Incubation Data

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Project
» Collaborative Research: Reevaluating calcification response to changes in seawater chemistry by testing the Proton Flux Hypothesis and the Coral Metabolism Model (Proton Flux Hypothesis)

Contributors	Affiliation	Role
Bahr, Keisha	Texas A&M, Corpus Christi (TAMU-CC)	Principal Investigator
McNicholl, Conall	Hawaii Institute of Marine Biology (HIMB)	Scientist
Armstrong, David	Texas A&M, Corpus Christi (TAMU-CC)	Student
Bretzing-Tungate, Robert	Texas A&M, Corpus Christi (TAMU-CC)	Data Manager

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Coverage

Spatial Extent: **Lat**:0 **Lon**:0

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Parameters

Parameters for this dataset have not yet been identified

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Project Information

Collaborative Research: Reevaluating calcification response to changes in seawater chemistry by testing the Proton Flux Hypothesis and the Coral Metabolism Model (Proton Flux Hypothesis)

Coverage: Kaneohe, Hawaii

NSF Award Abstract:
Corals build calcium carbonate skeletons to maintain the three-dimensional structure of a coral reef, which provides habitat for many organisms and protects shorelines from bioerosion and storm damage. However, changes in ocean chemistry threaten the ability of corals to build and sustain these ecological important structures. To further the understanding of how climate change impacts coral reefs, this project investigates how changes in ocean carbonate chemistry directly influence coral calcification. The researchers are conducting a series of experiments on corals grown in seawater tanks to study corals responses to seawater chemistry in a changing ocean. Broader impacts of the project include student research opportunities, science-inquiry labs, and virtual learning. This project supports the training of several early career researchers, Ph.D. students, undergraduates, and high school students in the disciplines of chemistry, engineering, and marine ecology. Researchers partner with the Texas State Aquarium to communicate with the general public through a

virtual research expedition series that will focus on coral reef health. This series includes interviews, behind the scene tours, and virtual dives on coral reefs in Hawaii.

This project examines the fundamental connections between seawater chemistry and coral physiology by investigating the modulation of seawater chemistry in the microenvironment surrounding corals. Specifically, this project 1) examines the response of corals to differing carbonate chemistry and 2) characterizes the proton gradient across the corals' boundary layers under differing ocean acidification conditions. Results of this work isolate whether carbonate ions or hydrogen ions have a stronger influence on calcification rates. This work utilizes a state-of-the-art experimental mesocosm facility that combines an automated systems to simultaneously and independently control both total alkalinity and carbon dioxide in the tanks to examine coral response under different carbon chemistry scenarios. Small-scale gradients in carbon chemistry surrounding the corals are being characterized using an innovative solid-state, reagentless sensor capable of making simultaneous measurements of two critical carbon system parameters. Coral biological response variables are quantified during short-term incubations and long-term mesocosm manipulations to understand physiological implications across multiple scales (i.e., individual and community scales) and across boundary layers.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2049406
NSF Division of Ocean Sciences (NSF OCE)	OCE-2049407

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