

Dissolved oxygen and temperature data from loggers deployed in Bahia Almirante (Coral microbiome resilience project)

Website: <https://www.bco-dmo.org/dataset/874724>

Data Type: Other Field Results

Version: 1

Version Date: 2022-05-23

Project

» [Collaborative Research: Biodiversity and resilience of corals and their microbiomes in response to ocean deoxygenation](#) (Coral microbiome resilience)

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Abstract

Ocean deoxygenation is a growing threat to marine life worldwide but our knowledge of oxygen dynamics in tropical coastal regions is poorly resolved. Here we provide high-resolution oxygen data for five coral reefs throughout Almirante Bay, Bocas del Toro, Panama. This current dataset includes a six-month record of hourly temperature and dissolved oxygen concentration measurements on five coral reefs, with two loggers taking data at each reef, one from a shallow (3 m) location and the other from a deeper (12 m) location. All loggers were deployed approx. 20 cm above the seafloor on concrete blocks that were nestled within the reef matrix. Preliminary data shows low oxygen values (<1.0 mg/L) occurring in all the deep sites on all the reefs except one, i.e., Hospital Point. Additionally, near anoxic oxygen conditions (> 0.3 mg/L) were measured on the Roldan Reef for approx. two weeks in February 2022. Loggers will continue to be serviced, calibrated, and maintained, and this dataset will be updated to create a three-year time-series of oxygen and temperature measurements at these tropical, coral-reef sites.

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Coverage

Spatial Extent: N:9.3484 E:-82.21741 S:9.21416 W:-82.35242

Temporal Extent: 2021-09-07 - 2022-03-22

Methods & Sampling

Methodology

OnSET HOB0 Dissolved Oxygen Loggers (Model U26-001) were calibrated with new optical caps using HOB0ware Software. Calibration included a 100% saturation point and 0% saturation point, using 0% Onset's zero-calibration solution, following the manufacturer instructions.

Loggers were deployed using Hobo Onset Shuttle and programmed to record hourly measurements. A copper antifouling cover was installed on each logger to reduce fouling. Loggers were then brought to the field sites and secured to concrete blocks on the seafloor. The face of the optical sensor was oriented to be perpendicular to the seafloor, so sediment was unable to collect on the surface.

Data were collected every 3-6 months. Sensor caps were replaced every 6 months with new, calibrated sensors.

Sampling and Analytical Procedures

Loggers measured temperature (C) and dissolved oxygen (mg/L) hourly at their deployment location.

Data Processing Description

Research Data Processing Steps:

1. Record salinity at each site during the deployment of each logger.
2. To download the data
 - Connect Logger to HOB0ware software, then select Readout data. To adjust the dissolved oxygen with the current salinity, on the readout data window, click "Process," then add salinity value previously recorded at the site that is being readout, and then click on "Create a new series". DO Adj Conc and DO Percent Sat series appear on Plot Setup. Data are visualized with the "Plot" function.
3. Export to .csv file using File > "Export Data Table".
 - Clean .csv file according to deployment time of each logger.

BCO-DMO Processing Description

- Converted dates to %Y-%M-%DT%H:%M format

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Data Files

File
874724_v1_physical_monitoring_data.csv (Comma Separated Values (.csv), 2.33 MB) MD5:77742a705452d4a74caf3e8b05ebfa8a
Primary data file for dataset ID 874724, version 1

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Supplemental Files

File
Physical_Monitoring_Calibration_Site_Log.csv (Comma Separated Values (.csv), 1.17 KB) MD5:7e1e495b9907b3b552089a6c5a4d3092
The calibration file includes the calibration date and offset for each new Onset DO logger cap that was used in the project, as well as the dates the loggers were deployed and which site/depth they were deployed at (i.e., GPS and site name).

Parameters

Parameter	Description	Units
Site	Site where the reef that the loggers were deployed on. Site locations include: Cayo Hermanas (SIS), Cayo Roldan (ROL), Seagal (SGL), Punta STRI (PST), and Hostpital Point (HOS).	units
depth	depth of logger deployment	ft
logger	logger short name	unitless
serial_number	logger serial number	unitless
date_time	Date and time in EST; %Y-%m-%dT%H:%M	unitless
do_conc	Dissolved oxygen	mg/L
temp	Water temperature	degrees Celsius
do_adj_conc	Dissolved oxygen adjusted to account for salinity	mg/L
do_percent_sat	Dissolved oxygen adjusted to account for salinity via percent saturation	unitless

Instruments

Dataset-specific Instrument Name	OnSET HOBO Dissolved Oxygen Loggers Model U26-001
Generic Instrument Name	Oxygen Sensor
Dataset-specific Description	Loggers were deployed using Hobo Onset Shuttle and programmed to record hourly measurements.
Generic Instrument Description	An electronic device that measures the proportion of oxygen (O ₂) in the gas or liquid being analyzed

Project Information

Collaborative Research: Biodiversity and resilience of corals and their microbiomes in response to ocean deoxygenation (Coral microbiome resilience)

Coverage: Caribbean Coast of Panama 9 N 82 W

NSF Award Abstract:

The world's oceans are facing the threat of deoxygenation - events of low dissolved oxygen insufficient for marine life and healthy ecosystems - which is accelerating along with other global crises including climate change and ocean acidification. The pace of these changes can lead to rapid shifts in the structure of marine communities due to changes in the distribution, abundance, and diversity of species. This collaborative project is among the first to examine the consequences of deoxygenation on coral reefs, which are sentinel ecosystems for studying ecological responses to global change because of their importance to human society, sensitivity to stress, and intricate relationships among their inhabitants. Specifically, the research team investigates why and how some coral species are more tolerant than others and the role that bacteria associated with the corals have in such tolerance. This predictive understanding is important to support

conservation and management efforts by identifying stress-tolerant coral species and establishing indicators for assessment of hypoxia stress. The project provides training for multiple undergraduate and graduate students and postdoctoral researchers. Findings from this project are disseminated through undergraduate and graduate courses taught at the University of Florida, a teacher training program at the Bocas del Toro Research Station at STRI in Panama, a workshop in Panama to build a community of scientists and informed practitioners, and webinars, toolkits, and other resources communicated through established networks of coral conservation and management practitioners.

Understanding the responses of coral reefs to ocean deoxygenation is limited to a few post hoc assessments of how unanticipated hypoxic events have impacted macrofauna. This project employs a predictive approach to examine the resilience of coral reef communities to ocean deoxygenation by examining both corals and their associated microbiomes. Complimentary manipulative laboratory and field experiments and surveys along natural gradients of hypoxic stress are being used to answer the following three fundamental questions about how variation in the tolerance of corals and their microbiomes predicts the resilience of reefs to deoxygenation: (1) How does the physiological response of the coral to hypoxia predict community shifts in the microbiome with deoxygenation? (2) To what degree do corals and their microbiomes show evidence of acclimatization to reduced oxygen, and how do these functional shifts confer increased resistance to subsequent hypoxic stress? (3) How are the feedbacks between coral hosts and their microbiomes apparent in the recovery of coral communities from hypoxia and patterns of community structure at the seascape scale? This project aims at developing a mechanistic and predictive understanding of coral reef community responses to ocean deoxygenation by examining stability and resilience at two levels of ecological organization: the assemblage of coral species at the reef scale, and the assemblage of microbes at the holobiont scale. Moreover, this study examines how those responses are coupled by feedbacks at the colony scale through coral physiological responses and microbial functional shifts.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2048955

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