Utilizing Alkalinity Enhancement to Increase Growth Rates of Corals in Ex-Situ Nurseries

Veronica Paul *and Chris Langdon*

Department of Marine Biology and Ecology, Rosenstiel School of Marine, Atmospheric, and Earth Science, University of Miami, Miami, Florida, USA

Studies have shown that coral growth rate can be increased 50-100% by increasing seawater saturation state. Maximizing coral growth rates in ex-situ nurseries is highly desirable, as it can significantly accelerate the production of outplantable-size corals for restoration efforts. Ex-situ nurseries offer a controlled, stable environment that supports coral growth and genetic diversity, and provides a reliable pipeline of corals for coral reef restoration projects. Given the critical depletion of coral populations in the Florida Keys and other regions, optimizing coral production in these nurseries for effective restoration is essential. At the University of Miami Experimental Hatchery, we have six aquaria within three raceway tanks, each of which has 43 corals for a total of 129 corals. This experiment includes six coral species with six replicates each: *Siderastrea siderea, Acropora cervicornis, Montastraea cavernosa, Pseudodiplora clivosa, Acropora prolifera, and Acropora palmata*. Coral growth was assessed utilizing the alkalinity anomaly method, which allowed for quantification of net calcification across all corals. Preliminary data reveal that calcification increased 67% as the aragonite saturation state was increased from the ambient seawater level of 4.0 up to 8.0, above 8.0 which the response stabilized and no further increase in growth was observed. These results reflect the collective response of all corals in the aquaria rather than species-specific trends. Future work will examine the species-specific responses. These findings demonstrate that the growth of corals in ex-situ nurseries can be increased ~1.7-fold by the simple addition of sodium carbonate and bicarbonate to the seawater, cutting the time for a new sexual coral recruit to reach outplantable size by approximately half.