Tissue thickness measurements from coral cores collected at Jarvis Island from 2010-2015

Website: https://www.bco-dmo.org/dataset/775832
Data Type: Other Field Results
Version: 1
Version Date: 2019-09-30

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 tissue thickness measurements for Jarvis Island coral cores from 2010-2015. Coral tissue thickness, measured as the vertical distance between the top of the core to the most recently accreted dissepiment, was measured on a slice of skeleton cut from the top of each core using a Nikon SMZ1500 stereomicroscope and SPOT imaging software.

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Coverage

Temporal Extent: 2010 - 2015

Dataset Description

These data were published in Barkley *et al.,* 2018 (Figure3).

This dataset contains tissue thickness measurements for Jarvis Island coral cores from 2010-2015. Coral tissue thickness, measured as the vertical distance between the top of the core to the most recently accreted dissepiment, was measured on a slice of skeleton cut from the top of each core using a Nikon SMZ1500 stereomicroscope and SPOT imaging software.

Methods & Sampling

Skeletal cores were collected from *Porites* coral colonies in April 2010 (n = 4), May 2012 (n = 3), September 2012 (n = 6), November 2015 (n = 16), and May 2016 (n = 1). All cores were collected from colonies at 3-17 m depth using pneumatic or hydraulic drills with diamond drill bits. Cores collected in 2010 and 2012 were sampled from healthy colonies and were between 50 and 200 cm in length. In 2015, cores were collected from bleached *Porites* colonies, and were limited to 5-10 cm length in accordance with United States Fish and Wildlife

Service permitting restrictions.

Core holes left in the coral colonies were filled with cement plugs, sealed with underwater epoxy, and secured flush with the existing colony surface. Visual inspections of coral colonies several years after coring demonstrated full recovery and complete tissue overgrowth of the cement plug.

Coral skeletal cores, were collected during expeditions aboard:

- NOAA ship Hi'ialakai (2–4 April 2010, 3–5 May 2012)
- Pangaea Exploration S/V Sea Dragon (13–16 September 2012)
- R/V Machias (12–15 November 2015)

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

Coral tissue thickness, measured as the vertical distance between the top of the core to the most recently accreted dissepiment, was measured on a slice of skeleton cut from the top of each core using a Nikon SMZ1500 stereomicroscope and SPOT imaging software.

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Data Files

File	
tissue_thickness_jarvis.csv	(Comma Separated Values (.csv), 608 bytes) MD5:303eec7033b12449c07c22403c30a8ee
Primary data file for dataset ID 775832	

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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
core_ID	unique coral core identifier	unitless
year	year of coral core collection	unitless
tissue_thickness	thickness of coral tissue layer	millimeter (mm)

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Nikon SMZ1500 stereomicroscope
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope".

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Deployments

HA1001-03

Website	https://www.bco-dmo.org/deployment/780536
Platform	R/V Hi'ialakai
Start Date	2010-03-27
End Date	2010-04-24
Description	HA1001, Leg 3

HA1201-04

Website	https://www.bco-dmo.org/deployment/780539
Platform	R/V Hi'ialakai
Start Date	2012-04-27
End Date	2012-05-24
Description	HA1201, Leg 4

SeaDragon-2012

Website	https://www.bco-dmo.org/deployment/780663
Platform	Sea Dragon
Start Date	2012-09-13
End Date	2012-10-02

Machias_2015

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

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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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