Raw and corrected light intensity time-series records at onshore and underwater sites at Rosario, Abanico and Varadero reefs, Colombia, Nov 2016-Dec 2017 (Varadero Reef project)

Website: https://www.bco-dmo.org/dataset/718956
Data Type: Other Field Results
Version: 2
Version Date: 2018-03-01

Project
» RAPID: Coral robustness: lessons from an "improbable" reef (Varadero Reef)

Contributors	Affiliation	Role
Medina, Mónica	Pennsylvania State University (PSU)	Principal Investigator
Iglesias-Prieto, Roberto	Pennsylvania State University (PSU)	Co-Principal Investigator
Lopez Lodoño, Tomás	Pennsylvania State University (PSU)	Contact
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
This dataset contains the light intensity raw values and the corrected light intensity values collected by the Odyssey-PAR sensors deployed at the three study sites: Varadero (10°18’23.3"N, 75°35’08.0"W), Rosario (10°11'12.1"N, 75°44'43.0"W) and Abanico (10°18'5.80"N, 75°34'37.10"W). To obtain the corrected light intensity values, we applied a correction factor to the raw data which was obtained from the calibration of each Odyssey-PAR sensor against a manufacturer-calibrated quantum sensor (LI-1400, LI-COR). The deployment location (onshore and underwater), the date, and time for each record are specified.

Table of Contents

Coverage

Spatial Extent: **Lat**:10.3028 **Lon**:-75.5819
Temporal Extent: 2016-11-26 - 2017-12-04

Dataset Description

This dataset contains the light intensity raw values and the corrected light intensity values collected by the Odyssey-PAR sensors deployed at the three study sites: Varadero (10°18’23.3"N, 75°35’08.0"W), Rosario (10°11'12.1"N, 75°44'43.0"W) and Abanico (10°18'5.80"N, 75°34'37.10"W). To obtain the corrected light intensity values, we applied a correction factor to the raw data which was obtained from the calibration of each Odyssey-PAR sensor against a manufacturer-calibrated quantum sensor (LI-1400, LI-COR). The deployment location (onshore and underwater), the date, and time for each record are specified. Measurements were recorded between November 2016 and December 2017.

Related Reference:
Pizarro V, Rodríguez SC, López-Victoria M, Zapata FA, Zea S, Galindo-Martínez CT, Iglesias-Prieto R, Pollock J,

Medina M. (2017) Unraveling the structure and composition of Varadero Reef, an improbable and imperiled coral reef in the Colombian Caribbean. PeerJ 5:e4119 https://doi.org/10.7717/peerj.4119

Methods & Sampling

The Varadero Reef is located south-west of the Cartagena Bay close to the southern strait that connects the Bay to the Caribbean Sea in Colombia (10°18’23.3"N, 75°35’08.0"W). The Bay is a receiving estuary from the Magdalena River through the Canal del Dique, a man-made channel whose construction and operation dates back almost a century. The depth of the particular transplant site in Varadero is 3.5m, while in Abanico, a nearby site with low coral cover, and Rosario, a site inside a marine protected area located south-west with relatively high coral cover, is 3m and 12m.

The local light environment at each experimental site was continuously monitored by attaching a light sensor to the PVC panel where the corals were mounted at each site. The Odyssey-PAR sensors were previously calibrated against a manufacturer-calibrated quantum sensor. The sensors were cleaned and downloaded every two/three months.

The light sensors used to monitor the light intensity at each site were Odyssey submersible PAR logger (Dataflow systems Ltda, Christchurch, New Zealand). The manufacturer-calibrated quantum sensor used to calibrate the Odyssey sensors was a LI-1400 (LI-COR, Nebraska, USA). Both types of sensors are cosine-corrected light intensity sensors.

Odyssey data logging software (Dataflow systems Ltda, Christchurch, New Zealand) was used to manage the logger and data operations.

