CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
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Project Number
J0924

Project Title
How Does Sunlight Affect the Chemistry of Water in a Saltwater Reef Aquarium?

Abstract

Objectives/Goals
My goal was to see what happens to water chemistry when the lights are turned on over a saltwater aquarium and find out if the same thing is happening in real coral reefs. From what I found out about photosynthesis and the reaction of carbon dioxide in water, I believe that when the lights are turned on and photosynthesis starts, pH, calcium carbonate saturation state, and oxygen will increase.

Methods/Materials
Lights were turned on or off every 12 hours over a 160-gallon reef aquarium that has corals and algae in it. Every four hours I measured pH with a pH meter and dissolved oxygen and alkalinity by titration with test kits. Measurements for alkalinity and pH were entered into a computer program to find calcium carbonate saturation state. The experiment was repeated over four day-night cycles.

Results
The results supported my hypothesis. When the lights were turned on, pH, calcium carbonate saturation state, and dissolved oxygen increased. Alkalinity decreased at a constant rate. pH was more resistant to change when alkalinity was greater.

Conclusions/Discussion
The reef aquarium is full of photosynthetic organisms. When the lights were turned on, photosynthesis began and that reaction uses water, carbon dioxide, and light energy to make carbohydrates and oxygen. When there is no light for photosynthesis, carbon dioxide increases in the water and that causes pH and calcium carbonate saturation state to decrease. Corals grow better with a greater calcium carbonate saturation state. This is exactly the same reaction that happens in the ocean and is why increasing carbon dioxide in seawater is harmful to coral reefs around the world.

Summary Statement
A change in water chemistry was measured when lights were turned on or off over coral reef organisms in an aquarium and I concluded that was because of photosynthesis and the reaction of carbon dioxide in water.

Help Received
My dad showed me how to find references at the University library and explained the parts I did not understand. My mom helped me cut out the pieces for the board and glue them down.