

# Tissue thickness from coral cores taken in the central equatorial Pacific

**Website:** <https://www.bco-dmo.org/dataset/773897>

**Data Type:** Other Field Results

**Version:** 1

**Version Date:** 2019-07-31

## Project

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

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## Abstract

Coral cores were collected in the central equatorial Pacific (Central Pacific Coral reefs, -5 to 5 latitude, Dongsha Atoll, Curacao, Barbados, Martinique coral reefs). The thickness of the tissue in each core was measured as an index of biomass or energetic reserve.

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## Table of Contents

- [Dataset Description](#)
    - [Methods & Sampling](#)
    - [Data Processing Description](#)
  - [Data Files](#)
  - [Related Publications](#)
  - [Parameters](#)
  - [Project Information](#)
  - [Funding](#)
- 

## Dataset Description

Coral cores were collected in the central equatorial Pacific (Central Pacific Coral reefs, -5 to 5 latitude, Dongsha Atoll, Curacao, Barbados, Martinique coral reefs). The thickness of the tissue in each core was measured as an index of biomass or energetic reserve.

## Methods & Sampling

These data were published in Mollica *et al.*, 2019

All cores were collected and analyzed using the same methods. Only live colonies were cored, establishing the top age, vertically i.e., parallel to the upward growth axis, and using either a pneumatic drill fitted with 3-cm diameter diamond tip coring bit or an hydraulic drill fitted with an 8-cm diameter bit. Core holes were sealed with a cement cap and underwater epoxy, secured flush with the colony surface to facilitate overgrowth of tissue and wound closure (e.g. Matson 2011), a 6 to 36-month process depending on the rate of coral growth and diameter of core. All cores were first air dried in the field, then oven dried at 60 deg C.

Location: Central Pacific Coral reefs, -5 to 5 latitude, Dongsha Atoll, Curacao, Barbados, Martinique coral reefs.

## Data Processing Description

The thickness of the tissue in each core was measured as an index of biomass or energetic reserve. The

vertical distance between the top of the core and the topmost dissepiment upon which the base of the tissue rests (e.g. Barnes and Lough 1992) was measured on a cut slab using a Nikon SMZ1500 stereomicroscope and SPOT imaging software (e.g. Barkley et al. 2018).

BCO-DMO Processing notes:

- Modified parameter names to conform with BCO-DMO naming conventions

[ [table of contents](#) | [back to top](#) ]

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## Data Files

File
<b>tissue_thickness.csv</b> (Comma Separated Values (.csv), 430 bytes) MD5:ed62ca590ae0babd5b06fed08321d945
Primary data file for dataset ID 773897

[ [table of contents](#) | [back to top](#) ]

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## Related Publications

Barnes, D. J., & Lough, J. M. (1992). Systematic variations in the depth of skeleton occupied by coral tissue in massive colonies of *Porites* from the Great barrier reef. *Journal of Experimental Marine Biology and Ecology*, 159(1), 113-128. doi:[10.1016/0022-0981\(92\)90261-8](https://doi.org/10.1016/0022-0981(92)90261-8)  
*Methods*

Matson, E.G. (2011). Core Plugs. In Hopley, D. (Ed.), *Encyclopedia of Modern Coral Reefs* (pp.294-296)Dordrecht: Springer. DOI:[10.1007/978-90-481-2639-2](https://doi.org/10.1007/978-90-481-2639-2)  
*Methods*

Mollica, N. R., Cohen, A. L., Alpert, A. E., Barkley, H. C., Brainard, R. E., Carilli, J. E., ... Young, C. W. (2019). Skeletal records of bleaching reveal different thermal thresholds of Pacific coral reef assemblages. *Coral Reefs*. doi:[10.1007/s00338-019-01803-x](https://doi.org/10.1007/s00338-019-01803-x)  
*Results*

[ [table of contents](#) | [back to top](#) ]

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## Parameters

Parameter	Description	Units
ENSO_State	State of the El Niño-Southern Oscillation	unitless
Island	Island of coral sampling	unitless
Tissue_Thickness	Tissue thickness	millimeter (mm)
Standard_Error	standard error	unitless

[ [table of contents](#) | [back to top](#) ]

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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.

[ [table of contents](#) | [back to top](#) ]

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## **Funding**

<b>Funding Source</b>	<b>Award</b>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1737311</a>

[ [table of contents](#) | [back to top](#) ]