Benthic temerature and light data from loggers deployed in Bermuda between 2010 and 2012 (BEACON project)

Website: https://www.bco-dmo.org/dataset/720802
Data Type: Other Field Results
Version:
Version Date: 2017-12-12

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: 2010-10-18 - 2012-09-20

Dataset Description

Benthic temperature and light data from HOBO Temperature and Light loggers were deployed at Hog Reef and Crescent Reef Bermuda recording temperature and light every 8 minutes for the duration of the two-year study period (2010-2012).

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

At each of two locations on Hog Reef and Crescent Reef respectively, two onset HOBO Pendant

Temperature/Light Data Loggers were deployed measuring temperature and light on the benthos every 8 minutes.

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

For more methodology details refer to Courtney et al. 2017.

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

Data Processing Description

Data are raw, unfiltered data from each deployment and have not been verified.

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 convention
* NaN values changed to nd for "no data"
* "Time" column split into "Date" and "Time" as it contained both

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Data Files

File
TempLight.csv (Comma Separated Values (.csv), 53.19 MB) MD5:e642820cd5cfbce1dfeac56651298e4d Primary data file for dataset ID 720802

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Parameters

Parameter	Description	Units
Site	Location of sampling (Hog = Hog Reef, Bermuda or Cres = Crescent Reef, Bermuda)	unitless
Logger	Logger ID at Reef	unitless
Date	Local date of sampling in format dd/MM/YYYY (AST and ADT)	unitless
Time	Local time of sampling in format HH:mm (AST and ADT)	unitless
Temp	Benthic seawater temperature	degrees Celsius (°C)
Light	Benthic light levels	lumens per meter squared (lux)
Lat	Latitude of site	decimal degrees
Lon	Longitude of site	decimal degrees

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Instruments

Dataset-specific Instrument Name	Onset Hobo light logger
Generic Instrument Name	Light Meter
Generic Instrument Description	Light meters are instruments that measure light intensity. Common units of measure for light intensity are umol/m2/s or uE/m2/s (micromoles per meter squared per second or microEinsteins per meter squared per second). (example: LI-COR 250A)

Dataset-specific Instrument Name	Onset Hobo temperature logger
Generic Instrument Name	Temperature Logger
Generic Instrument Description	Records temperature data over a period of time.

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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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