Absorbance at 3 wavelengths from pigment extractions of coral Orbicella faveolata from Rosaria and Varadero reef sites, Colombia, 2016 & 2017 (Varadero Reef project)

Website: https://www.bco-dmo.org/dataset/719318
Data Type: experimental
Version: 2
Version Date: 2018-03-05

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 absorbance at 3 wavelengths from pigment extractions of coral Orbicella faveolata, the results of the preliminary analysis of the optical descriptors calculated for each coral fragment of the species Orbicella faveolata used in the transplant experiment between three 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). The tag number/color of each fragment, the date of data collection, and the sites of origin and destination are specified.

Table of Contents

Coverage

Spatial Extent: **Lat**:10.3028 **Lon**:-75.5819
Temporal Extent: 2016-10 - 2017-05

Dataset Description

This dataset contains the absorbance at D630, D663, and D750 of pigments extracted from coral Orbicella faveolata collected at Rosaria and Varadero reef sites, Colombia, Nov-Dec. 2016.

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. 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 at Rosario, a site inside a marine protected area located south-west with relatively high coral cover, is 3m and 12m.

Absorbance (D) spectra were calculated as D=log (1/R), assuming that transmission through the skeleton is negligible. Optical determinations were estimated following Shibata (1969) and Enríquez et al. (2005).

Methodology References:

- Shibata, K. 1969. Pigments and a UV-absorbing substance in corals and a blue-green alga living in the Great Barrier Reef. Plant Cell Physiol. 10: 325–335. DOI: 10.1093/oxfordjournals.pcp.a074411
- Enríquez, S., E.R. Méndez and R. Iglesias-Prieto. 2005. Multiple scattering on coral skeletons enhances light absorption by symbiotic algae. Limnol. Oceanogr., 50(4), 2005, 1025–1032. DOI: 10.4319/lo.2005.50.4.1025

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
- corrected spelling of Orbicella faveoalta to Orbicella faveolata

[table of contents | back to top]

Data Files

File	
absorbance_v2.csv	(Comma Separated Values (.csv), 17.96 KB) MD5:fb3f6393281123816447394f3953dd28
Primary data file for dataset ID 719318	

[table of contents | back to top]

Related Publications

Enríquez, S., Méndez, E. R., & -Prieto, R. I. (2005). Multiple scattering on coral skeletons enhances light absorption by symbiotic algae. Limnology and Oceanography, 50(4), 1025–1032. doi:10.4319/lo.2005.50.4.1025
Methods

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

Marsh, J. A. (1970). Primary Productivity of Reef-Building Calcareous Red Algae. Ecology, 51(2), 255–263. doi:10.2307/1933661
Methods

Pigments and a UV-absorbing substance in corals and a blue-green alga living in the Great Barrier Reef1. (1969). Plant and Cell Physiology. doi:10.1093/oxfordjournals.pcp.a074411
Methods

[table of contents | back to top]

Parameters

Parameter	Description	Units
Species	taxonomic species name	unitless
Parent_Colony_id	parent colony number	unitless
Parent_tag_color	parent colony tag color	unitless
Fragment_id	fragment number	unitless
Fragment_tag_color	fragment tag color	unitless
replicate	replicate number	unitless
Date_collected	date collected	unitless
Transplanted_from	location coral fragment was transplanted from	unitless
Transplanted_to	location coral fragment was transplanted to	unitless
D_675_nm	absorbance at 630 nm	unitless
D_663_nm	absorbance at 750 nm	unitless
D_750_nm	absorbance at 630 nm	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	mini spectrophotometer (Ocean Optics USB4000)
Generic Instrument Name	Spectrophotometer
Generic Instrument Description	An instrument used to measure the relative absorption of electromagnetic radiation of different wavelengths in the near infra-red, visible and ultraviolet wavebands by samples.

[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]