



# CALIFORNIA STATE SCIENCE FAIR

## 2012 PROJECT SUMMARY

Name(s) <b>Ailis C. Dooner</b>	Project Number <b>S1110</b>
<b>Project Title</b> <b>Endosymbiotic Sustainability: Effects of Ambient Nitrate and Phosphate on Zooxanthellae of Anthopleura elegantissima</b>	
<b>Objectives/Goals</b> This study evaluates the physiological effects of ambient phosphate and nitrate concentration in the aqueous environment on quantitative fluctuation of intracellular zooxanthellae of <i>Anthopleura elegantissima</i> (aggregating anemone), an essential mutualistic algal endosymbiont. Increased ionic concentrations of phosphates and nitrates simulate those imposed on the rocky intertidal, <i>A. elegantissima</i> 's place of inhabitance, by human activity. Quantitative fluctuation in symbiont density is gauged utilizing hemocytometer quantification techniques.	<b>Abstract</b>  Obtained 16 genetically identical specimens of <i>Anthopleura elegantissima</i> ; analyzed longitudinal water quality reports of the Monterey Bay to determine ionic concentrations to which subjects were exposed. Tank A was exposed to increased synergistic phosphates and nitrates at concentrations of 0.36 ppm and 1.2 ppm, Tank B was exposed to heightened nitrates at a concentration of 1.2 ppm, Tank C was assigned as a control cohort, and Tank D was exposed to increased phosphates at 0.36 ppm. 1.25 cm tenticular samples were extracted every two days for ten day experimentation window and fluctuation in zooxanthellae population density was quantified in 160 homogenate aliquots using a hemocytometer counting technique.
<b>Methods/Materials</b> With synergistic exposure to 0.36 ppm phosphate and 1.2 ppm nitrate, zooxanthellae density (cells/mL tissue) declined by 0.000133, an overall 20.6% decrease. With heightened nitrate concentrations at 1.2 ppm, zooxanthellae density experienced a notable increase, climbing 0.005265 cells/mL tissue, a 1,238% gain from day 1 density. With no altered chemical composition, zooxanthellae concentration increased slightly by 0.00110 cells/mL tissue, a 159% increase. With increased exposure to phosphates at a concentration of 0.36 ppm, zooxanthellae density increased by 0.000815 cells per mL tissue, a 204% gain.	<b>Results</b> With synergistic exposure to 0.36 ppm phosphate and 1.2 ppm nitrate, zooxanthellae density (cells/mL tissue) declined by 0.000133, an overall 20.6% decrease. With heightened nitrate concentrations at 1.2 ppm, zooxanthellae density experienced a notable increase, climbing 0.005265 cells/mL tissue, a 1,238% gain from day 1 density. With no altered chemical composition, zooxanthellae concentration increased slightly by 0.00110 cells/mL tissue, a 159% increase. With increased exposure to phosphates at a concentration of 0.36 ppm, zooxanthellae density increased by 0.000815 cells per mL tissue, a 204% gain.
<b>Conclusions/Discussion</b> Partially supportive of initial hypotheses, zooxanthellae density declined with exposure to synergistic nitrates and phosphates, increased with exposure to increased nitrates, slightly increased in control cohort, and increased with increased phosphates. Sufficient sample size and averaged double aliquot examination of all samples ensures statistical significance of results obtained.	
<b>Summary Statement</b> This study evaluates the physiological effects of ambient nitrate and phosphate on zooxanthellae, intracellular algal symbiont, of <i>Anthopleura elegantissima</i> (aggregating anemone).	
<b>Help Received</b> Used equipment at Stanford's Hopkins Marine Station and the Monterey Bay Aquarium under supervision of Hannah Jaris and Gabriel de la Llata.	