In situ temperature and light time-series from HOBO data loggers, Belize Mesoamerican Barrier Reef System (MBRS), Nov. 2014 - Oct. 2015

Website: https://www.bco-dmo.org/dataset/734442
Data Type: Other Field Results
Version: 2
Version Date: 2018-05-02

Project
» Investigating the influence of thermal history on coral growth response to recent and predicted end-of-century ocean warming across a cascade of ecological scales (Thermal History and Coral Growth)

Contributors	Affiliation	Role
Castillo, Karl D.	University of North Carolina at Chapel Hill (UNC-Chapel Hill)	Principal Investigator
Baumann, Justin	University of North Carolina at Chapel Hill (UNC-Chapel Hill)	Student, Contact
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
This dataset contains temperature and light data obtained from in situ HOBO V2 data loggers situated at each study site. These data were used in a coral study in Baumann et al. (2016) DOI: 10.1371/journal.pone.0162098.

Table of Contents

Coverage

Spatial Extent: **N**:17.82413 **E**:-88.00196 **S**:16.13013 **W**:-88.62943
Temporal Extent: 2014-11-19 - 2015-10-31

Dataset Description

This dataset contains temperature and light data obtained from in situ HOBO V2 data loggers situated at each study site.

These data were used in a coral study in Baumann et al. (2016) DOI: 10.1371/journal.pone.0162098.

Methods & Sampling

Data from in situ loggers were collected from 7 sites along the Belize Mesoamerican Barrier Reef System.

Raw data are submitted here. All processing and analysis was conducted in R.

Data Processing Description

BCO-DMO Processing Notes:
- added 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
- joined lat, lon and description from sites dataset to this data

[table of contents | back to top]

Data Files

File
Baumann_2016_insitu_temp.csv (Comma Separated Values (.csv), 10.95 MB) MD5:56860c865eac57d78feccda8179e4ce4 Primary data file for dataset ID 734442

[table of contents | back to top]

Related Publications

Baumann, J. H., Townsend, J. E., Courtney, T. A., Aichelman, H. E., Davies, S. W., Lima, F. P., & Castillo, K. D. (2016). Temperature Regimes Impact Coral Assemblages along Environmental Gradients on Lagoonal Reefs in Belize. PLOS ONE, 11(9), e0162098. doi:10.1371/journal.pone.0162098
Results

[table of contents | back to top]

Parameters

Parameter	Description	Units
site	site identifier	unitless
type	thermal regime code: 1=lowTP; 2=modTP; 3=highTP. These 3 categories are based on low; moderate; and high temperature parameters (see Baumann et al 2016 for details)	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
description	site description: nearby city name and low; moderate; or high temperature parameter	unitless
ISO_DateTime_Local	UTC date and time based on ISO format: yyyy-mm-ddThh:mm:ssZ	unitless
date	date; formatted as yyyy-mm-dd	unitless
month	month	unitless
day	day	unitless
year	year	unitless
time	time	unitless
hobo_logger_temp	temperature collected by Onset HOBO data logger	degrees Celsius
hobo_pendant_temp	temperature collected by Onset HOBO pendant data logger	degrees Celsius
light	Irradiance from Onset HOBO Pendant data logger	lumens/ft2

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Onset HOBO U22 and V2 data loggers
Generic Instrument Name	Data Logger
Dataset-specific Description	Used to collect temperature and light data.
Generic Instrument Description	Electronic devices that record data over time or in relation to location either with a built-in instrument or sensor or via external instruments and sensors.

[table of contents | back to top]

Project Information

Investigating the influence of thermal history on coral growth response to recent and predicted end-of-century ocean warming across a cascade of ecological scales (Thermal History and Coral Growth)

Website: http://www.unc.edu/~kdcastil/research.html

Coverage: Western Caribbean

Description from NSF award abstract:
Rising global ocean surface temperatures have reduced coral growth rates, thereby negatively impacting the health of coral reef ecosystems worldwide. Recent studies on tropical reef building corals reveal that corals' growth in response to ocean warming may be influenced by their previous seawater temperature exposure - their thermal history. Although these recent findings highlight significant variability in coral growth in response to climate change, uncertainty remains as to the spatial scale at which corals' thermal history influences how they have responded to ocean warming and how they will likely respond to predicted future increases in ocean temperature. This study investigates the influence of thermal history on coral growth in response to recent and predicted seawater temperatures increases across four ecologically relevant spatial scales ranging from reef ecosystems, to reef communities, to reef populations, to an individual coral colony. By understanding how corals have responded in the past across a range of ecological scales, the Principal Investigator will be able to improve the ability to predict their susceptibility and resilience, which could then be applied to coral reef conservation in the face of climate change. This research project will broaden the participation of undergraduates from underrepresented groups and educate public radio listeners using minority voices and narratives. The scientist will leverage current and new partnerships to recruit and train minority undergraduates, thus allowing them to engage high school students near field sites in Florida, Belize, and Panama. Through peer advising, undergraduates will document this research on a digital news site for dissemination to the public. The voice of the undergraduates and scientist will ground the production of a public radio feature exploring the topic of acclimatization and resilience - a capacity for stress tolerance within coral reef ecosystems. This project will provide a postdoctoral researcher and several graduate students with opportunities for field and laboratory research training, teaching and mentoring, and professional development. The results will allow policy makers from Florida, the Mesoamerican Barrier Reef System countries, and several Central American countries to benefit from Caribbean-scale inferences that incorporate corals' physiological abilities, thereby improving coral reef management for the region.

Coral reefs are at significant risk due to a variety of local and global scale anthropogenic stressors. Although various stressors contribute to the observed decline in coral reef health, recent studies highlight rising seawater temperatures due to increasing atmospheric carbon dioxide concentration as one of the most significant stressors influencing coral growth rates. However, there is increasing recognition of problems of scale since a coral's growth response to an environmental stressor may be conditional on the scale of description. This research will investigate the following research questions: (1) How has seawater temperature on reef ecosystems (Florida Keys Reef Tract, USA; Belize Barrier Reef System, Belize; and Bocas Del Toro Reef Complex, Panama), reef communities (inshore and offshore reefs), reef populations (individual reefs), and near reef colonies (individual colonies), varied in the past? (2) How has seawater temperature influenced rates of coral growth and how does the seawater temperature-coral growth relationship vary across these four

ecological spatial scales? (3) Does the seawater temperature-coral growth relationship forecast rates of coral growth under predicted end-of-century ocean warming at the four ecological spatial scales? Long term sea surface temperature records and small-scale high-resolution in situ seawater temperature measurements will be compared with growth chronologies for the reef building corals Siderastrea siderea and Orbicella faveolata, two keystone species ubiquitously distributed throughout the Caribbean Sea. Nutrients and irradiance will be quantified via satellite-derived observations, in situ measurements, and established colorimetric protocols. Field and laboratory experiments will be combined to examine seawater temperature-coral growth relationships under recent and predicted end-of-century ocean warming at four ecologically relevant spatial scales. The findings of this study will help us bridge the temperature-coral growth response gap across ecologically relevant spatial scales and thus improve our understanding of how corals have responded to recent warming. This will lead to more meaningful predictions about future coral growth response to climate change.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1459522

[table of contents | back to top]