Dissepiment counts obtained from staining experiment of Porites coral from Palau

Website: https://www.bco-dmo.org/dataset/688125
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 counts obtained from staining experiment of Porites coral from Palau.

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Coverage

Spatial Extent: **N**:7.323 **E**:134.521 **S**:7.267 **W**:134.494
Temporal Extent: 2013-11-04 - 2015-01-10

Dataset Description

Dissepiment counts obtained from staining experiment of Porites coral from Palau.

See related dataset for coral dissepiment spacing (https://www.bco-dmo.org/dataset/688052).

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

During 27–28 April 2013, twenty Porites colonies living at 1–5 m depths in the Republic of Palau were stained with alizarin red-S dye. We stained 20 colonies, 10 each in Nikko Bay (7.323N, 134.494E) and on Uchelbeluu reef (7.267N, 134.521E). Ten of the 20 colonies initially stained were located during subsequent sampling expeditions but we were unable to locate the ten remaining colonies, likely because either the tags or the colonies themselves were dislodged during storms. The skeletons of nine of the 20 stained colonies were located and sampled twice, on 4 November 2013 and 9–10 January 2015, to measure the number of dissepiments formed over time.

Dissepiments were counted in stained *Porites* corals to determine the frequency of dissepiment formation. Skeletal cores were extracted from living colonies previously stained with alizarin dye. The cores were sectioned and polished, and dissepiments were counted from microscope images.

See related dataset for coral dissepiment spacing (https://www.bco-dmo.org/dataset/688052).

Data Processing Description

BCO-DMO Processing:
- transposed data from rows to columns;
- replaced spaces in site names with underscores;
- obtained lat and lon of sites from related publication and added to dataset.

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Data Files

File
Palau_staining_exp.csv (Comma Separated Values (.csv), 622 bytes) MD5:be93f2ac6bae189318ba5e874cc3ae46 Primary data file for dataset ID 688125

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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

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Parameters

Parameter	Description	Units
coral_id	Identification number of coral colony	unitless
site	Name of study site	unitless
lat	Latitude of study site	decimal degrees
lon	Longitude of study site	decimal degrees
density	Coral skeletal density	grams per cubic centimeter (g cm-3)
extension	Coral skeletal extension rate	centimeters per year (cm yr-1)
calcification	Coral calcification rate	grams per square centimeter per year (g cm-2 yr-1)
tissue_layer	Coral tissue layer thickness	millimeters (mm)
dissepiments_11_2013	Dissepiments above stain Nov. 2013	unitless (counts)
dissepiments_01_2015	Dissepiments above stain Jan. 2015	unitless (counts)
dissepiments_formed	Dissepiments formed Nov. 2013 to Jan. 2015	unitless (counts)

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	The cores were sectioned and polished, and dissepiments were counted from microscope images.
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

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.

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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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