Dissepiment spacing in Porites corals from Palmyra Atoll and Airai Bay, Palau

Website: https://www.bco-dmo.org/dataset/688052
Data Type: Other Field Results
Version: 1
Version Date: 2017-04-21

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

Contributors	Affiliation	Role
Cohen, Anne L.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Dissepiment spacing in Porites corals from Palmyra Atoll and Airai Bay, Palau.

Table of Contents

Coverage

Spatial Extent: **N**:7.3321 **E**:-162.1095 **S**:5.8664 **W**:134.5602
Temporal Extent: 1997-02-08 - 2010-04-01

Dataset Description

Dissepiment spacing in Porites corals.

See related dataset for coral dissepiment counts (https://www.bco-dmo.org/dataset/688125).

Related publications:
DeCarlo T.M. & A.L. Cohen (2017). Dissepiments, density bands and signatures of thermal stress in *Porites* skeletons. *Coral Reefs*. doi:10.1007/s00338-017-1566-9

Methods & Sampling

Dissepiment mapping was conducted on two Porites corals from the southern fore reef of Palmyra Atoll (5.866N, 162.109W) in the central Pacific Ocean. These two corals were selected for dissepiment analysis because even though they were collected within 5 m of each other and at the same depth (13 m), one coral has exceptionally clear density banding while the other coral has almost no visible banding pattern. An additional coral from Palau was also used for dissepiment spacing measurements. This core was collected from a colony in Airai Bay (7.329N, 134.557E) and drilled to a depth of 30 cm into the skeleton.

Dissepiment spacing was measured in cores from Palau and Palmyra Atoll. Skeletal cores collected from live colonies were sectioned and polished, and dissepiments were visualized under a microscope with an automated stage.

See related dataset for coral dissepiment counts (https://www.bco-dmo.org/dataset/688125).

Data Processing Description

Dissepiment spacing was measured with ImageJ software.

[table of contents | back to top]

Data Files

File
coral_dissepiments.csv (Comma Separated Values (.csv), 11.52 KB) MD5:e5a36bc95df71df778aa80cf0ff1e860 Primary data file for dataset ID 688052

[table of contents | back to top]

Related Publications

DeCarlo, T. M., & Cohen, A. L. (2017). Dissepiments, density bands and signatures of thermal stress in Porites skeletons. Coral Reefs, 36(3), 749–761. doi:10.1007/s00338-017-1566-9
General

[table of contents | back to top]

Parameters

Parameter	Description	Units
site	Name of study site	unitless
lat	Latitude of study site	decimal degrees
lon	Longitude of study site	decimal degrees
ISO_DateTime_UTC	Date and time formatted to ISO 8601 standard, where T represents the start of the time string and Z indicates UTC. Format: YYYY-mm-ddTHH:MM:SS.ssZ	unitless
dissepiment_spacing	Spacing between consecutive dissepiments	millimeters (mm)
dataset	Name of the time series	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Dissepiments were visualized under a microscope with an automated stage.
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".

[table of contents | back to top]

Deployments

lab_Cohen_deCarlo

Website	https://www.bco-dmo.org/deployment/542436
Platform	WHOI
Start Date	2011-09-01
End Date	2012-03-31
Description	Coral skeleton cores were collected in the Tropical Pacific Ocean and analyzed in the lab. Seawater samples were collected.

[table of contents | back to top]

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.

[table of contents | back to top]

Funding

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

[table of contents | back to top]