CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

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Project Number

31196

Project Title

Red Tide Sensitivity to Ocean Acidification

Abstract

Objectives/Goals

The goal of this project was to develop a tank in which I could study the effects of ocean acidification on the dinoflagellate L. polyedra, and then study the effects of ocean acidification on this species.

Methods/Materials

Materials: Tank Development: Omega mass flow controllers, manifold, computer, LabView, Li-cor Li-820 CO2 analyzer, Qubit O2 analyzer, Liqui-cel, sterile filtered seawater.
Lingulodinium polyedra Culture. Equipment: microwave, steam sterilization bags, portable hand lamp, temperature controller, electronic thermometer, pH meter, Bunsen burner, aluminum foil, photomicroscope, microscope, hemocytometer. Equipment Purchased Sterile: cotton wool, gloves, pipettes, droppers, laboratory glassware, media bottles.
Procedures: Tank Development: A tank program was developed using LabView, a computer programming system, to produce gas compositions for future ocean acidification projections. L.polyedra Culture: L. polyedra was serially cultured. Its growth curve was characterized. Then, it was cultured at varying carbon dioxide levels. Cell counts were done on a hemocytometer. Dry mass was taken and size and shape were observed under a photomicroscope.

Results

Tank Development: The tank had a sustainable gas output with minimal variability as shown with a R2 value of 0.9577. The input CO2 levels matched relatively well with the output data and met the specification.
Lingulodinium polyedra Study: There was an increase in growth rate of L. polyedra, incubated with and without media, when cultured at higher CO2 levels. The overall increase in organic matter production was 32%. Along with an increase in dry mass production, L. polyedra underwent a size increase and morphological change at 1453 ppm CO2. The increase in size ranged on average between 10-30 µm and was statistically significant (T-test $p<0.05$).

Conclusions/Discussion

Tank Development: A tank was successfully developed that reproducibly models ocean acidification and its future implications with CO2. The tank will be used for future experimentation on the effects of ocean acidification.
Lingulodinium polyedra Study: The species demonstrated a significant change in growth rate under higher CO2 conditions. Along with an increase in growth rate, L.polyedra demonstrated a statistically significant increase in mass and size and change in cell structure, under elevated CO2 levels.

Summary Statement

The effect of ocean acidification on L. polyedra.

Help Received

Used lab equipment at Scripps Institution of Oceanography

Preliminary