then saturates the water reducing the pH and the amount of available carbonate for organisms to produce calcium carbonate for shells and skeletal structures. Less available carbonate for organisms to use to make their shells, could affect the final mass of an organism because it is forced to exert more energy breaking apart bicarbonates into hydrogen and carbonate to produce its shell. This project aims to study the effects of ocean acidification on the base level consumers Artemia salina (brine shrimp).

Methods/Materials

Using a custom made apparatus, nine 500ml salt water tanks were split into three different pH groups: 7.1, 7.6, and 8.1. The pH was maintained in each tank using a series of valves to combine CO(2) gas with compressed air. This mixture was then selectively delivered to each tank via a three-way valve to maintain a constant pH, and naturally recreate ocean acidification in a controlled laboratory environment. Artemia cysts were then introduced into each tank and allowed to grow over a two week period at 25C. At the end of that period, 50 brine shrimp from each tank were collected and dried to obtain a dry mass weight.

Results

A one-way ANOVA was conducted to compare each of the weights from the tank populations. The mean weight of each population was very different with a pH of 7.1 having a mean of 4.567 + 216 mg, 7.6 having a mean of 7.133 + 293 mg, and 8.1 having a mean of 10.033 + 513mg. The means of each pH treatment are statistically significant with a p-value less than .001. A scatterplot of the data shows a strong linear relationship.

Conclusions/Discussion

This data demonstrates that more acidic pH environments may affect growth rates of Artemia salina. This could be do to exertion of more energy to create their shells thus reducing the amount of energy stored and preventing growth.

Summary Statement

This project aims to look at the correlation between more acidic pH marine environments and the affects on the growth and energy use of Artemia salina.

Help Received

Dr. Brian Tsukimura, provided environmental chambers to grow Artemia, provided brine shrimp cysts, scale, forceps, weigh boats, and low weight scale