CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

36692

Project Title

Investigating Ocean Acidification on Bivalves and Echinoids: Filter Study and Water Preservation Using Vector Mapping

Abstract

Objectives/Goals

(1) To determine if acidification will affect the calcium structure of sea urchins (lytechinus variegatus) and bivalve clam (venerupis philippinarum) and (2) minimize the damage with a two-stage filter design. Since Ocean Acidification is composed of diffused CO2 from industrial waste and eutrophicated water, I analyzed waterbody reports to track input from local runoff, to (3) determine the best placement of said filter by vector field analysis.

Methods/Materials

This project has two phases of study: Phase (1) utilized three different water types, current ocean water as the control (pH 8.1), increased acidity ocean water emulating a 100yr projected level (pH 7.5), and increased acidity ocean water (pH 7.5) with an activated carbon filter. The dependent variable was the weight and decay of bivalve shells over time. Data was taken every three days with six shells in each type of water over 27 days. They were baked at 120F for six minutes to ensure that the absorbed water in the shells was not contributing to the total weight. To study the effect on the urchins, twelve urchins were bathed with water of varying pH, four in each level pH 8.1, pH 7.5, and pH 7.5 with filter. The urchin activity levels, food consumption and life spans were recorded. The waterbody mapping analysis is based on EPA reports and vector analysis was used to trace back from three different ocean estuaries: Santa Cruz, Long Beach and the Gulf of Mexico.

Results

Data showed that while shells in acidic ocean water had weight decreased by 13% on average, the acidic water with the filter and current ocean water decreased by 0.3% and 0.5% on average. The waterbody mapping showed increased pollutants and contaminants from over fertilization and street runoff contributing to the ocean decay.

Conclusions/Discussion

Overall, the filter decreased the average weight change from the acidic water significantly. The results show we can reduce ocean acidification with a filter placed in front of storm drains to purify water flowing to the bay, or attached to boats in a cage over the propellers to prevent animals from being cut by the propellers and purifying the ocean as well. With a little love and dedication, in time, we can restore our acidifying ocean to normal.

Summary Statement

As part of my investigation of the effect of ocean acidification, I created a two-stage filter and analyzed optimum placement based on vector mapping; with the hope that it can clean our oceans, one stream at a time.

Help Received

Dr. Jim Barry (MBARI) encouraged me to use sea urchins in addition to clams because they are particularly sensitive to ocean acidification.