# Annual calcification rate time series of Porites corals on Dongsha Atoll

**Website**: https://www.bco-dmo.org/dataset/687887
**Data Type**: Other Field Results
**Version**: 1
**Version Date**: 2017-04-19

**Project**
» Can Coral Reefs in the Central Pacific Survive Ocean Warming? A 2015 El Nino Test (Coral Reef Resilience)

| Contributors | Affiliation | Role |
|---|---|---|
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**Abstract**
Annual calcification rate time series of Porites corals on Dongsha Atoll.

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## Coverage

**Spatial Extent**: **Lat**:20.8 **Lon**:116.7

## Dataset Description

Annual calcification rate time series of Porites corals on Dongsha Atoll (20.8 N 116.7 E).

**Related publications:**
DeCarlo T.M., Cohen A.L., Wong G.T.F., Davis K.A., Lohmann P., & K. Soong (2017). Mass coral mortality under local amplification of 2 °C ocean warming. *Scientific Reports* 7, 44586. doi:10.1038/srep44586

### Methods & Sampling

Coral skeletal cores were collected from massive Porites colonies using underwater pneumatic drills with 3 cm diameter drill bits. The cores were scanned at Woods Hole Oceanographic Institution Computerized Scanning and Imaging Facility and skeletal density was calculated by comparison to previously calibrated coral skeletal density standards.

### Data Processing Description

Annual calcification rates were calculated using the software program coralCT and the mean calcification rate was calculated for 2007-2012, the years that are overlapping among all colonies. Stress bands were identified visually from coral CT scans.

**Reference:**
DeCarlo T.M. and Cohen A.L. (2016) coralCT: software tool to analyze computerized tomography (CT) scans of coral skeletal cores for calcification and bioerosion rates. Zenodo. https://zenodo.org/record/57855 doi:10.5281/zenodo.57855

**BCO-DMO Processing:**
- transposed data so sample data are in columns;
- replaced commas with semi-colons; added underscores (in stress_bands column);
- added location name and lat/lon from metadata file.

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## Data Files

| File |
|---|
| **Dongsha_calcification.csv** (Comma Separated Values (.csv), 69.29 KB) MD5:dc42d0a1da5803412e47ec04b1148931<br>Primary data file for dataset ID 687887 |

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## Related Publications

DeCarlo, T. M., & Cohen, A. L. (2016, July 14). Coralct: Software Tool To Analyze Computerized Tomography (Ct) Scans Of Coral Skeletal Cores For Calcification And Bioerosion Rates (Version 1.1). Zenodo. https://doi.org/10.5281/zenodo.57855
*Methods*

DeCarlo, T. M., Cohen, A. L., Wong, G. T. F., Davis, K. A., Lohmann, P., & Soong, K. (2017). Mass coral mortality under local amplification of 2 °C ocean warming. Scientific Reports, 7(1). doi:10.1038/srep44586
*General*

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| location | Name of area of study | unitless |
| lat | Latitude of study site | decimal degrees |
| lon | Longitude of study site | decimal degrees |
| core_id | Identification number of coral core | unitless |
| status_July_2015 | Status of colony in July 2015: "bleached" / "dead" / "alive, pigmented" | unitless |
| stress_bands | Years with identified stress bands | unitless |
| year | 4-digit calendar year for which calcification rate was determined | unitless |
| calcification_rate | Annual calcification rate | grams per centimeter per year (g cm-2 yr-1) |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | underwater pneumatic drills |
| **Generic Instrument Name** | Manual Biota Sampler |
| **Dataset-specific Description** | Coral skeletal cores were collected from massive Porites colonies using underwater pneumatic drills with 3 cm diameter drill bits. |
| **Generic Instrument Description** | "Manual Biota Sampler" indicates that a sample was collected in situ by a person, possibly using a hand-held collection device such as a jar, a net, or their hands. This term could also refer to a simple tool like a hammer, saw, or other hand-held tool. |

