Porites asteroides and Diploria labyrinthiformis calcification from coral colony buoyant weights measured at Hog and Crescent Reef, Bermuda between 2010 and 2012 (BEACON project)

Website: https://www.bco-dmo.org/dataset/720763
Data Type: Other Field Results
Version:
Version Date: 2018-03-02

Project
» BErmuda ocean Acidification and COral reef iNvestigation (BEACON)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **N**:32.457333 **E**:-64.797469 **S**:32.400777 **W**:-64.834759
Temporal Extent: 2010-08-18 - 2012-09-18

Dataset Description

This dataset contains coral (*Diploria labyrinthiformis* and *Porites asteroides*) buoyant weights from coral colonies at Hog and Crescent Reef, Bermuda between 2010 and 2012.

Sampling locations: Bermuda Platform: Hog Reef (32.45733, -64.83476) and Crescent Reef (32.40078, -64.79747).

These data were utilized in the following publication:

Courtney, T. A., Lebrato, M., Bates, N. R., Collins, A., de Putron, S. J., Garley, R., ... & Andersson, A. J. (2017). Environmental controls on modern scleractinian coral and reef-scale calcification. *Science advances*, *3*(11), e1701356. doi: 10.1126/sciadv.1701356

Methods & Sampling

48 corals of each species (*Diploria labyrinthiformis* and *Porites asteroides*) were collected from Hog Reef and Crescent Reef respectively and cemented onto acrylic tiles using Z-spar A-788 epoxy for a total of 96 coral colonies. 12 colonies of each species were deployed at two separate reef sites on Hog Reef and Crescent Reef for a total of 24 colonies of each species at each reef location. Initial weight (Initial Wt) indicates the weight of coral colony and initial weight 1 (In. Wt 1) represents the coral colony weight plus acrylic tile and cement. Each subsequent weight X represents weighing of coral+epoxy+tile on the day of collection listed in the date column. Temperature and salinity were measured at the time of buoyant weighing in the lab so that seawater density could be calculated to calculate the weight of water displaced by the coral colony. Corals were buoyantly weighed following standard protocols on an OHAUS AV 412 balance twice (wt_1 and wt_2). If weights were significantly different, a third weight (wt_3) was measured.

Data Processing Description

All data are the raw un-processed values at the time of measurement.

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
* NaN values changed to nd for "no data"
* Added Site (Cres|Hog),Lat,Lon to be consistent with other datasets. Existing "Site" changed to Site ID (e.g. "Cres 2")

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Data Files

File
PoritesDiploria.csv (Comma Separated Values (.csv), 95.70 KB) MD5:fd5586cc3a86af61afdf79453294a7e5 Primary data file for dataset ID 720763

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Parameters

Parameter	Description	Units
Date	Local date of coral weights in format dd/MM/YYYY (AST and ADT)	unitless
Wt_label	Identifier for weight period	unitless
Site	Site name of coral in situ growth (Hog = Hog Reef, Bermuda or Cres = Crescent Reef, Bermuda)	unitless
Lat	Latitude of site	decimal degrees
Lon	Longitude of site	decimal degrees
Site_ID	Site identifier of coral in situ growth	unitless
Species	Coral species (Porites=*Porites asteroides*,Diploria=*Diploria labyrinthiformis*)	unitless
Coral_ID	Identifier for each coral	unitless
Tag_ID	ID tag for each coral	unitless
Salinity	Salinity of seawater used for buoyant weight	parts per thousand (ppt)
Temp	Temperature of seawater used for buoyant weight	degrees Celsius
wt_1	Buoyant weight of coral 1	grams (g)
wt_2	Buoyant weight of coral 2	grams (g)
wt_3	Buoyant weight of coral 2	grams (g)

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Instruments

Dataset-specific Instrument Name	OHAUS AV 412 (Coral weights)
Generic Instrument Name	scale or balance
Generic Instrument Description	Devices that determine the mass or weight of a sample.

Dataset-specific Instrument Name	YSI 556 Handheld Multiparameter Instrument
Generic Instrument Name	Water Quality Multiprobe
Dataset-specific Description	A YSI 556 Handheld Multiparameter Instrument was used to measure in situ temperature (accuracy ± 0.15°C), and salinity (accuracy ± 1%).
Generic Instrument Description	An instrument which measures multiple water quality parameters based on the sensor configuration.

