Water pH during coral calcification experiments conducted on Oahu, Hawaii from November of 2014 to November of 2015

Website: https://www.bco-dmo.org/dataset/708358

Data Type: experimental

Version: 1

Version Date: 2017-07-13

Project

» Will corals recover from bleaching under ocean acidification conditions? (RAPID Hawaii)

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Abstract

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Coverage

Spatial Extent: **N**:21.46278 **E**:-157.693 **S**:21.335 **W**:-157.81028

Temporal Extent: 2014-11-17 - 2015-11-27

Dataset Description

This dataset contains pH records for eight aquaria between Nov 17th, 2014 to Nov 27th, 2015 which were used in coral calcification experiments conducted on Oahu, Hawaii.

Datasets relevant to this experiment:
* salinity
* water temperatures
* total alkalinity
* coral calcification

Acquisition Description

About weekly, bottle samples were also collected for total alkalinity and pH. Bottles were rinsed with sample repeatedly before sample collection. Alkalinity samples were collected in borosilicate glass bottles without air space, and were analyzed via a modified Gran titration using an 877 Titrino plus, typically within 3 hr of collection, though they appeared to be stable for at least 7 days. Titrations were verified using Certified Reference Materials obtained from Andrew Dickson and precision and accuracy were typically +-10 ueq/kg or better. pH samples were collected in 50 ml centrifuge tubes without air space and analyzed spectrophotometrically with m-cresol purple, following standard protocols, and typically within 1 hr of collection, though they appeared to be stable for at least 24 hr. Precision of pH analyses was typically +-0.002 units or better, while accuracy of this method is estimated as +-0.02 units or better.

Tank treatments:

Below, "High" or "Low" pH refers to target pH levels. "Fed" or "Unfed" refers to whether the tank was fed zooplankton not.

Tank t1: High pH, Unfed
Tank t2: High pH, Fed
Tank t3: Low pH, Unfed
Tank t4: Low pH, Fed
Tank t5: High pH, Fed
Tank t6: Low pH, Unfed
Tank t7: Low pH, Fed
Tank t8: High pH, Unfed

Location information:

The coral collection sites were the reef around HIMB and the reef adjacent to Kaiona Beach Park in Waimanalo (about 1 mile north of the Makai Pier). The lat/long for the approximate center of the sampling area at each site are as follows, and the sampling at each site was located within about +/- 200 m of that central point:

Kane'ohe Bay: 21.4336 N, -157.7861 W
Waimanalo Bay: 21.3272 N, -157.6811 W

The tank experiments were conducted at the Point Lab on Coconut Island, which is ~18 km from the sampling area in Waimanalo Bay and adjacent to the sampling area in Kane'ohe Bay. The high pH treatment was ambient Kane'ohe Bay seawater chemistry (pH ~7.9-8.0) whereas the target for the low pH treatment was ~0.25 units below ambient.

Processing Description

BCO-DMO Data Manager Processing Notes:
* added a conventional header with dataset name, PI name, version date
* modified parameter names to conform with BCO-DMO naming conventions
* added ISO Date format generated from Date and Time values
* date and time (local HST) changed to format yyyy-mm-dd
* rounded pH values to three decimal places

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Parameters

Parameter	Description	Units
date_HST	Local date; Hawaii Standard Time (HST;UTC-10) in format yyyy-mm-dd	unitless
t1	pH in aquarium "t1"	pH total hydrogen ion scale
t2	pH in aquarium "t2"	pH total hydrogen ion scale
t3	pH in aquarium "t3"	pH total hydrogen ion scale
t4	pH in aquarium "t4"	pH total hydrogen ion scale
t5	pH in aquarium "t5"	pH total hydrogen ion scale
t6	pH in aquarium "t6"	pH total hydrogen ion scale
t7	pH in aquarium "t7"	pH total hydrogen ion scale
t8	pH in aquarium "t8"	pH total hydrogen ion scale

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Deployments

RAPID_Hawaii_2014_2015

Website	https://www.bco-dmo.org/deployment/708337
Platform	shoreside Oahu
Start Date	2014-11-17
End Date	2015-11-27
Description	Coral collections at Kaneohe and Waimanalo Bays, Oahu, HI. Calcification experiments done in aquaria.

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Project Information

Will corals recover from bleaching under ocean acidification conditions? (RAPID Hawaii)

Coverage: Oahu, HI; Hawaii Institute of Marine Biology

Following the second hottest month on record since the 1940s, water temperatures on O'ahu reached 30 degrees C. The result of this ~2 degree C increase above summer mean temperatures has been a severe bleaching event across the entire length of the Hawaiian Archipelago, with as many as 75% of the dominant coral species in Kane'ohe Bay losing color or bleaching completely white. This event exceeds the magnitude of the only major bleaching event previously documented for Hawaii in 1996. Although tragic, this event provides a rare natural experiment to understand the impact of coral bleaching on the ability of Hawaiian corals to recovery from high temperature stress in the context of climate change and ocean acidification. The proposed will leverage previous work by the PIs to compare recovery following this event and the 1996 mass bleaching event to the recovery rates of Hawaiian corals under future climate change scenarios. Results from this work will provide data on coral resistance and recovery potential from bleaching events of the future. Coral reefs are among the most diverse ecosystems on the planet, housing an estimated 25% of marine species. But, that diversity appears particularly susceptible to the effects of global change. Massive coral bleaching poses a substantial threat to the integrity of coral reef habitat in US waters, and is predicted to be the major source of mortality for reefs under future climate scenarios. Although previous work on the recovery of corals from bleaching sets the groundwork for this project, it remains to be seen how recovery from bleaching will be impacted by climate change and ocean acidification. To address this fundamental question, we take advantage of the natural difference in baseline temperature and pCO2 conditions between Kane'ohe Bay and Waimanalo Bay, HI, both of which are currently impacted by the massive bleaching event in the Hawaiian Archipelago. This natural experiment makes possible a rare opportunity to test three basic questions about the rates of recovery of bleached and unbleached corals under future climate change scenarios: 1) Will ocean acidification slow rates of recovery from bleaching?; 2) Does zooplankton feeding minimize the impact?; and 3) Do corals acclimated to warmer, more acidic baseline conditions (Kane'ohe Bay) recover more quickly under future conditions than corals from present day mean oceanic conditions (Waimanalo Bay)? This research addresses broad scientific questions relating to the ability of corals to acclimate or adapt to both local environments and future climate conditions, and to help identify coral populations that may be resilient to the predicted impacts of climate change on the reefs of the future.

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Funding Source	Award
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