CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
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Project Number
S0816

Project Title
Viability of M. californianus to Control Nutrient Levels in Algal Blooms

Abstract

Objectives/Goals
To determine how California Mussels affect nitrate and phosphate concentrations in ocean water, with specific regards to algal blooms and eutrophication.

Methods/Materials
30 Mytilus californianus mussels, 1 spectrophotometer, 2 HACH nitrate/phosphate reagent testing kits, 2 bottles-100 mg/L nitrate/phosphate solutions, 30 cuvettes, pipettes, timer, beakers, filtered sea water, insulated cooler.

Create 3 nitrate solutions and 3 phosphate solutions, one of each at: 5mg/L, 4mg/L, and 3mg/L with HACH Standard Solutions. At each concentration, create 5 identical beakers with 400-mL of nutrient solution. Place 4 mussels in the beakers, and leave the last one empty. Measure concentrations of phosphate or nitrate in water samples from all beakers twice every 10 minutes for 90 minutes. Do this by adding the HACH reagent liquid, which will turn the solution blue (phosphate) or red (nitrate). The shade of solution corresponds to nutrient concentration, and thus, place the colored solution in the spectrophotometer and record percent transmittance. Zero out and calibrate the spectrophotometer in order to convert from transmittance to mg/L, then repeat procedures for all other concentrations.

Results
Nitrate levels decreased 70-80% (mean=2.7mg/L), while phosphate levels decreased 45-55% (mean=1.2mg/L). The varying starting concentrations yielded the same patterns in both nitrate and phosphate. The graph of nutrients present in solution over time has a negative slope. Linear regression t-tests yielded P-values less than 0.01, thus confirming the consistency of the data over time.

Conclusions/Discussion
Algal blooms are mainly caused by an overabundance of nitrate and phosphate. Thus, California Mussels are a viable way to improve nutrient levels and prevent algal blooms. Their filter-feeding capabilities also lends them to combat eutrophication directly. Calculations show that 2000 mussels in a 1-million gallon body of eutrophic water can decrease nutrient levels by 50% in less than 2 years. However, such large-scale implementations would have to first be applied in a simulated environment to assess the impact of a mussel population on surrounding water life.

Summary Statement
My project tested the effects that California Mussels have on nitrate and phosphate concentration levels in ocean water, with regards to algal blooms and eutrophication.

Help Received
Mr. Paul Hunt (Villa Park HS Biology Teacher) allowed me to use his classroom for my workspace and also allowed me to use all of his equipment for my experimentation.