Caleb Kruse
Senior Division Environmental Sciences
C The Difference II: The Effect Of Ascorbic Acid On Zooxanthellal Density During Coral Bleaching

Coral reefs are being destroyed, due in large part to coral bleaching. Bleaching occurs when a coral expels its symbiotic dinoflagellate zooxanthellae. This detrimental effect often results in coral death because the zooxanthelae provide the coral with up to 90% of its energy. Bleaching often occurs in response to higher surface sea temperatures (SST) which are rising due to the effects of global warming. In the following study, ascorbic acid was used to deter the effect of the hydroxyl ion, which is an oxidant in the bleaching process. In an attempt to diminish the effects of coral bleaching, an experiment was designed to quantify zooaxthelal density during bleaching, and to determine whether ascorbic acid would slow or arrest zooxanthellal expulsion. Red Montipora capricornis, green Montipora capricornis, and green Montipora undata were subjected to a simulation of the increased SST (32 degrees C) mimicking the warming encountered in the natural reefs. Controls were kept at 25.5 degrees C. At set stages during the simulation, coral samples were homogenized, zooxanthelae was isolated and counted using a hemocytometer. Zooxanthellal densities were determined over 20 hours and found to decrease at a rate of 1.7x105 cells/mL hourly. For the next test, 1.0 mL of ascorbic acid per 10-gallons was supplemented, the above procedure was followed. With ascorbic acid supplementation, zooxanthellal density only decreased 3.6x104 cells/mL hourly, a difference of 134,000 cells between the un-supplemented coral. It also closely imitated the control where zooxanthellal density remained steady. It is concluded that ascorbic acid significantly reduces zooxanthellal expulsion, thus deterring bleaching.