

Coral calcification rates from experiments conducted on Oahu, Hawaii from December of 2014 to November of 2015

Website: <https://www.bco-dmo.org/dataset/708338>

Data Type: experimental

Version: 1

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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: 2014-12-03 - 2015-11-14

Dataset Description

This dataset contains coral (*Porites compressa* and *Montipora capitata*) calcification rates from experiments conducted from December of 2014 to Nov of 2015 on Oahu, Hawaii. Coral nubbins were collected at Kaneohe Bay and Waimanalo Bay, Oahu, HI at a depth 0.5-3 m.

Datasets relevant to this experiment:

- * [salinity](#)
- * [pH](#)
- * [water temperatures](#)
- * [Total alkalinity](#)

Methods & Sampling

Calcification was assessed via the buoyant weighing technique using a balance precise to ± 0.01 g, yielding a precision of calcification estimates of $\pm 1\%$ or better. Corals which died, experienced $>25\%$ partial mortality, or *Porites* which were attacked by the predatory nudibranch *Phestilla* spp. were dropped from the calcification analysis.

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.

Data 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
- * original file had multiple columns of calcification for every date sampled. Added two columns; date of calcification measurement, and calcification column. Transformed data to fill the two columns and removed all the columns for calcification by date.
- * Added coral species name column and combined the data for *Porites compressa* and *Montipora capitata*
- * rounded calcification values to three decimal places
- * replaced code KB with "Kaneohe Bay" and WB with "Waimanalo Bay" in the collection location column
- * added lat_approx, lon_approx for the two bays

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Data Files

File
calcification.csv (Comma Separated Values (.csv), 573.34 KB) MD5:6032e690fdaa8f032fa8c7149d17f5a9
Primary data file for dataset ID 708338

Parameters

Parameter	Description	Units
Species	Coral species of nubbin	unitless
Tank	Tank identifier for experiment	unitless
Treatment_pH	Target pH level for tank (High Low)	unitless
Treatment_feed	Target feeding level for tank; either fed zooplankton or unfed (Fed Unfed)	unitless
Date_HST	Local date; Hawaii Standard Time (HST;UTC-10) in format yyyy-mm-dd	unitless
Calcification	Calcification rate	milligrams per gram per day (mg/g/d)
Colony_number	coral colony number; particular coral colony of each species at each site	unitless
Nubbin_number	Coral nubbin number; an arbitrary numeric (1-12) to individually identify each coral nubbin given colony number; species; and site	unitless
Bleach_Status_2014	Whether the corals were visibly bleached when collected in 2014 (bleached unbleached)	unitless
Collection_location	Name of the bay where the coral nubbin was collected	unitless
Lat_approx	Approximate latitude of the bay where the coral nubbin was collected	decimal degrees
Lon_approx	Approximate longitude of the bay where the coral nubbin was collected	decimal degrees

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.

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 $p\text{CO}_2$ 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

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1514859
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