CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
S1507

Project Title
The Effects of Ocean Acidification

Abstract

Objectives/Goals
The purpose of this project is to determine the effects of ocean acidification (a process in which waters have lowered pHs and higher CO(2) concentration) on purple sea urchins. The urchins# homeostasis will be measured by observing mortality rates and the amount of food consumed. The urchins were exposed to pHs of 8.2 (control), 7.5, 6.8 and 6.2. It was believed that all the urchins would die in the pH of 6.8.

Methods/Materials
The experiment began by placing the urchins in 8 - 2 gallon sea-water tanks. The pH was adjusted using dry ice, with two tanks allotted to each pH level being tested. A buffer of citric acid was added to each tank to keep the pH at a more constant level. Although the water flow was removed to keep the pH constant, the tanks had screened tops so oxygen was still entering the water. The urchins were fed 50 grams of fresh kelp every day, and the food remaining from the previous day was measured. Every day, the tanks were siphoned to be cleansed of the debris accumulated over night. Water would be removed from the tanks in this process, which was then replaced, and the pH was re-adjusted. Whenever an urchin died, it was removed from the tank.

Results
After nine days of testing, 15 of the 48 original sea urchins had died. One urchin each died in a control tank and one tank with a pH of 7.5. In the tanks with a pH of 6.8, three urchins died. Ten urchins died in the tanks with a pH of 6.2. The least food was eaten in pH 6.2 (an average of 255 grams per tank over nine days), while the most was eaten in the control tanks (average 395 grams per tank). An average of 372.5 grams of kelp was eaten in the tanks with a pH of 7.5, whereas 332.5 grams average was eaten in each of the tanks with a pH of 6.8.

Conclusions/Discussion
This information did not support the hypothesis, as only 25% of the sea urchins died in 6.8 pH. However, 83% of the sea urchins died in the tank with a pH of 6.2, supporting the idea that ocean acidification could still have devastating effects on the environment. Further research could be done with other animals the utilize calcium carbonate, or in an ecosystem with different species in varied levels of the food chain.

Summary Statement
The purpose of this project is to determine the effects of ocean acidification (a process in which waters have lowered pHs and higher CO(2) concentrations) on purple sea urchins.

Help Received
Inspiration, support, and help in planning the project from Dr. George Matsumoto of Monterey Bay Aquarium Research Institute, used lab equipment at Hopkins Marine Station (of Stanford University) courtesy of Freya Sommers