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## Deployments

### Cohen_2013-15

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/560664 |
| **Platform** | Dongsha_Atoll |
| **Start Date** | 2013-06-20 |
| **End Date** | 2015-08-03 |
| **Description** | Various coral reef studies conducted at Dongsha Atoll during 2013-2015. |

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## Project Information

**Can Coral Reefs in the Central Pacific Survive Ocean Warming? A 2015 El Nino Test (Coral Reef Resilience)**

**Coverage**: Central Tropical Pacific

This project supports a 7 day expedition to the heart of the central tropical Pacific during a particularly strong El Niño event, arguably one of the strongest on record. The target is Jarvis Island, located in the path of the cool, nutrient-rich Equatorial Under-Current (EUC). As a consequence of its location, Jarvis, a pristine, uninhabited coral reef ecosystem, is characterized by enhanced productivity, high densities of large predatory fish, turtles, corals and other sea life. However, sea surface temperatures on Jarvis are currently 3.9 degrees Celsius higher than normal for this time of year, due to El Niño. This provides investigators with a unique opportunity to examine how a highly productive reef ecosystem responds to ocean warming, and the mechanisms and timescales for recovery. Information will be collected by deploying state-of-the-art instrumentation on the reef, and sampling seawater, particulates, plankton and corals from surface to 150 meters depth. This will be the first expedition to Jarvis Island during a bleaching event. The US Pacific Remote Island Marine National Monument (PRIMNM) was recently expanded as part of a multi-national commitment to protect and preserve vast areas of our ocean and ocean resources for future generations. However, these protections do not shield ocean ecosystems from the impacts of 21st century climate change. The project investigates the potential for simultaneous changes in equatorial ocean circulation to lessen the impacts of the global warming for equatorial reefs. It tests hypotheses that improve understanding of fundamental mechanisms of coral reef resilience to climate change, and the ability to identify such reef systems for inclusion in Protected Area Networks. The cruise supports the training of four PhD students, three of whom are National Science Foundation / National Defense Science and Engineering graduate research fellows, and provide material in support of six PhD theses. Results will be shared at international meetings and workshops, and published in peer-reviewed journals. All data collected and generated from the cruise will be made publicly available via the Biological and Chemical Oceanography Data Management Office.

Global climate models project enhanced warming of the central tropical Pacific over this century. By implication, waters bathing five out of the seven coral reef ecosystems protected within the recently expanded PRIMNM, will warm by more than 3 degrees Celsius. This rate of warming far exceeds the known thermal tolerances of reef-building corals, fueling concerns that these reefs may not survive 21st century climate change. However the same models project a concurrent strengthening of the EUC, a projection supported by observations. The EUC carries cool, nutrient-rich waters that upwell on the west sides of the equatorial islands, cooling the reefs and enhancing productivity locally. If the GCM projections are realized, a strengthening EUC could modulate the impact of ocean warming for these reefs by reducing the rate of warming and supporting energetically replete coral communities that survive bleaching. This proposal exploits the current El Niño state of the tropical Pacific to test the following hypotheses: (1) Coral communities bathed in the nutrient-rich, productive waters of the central equatorial Pacific bleach during every El Niño, but mortality is low and as a result, percent live cover remains high. (2) Localized EUC-enhanced productivity supports nutritionally replete coral communities, which metabolize existing lipid reserves to support energetic requirements during bleaching. (3) In addition, equatorial corals adopt a flexible feeding strategy, switching from direct nitrate uptake during nitrogen-rich (greater than 5 micromolar nitrate) La Niña conditions to heterotrophic feeding during nitrogen-"poor" (less than 3 micromolar nitrate) El Niño conditions. We propose that, fueled by exogenous sources, equatorial Pacific coral communities survive bleaching with limited mortality, coral cover remains high and coral growth rates quickly recover. If data generated under this project support our hypotheses, then the combination of oceanographic and political protections could maximize the potential for coral reef survival through the 21st century.

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## Funding


| Funding Source | Award |
| --- | --- |
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1605365 |


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