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
- reformatted date from m/d/yyyy to yyyy-mm-dd
- added ISO_DateTime_UTC column
- blank values were replaced with no data value 'nd'

[table of contents | back to top]

Data Files

File
light_raw.csv (Comma Separated Values (.csv), 7.76 MB) MD5:55d9afc39e4b4c83e3e88bb7602426ab Primary data file for dataset ID 718956

[table of contents | back to top]

Related Publications

Johnson, M. D., Price, N. N., & Smith, J. E. (2014). Contrasting effects of ocean acidification on tropical fleshy and calcareous algae. PeerJ, 2, e411. doi:10.7717/peerj.411
Related Research

[table of contents | back to top]

Parameters

Parameter	Description	Units
site	reef name	unitless
site_description	subsite on reef: onshore or underwater	unitless
year	year	unitless
month	month	unitless
day	day	unitless
date_utc	date; UTC	unitless
time_utc	time; UTC	unitless
ISO_DateTime_UTC	date/time (UTC) ISO formatted based on ISO 8601:2004(E) with format YYYY-mm-ddTHH:MM:SS	unitless
light_raw	light intensity raw value	integrated millivolts (mV)
light_corr	light corrected (crrx) value	micromoles quanta/meter^2/second (umol quanta m-2 s-1)

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	LI-1400 (LI-COR, Nebraska, USA)
Generic Instrument Name	Data Logger
Dataset-specific Description	Data logger connected to a quantum sensor was used to calibrate the Odyssey sensors
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.

Dataset-specific Instrument Name	Odyssey submersible PAR logger (Dataflow systems Ltda, Christchurch, New Zealand)
Generic Instrument Name	Light Meter
Dataset-specific Description	Used to monitor the light intensity at each site.
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)

[table of contents | back to top]

Project Information

RAPID: Coral robustness: lessons from an "improbable" reef (Varadero Reef)

Coverage: Caribbean Sea (10°18’10”N, 75°34’ 55”W)

NSF Award Abstract:
Coral reefs provide invaluable services to coastal communities, but coral populations worldwide are in a state of unprecedented decline. Studying resilient reefs is of primary importance for coral conservation and restoration efforts. A unique natural experiment in coral resilience to stress has been playing out in Cartagena Bay, Colombia since the Spanish conquistadors diverted the Magadalena River into the Bay in 1582. Varadero Reef at the southern mouth of the Bay has survived centuries of environmental insults and changing conditions with up to 80% coral cover. This reef provides an ideal system to test biological robustness theory. Given that Varadero is a highly perturbed system, we hypothesize that while likely more robust to perturbation than nearby pristine reefs, it will be less physiologically efficient. Some of the large star coral colonies (Orbicella faveolata) at this site have existed since before the construction of the Canal del Dique. These coral specimens contain invaluable information regarding the conditions of the Magdalena River wathershed and its construction in the XIV century. Changes in turbidity of the plume associated with the urban industrial and agricultural development of Colombia can be documented as variations in calcification rates and changes in the microstructure of the skeleton. The Colombian government has announced the approval for the construction of a shipping channel that will go right over this reef, with the goal to start dredging as early as Fall 2016 or early 2017. The RAPID funding mechanism would enable immediate collection of data and information of why this reef has survived centuries of environmental stress that can shed light on what genotype combinations of coral and its microbial constituents will fare better in similar conditions at other reef locations around the world. Coral reef conservation biology will benefit from this study by generating data for the development of stress diagnostic tools to identify resilient corals. This project will help broaden participation in science by training a diverse cohort of students to work effectively in the global arena while fostering productive collaborations with several Colombian researchers and educational institutions. Students will also gain cultural empathy and sensitivity through direct engagement with the members of society who are most directly impacted by coral reef degradation (e.g. fishermen). Student researchers from Penn State University will work alongside their Colombian counterparts to develop a series of bilingual blog posts to record the cultural and scientific aspects of this project's research expeditions. The blog postings will be submitted for wide dissemination to the Smithsonian's Ocean Portal where Penn State students have published in the past. An educational coral kit developed by the Medina Lab and extensively tested in schools in the US has been translated into Spanish and will be used in local schools in Cartagena and vicinities. All expedition data and metadata will be incorporated into the Global Coral Microbiome Project's interactive web portal, a responsive outreach tool allows researchers, students and/or teachers to access a wealth of information about every coral colony we sample and to virtually explore coral reefs around the world from any internet-enabled device.

This research will generate information to understand functional traits related to symbioses stability under different perturbation regimes. Comparative analyses of microbiome modifications generated during the reciprocal transplantation will allow us to document possible differential responses of the holobionts to acute and chronic stressors relative to corals not exposed to significant levels of perturbation. The development of local bio-optical models of coral calcification and the characterization of the coral holobiont will permit the distinction between the effects in calcification attributed to local turbidity from those that can be ;attributed to differences in host genotype and/or microbial community composition and function. The information recorded in coral skeletons can be used to reconstruct the rates of agricultural, industrial and urban development of Colombia through the last 5 centuries as changes in the turbidity of the effluent of the Magdalena River.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1642311

[table of contents | back to top]