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Deployments

BIOS_BEACON

Website	https://www.bco-dmo.org/deployment/626096
Platform	BIOS_Small_Boat
Start Date	2007-06-15
End Date	2012-09-18
Description	Sample collection platforms for the BEACON Project. The samples were collected from a small boat (27 ft Twin Vee or 26 ft Seadance)

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Project Information

BErmuda ocean Acidification and COral reef iNvestigation (BEACON)

Website: https://scripps.ucsd.edu/research/projects/bermuda-ocean-acidification-and-coral-reef-investigation-beacon

Coverage: Bermuda

NSF abstract:

Ocean acidification owing to anthropogenic emission of CO2 is a significant and imminent threat to marine calcifying organisms and ecosystems such as corals and coral reefs. As a result of future ocean acidification, i.e., increasing seawater CO2, and decreasing pH, carbonate ion concentration [CO3], and carbonate saturation state, it is likely that marine calcifiers will have difficulty growing their shells and skeletons of calcium carbonate (CaCO3) at their present rates. Dissolution of carbonate sediments and structures are also likely to increase, and could ultimately exceed calcification and CaCO3 production, leading to a transition from net accumulation to a net loss in carbonate material of individual coral colonies, coral communities and coral reef ecosystems. Because of Bermuda's relatively high-latitude location (32° N), the annual average surface seawater [CO3] is lower in Bermuda than regions closer to the tropics. As a consequence, the Bermuda coral reef is likely to experience critical [CO3] values and net dissolution before its tropical counterparts as a result of continued ocean acidification. Furthermore, a natural gradient in [CO3] exists along the Bermuda reef with environmental parameters such as, light, temperature, and nutrients being near identical. This gradient allows for unique cross-comparisons of calcification of individual calcifiers and calcifying communities under different [CO3] in a natural environment.

In this study, researchers at the Bermuda Institute of Ocean Science (BIOS) will launch the BEACON project to further our understanding of the consequences of ocean acidification to the process of calcification and CaCO3 production at three different spatial scales including (1) individual coral colonies, (2) local reef communities, and (3) regional coral reef ecosystems. They will conduct (1) in situ and in vitro experiments to

assess growth and evaluate net calcification of individual coral colonies of three different species common to Bermuda and the Caribbean exposed to different [CO3] under both natural and controlled experimental conditions; (2) diel and quasi-lagrangian calcification experiments to evaluate net calcification of local reef communities and in moving water masses along the natural [CO3] gradient existent on the Bermuda platform; and (3) time series data collected across the Bermuda platform and offshore, to evaluate net calcification and CaCO3 production of the Bermuda coral reef ecosystem and platform over seasonal and annual cycles.

Broader impacts: This project will provide fundamental data on the consequences of ocean acidification to coral reefs on different temporal and spatial scales. Combined, knowledge at each of the scales will contribute to an improved understanding of this problem in a broader context, i.e., the effect on coral reefs as a global entity and role in the global carbon cycle during past, present and future seawater chemical conditions. As the meaning implies, the research team envisions BEACON to serve as a guiding light to assist researchers and policymakers in framing future strategies and making decisions regarding the management of coral reefs and CO2 emission policies in order to establish CO2 stabilization targets. Scientific understanding and research products from the project will be specifically used in the BIOS explorer program, CoE POGO ocean acidification module, and the coral reef ecology class taught at BIOS. It will also contribute to developing the research and technical skills of one graduate student and one research technician at BIOS, and will include the involvement of interns and NSF REU fellowship students each year of the project.

Based on the findings of the BEACON project, and especially the results published in Andersson et al. (Nature Climate Change, 4, 56-61, 2014) and Yeakel et al. (PNAS, 112, 14512-14517, 2015), BEACON II (https://www.bco-dmo.org/project/737955) aims to assess the links between offshore and reef biogeochemistry by continuing and expanding on the physical and chemical measurements on the Bermuda coral reef and in the surrounding Sargasso Sea.

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Program Information

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0928406

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