In situ temperature measurements collected at the height of El Niño at Jarvis Island in 2015 and 2016

Website: https://www.bco-dmo.org/dataset/775839
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)

Contributors	Affiliation	Role
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Abstract
This dataset contains in situ temperature 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 in situ temperature 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.

Methods & Sampling

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.

Data 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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Data Files

File
temperature.csv (Comma Separated Values (.csv), 5.76 MB) MD5:d6096325f4e0aca841cdd37da25fa294 Primary data file for dataset ID 775839

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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
Results

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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
temperature	Temperature	degrees Celcius (°C)
ISO_DateTime_UTC	Date/Time (UTC) ISO formatted [YYYY-mm-ddTHH:MM:SS[.xx]Z (UTC time)] - temporal precision: Hours:Minutes	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	CTD Sea-Bird MicroCAT 37
Dataset-specific Description	SBE-37 Microcat (Sea-Bird Electronics, 20 sec sampling interval)
Generic Instrument Description	The Sea-Bird MicroCAT CTD unit is a high-accuracy conductivity and temperature recorder based on the Sea-Bird SBE 37 MicroCAT series of products. It can be configured with optional pressure sensor, internal batteries, memory, built-in Inductive Modem, integral Pump, and/or SBE-43 Integrated Dissolved Oxygen sensor. Constructed of titanium and other non-corroding materials for long life with minimal maintenance, the MicroCAT is designed for long duration on moorings. In a typical mooring, a modem module housed in the buoy communicates with underwater instruments and is interfaced to a computer or data logger via serial port. The computer or data logger is programmed to poll each instrument on the mooring for its data, and send the data to a telemetry transmitter (satellite link, cell phone, RF modem, etc.). The MicroCAT saves data in memory for upload after recovery, providing a data backup if real-time telemetry is interrupted.

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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 Award 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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Funding

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

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