

pH - Jarvis Island

Website: <https://www.bco-dmo.org/dataset/775838>

Data Type: Other Field Results

Version: 1

Version Date: 2019-10-01

Project

» [Skeletal Records of Coral Reef Bleaching in the Central Equatorial Pacific](#) (Coral Bleaching Skeletal Records)

Program

» [Paleo Perspectives on Climate Change](#) (P2C2)

Contributors	Affiliation	Role
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Abstract

This dataset contains pH measurements collected at the height of El Niño on 12-15 November 2015 and after severe El Niño conditions had subsided on 16-24 May 2016 for the west and east sides of Jarvis Island at 7-10 m depth.

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Coverage

Spatial Extent: N:-0.369 E:-159.98 S:-0.372 W:-160.008

Temporal Extent: 2015-11-12 - 2016-05-23

Dataset Description

This dataset contains pH measurements collected at the height of El Niño on 12-15 November 2015 and after severe El Niño conditions had subsided on 16-24 May 2016 for the west and east sides of Jarvis Island at 7-10 m depth.

Acquisition Description

Short-term oceanographic instrument deployments were conducted at the same sites on 12-15 November 2015 and 16-23 May 2016. Instrument package deployments included a SAMI-pH sensor (Sunburst Sensors, 15 min sampling interval), SBE-37 Microcat (Sea-Bird Electronics, 20 sec sampling interval), and dissolved oxygen sensor (RBR, 1 min sampling interval) which were affixed to the reef at 7 m (east) and 10 m (west) depth.

Samples were collected during expeditions aboard:

- R/V Machias (12–15 November 2015)
- NOAA ship Oscar Elton Sette (17–23 May 2016)

Research activities and sample collection were conducted under U.S. Fish and Wildlife Service Pacific Reefs National Wildlife Refuge Complex Research and Monitoring Special Use Permits:

- 12521-10001 (effective date: 15 Jan 2010; expiration date: 30 May 2010)
- 12521-12001 (effective date: 7 Feb 2012; expiration date: 31 Dec 2012)
- 12521-12005 (effective date: 29 Aug 2012; expiration date: 30 June 2014)
- 12521-14001 (effective date: 1 Jan 2015; expiration date: 31 Dec 2015)
- 12513-15001 (effective date: 11 Nov 2015; expiration date: 31 Dec 2015)

and in compliance with Presidential Proclamation 8336.

Processing Description

All instrument data were processed in R (version 3.0.1).

BCO-DMO processing notes:

- Added ISO datetime column for interoperability purposes

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Related Publications

Barkley, H. C., Cohen, A. L., Mollica, N. R., Brainard, R. E., Rivera, H. E., DeCarlo, T. M., ... Luu, V. H. (2018). Repeat bleaching of a central Pacific coral reef over the past six decades (1960–2016). *Communications Biology*, 1(1). doi:[10.1038/s42003-018-0183-7](https://doi.org/10.1038/s42003-018-0183-7)

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Parameters

Parameter	Description	Units
datetime_UTC	Date and time in UTC (mm/dd/yyyy hh:mm)	unitless
Latitude	Latitude of sampling location; north = positive	decimal degrees
Longitude	Longitude of sampling location; east = positive	decimal degrees
Location_Label	Location (East side or West side of Jarvis)	unitless
pH	pH	unitless
ISO_DateTime_UTC	Date/Time (UTC) ISO formatted [YYYY-mm-ddTHH:MM:SS[.xx]Z (UTC time)] - temporal precision of the dataset HH:MM	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	pH Sensor
Dataset-specific Description	SAMI-pH sensor (Sunburst Sensors, 15 min sampling interval)
Generic Instrument Description	General term for an instrument that measures the pH or how acidic or basic a solution is.

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Deployments

Machias 2015

Website	https://www.bco-dmo.org/deployment/780708
Platform	R/V Machias
Start Date	2015-11-12
End Date	2015-11-15

SE1602-02

Website	https://www.bco-dmo.org/deployment/780633
Platform	NOAA Ship Oscar Elton Sette
Start Date	2016-05-11
End Date	2016-05-31
Description	SE1602, Leg 2

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Project Information

Skeletal Records of Coral Reef Bleaching in the Central Equatorial Pacific (Coral Bleaching Skeletal Records)

Coverage: Central Equatorial Pacific

NSF abstract: Ocean warming kills corals and efforts are underway to identify and protect coral reefs that may withstand the projected 21st century rise in tropical ocean temperatures. Coral reefs in the central equatorial Pacific (CEP) have been exposed to episodes of extreme warmth every 3-7 years for centuries, if not millennia, yet remain highly productive ecosystems. Initial data obtained by the investigator from stress signatures archived in the skeletons of long lived coral species, suggests that CEP reefs lose their symbiotic algae or bleach, sometimes severely, during warm episodes. The observation that CEP reefs bleach repetitively yet remain productive implies uncommon resilience to ocean warming. The investigator will use laboratory experiments and field observations to validate skeletal records of historical bleaching. A successful outcome will provide novel and valuable insights into the resilience of the CEP reefs and a new tool with which to identify thermally tolerant coral reef ecosystems across the tropics. Additionally, this project includes mentorship of a postdoc and six undergraduate or high school students, outreach through presentations and media, and expansion of publically available software for coral stress band analysis. Ocean warming projections indicate severe impacts to coral reefs will occur on an annual basis within the next few decades.

Consequently, a coordinated effort is underway to identify reefs that might survive these changes. The investigator will test the hypothesis that such reefs exist at the epicenter of influence of the El Niño-Southern Oscillation (ENSO), where strong inter-annual temperature variability creates conditions conducive for the development of thermal resilience. The project uses laboratory-based bleaching experiments and actual stress signatures accreted by wild corals during the 2015 El Niño to validate signatures of historical bleaching archived in the skeletons of massive reef building corals. In addition the investigator will use new, long cores from the CEP to build a robust dataset of historical bleaching back to the 1800's. A successful outcome will increase confidence in the interpretation of skeletal stress bands as quantitative bleaching proxies and enable the reconstruction of the history of coral reef bleaching and recovery in the CEP.

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Program Information

Paleo Perspectives on Climate Change (P2C2)

Website: <https://www.nsf.gov/pubs/2017/nsf17582/nsf17582.htm>

NSF Synopsis of Program: The goal of research funded under the interdisciplinary P2C2 solicitation is to utilize key geological, chemical, atmospheric (gas in ice cores), and biological records of climate system variability to provide insights into the mechanisms and rate of change that characterized Earth's past climate variability, the sensitivity of Earth's climate system to changes in forcing, and the response of key components of the Earth system to these changes. Important scientific objectives of P2C2 are to: 1) provide comprehensive paleoclimate data sets that can serve as model test data sets analogous to instrumental observations; and 2) enable transformative syntheses of paleoclimate data and modeling outcomes to understand the response of the longer-term and higher magnitude variability of the climate system that is observed in the geological and cryospheric records.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1737311

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