Results of the quantification of symbiont cell numbers from 400 Acropora hyacinthus colonies subjected to experimental bleaching in the summer of 2018 in Palau.

Website: https://www.bco-dmo.org/dataset/813187
Data Type: experimental
Version: 1
Version Date: 2020-06-23

Project
» Predicting the global location of heat tolerant corals: Palau patch reefs as a general model (Heat Tolerant Corals)

Contributors	Affiliation	Role
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Abstract
Results of the quantification of symbiont cell numbers from 400 Acropora hyacinthus colonies subjected to experimental bleaching in the summer of 2018 in Palau.

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Coverage

Spatial Extent: **N**:7.92908 **E**:134.66061 **S**:7.20388 **W**:134.21919
Temporal Extent: 2018-07-19 - 2018-08-11

Methods & Sampling

The samples that were analyzed for this study are 400 colonies of Acropora hyacinthus. Nubbins from each colony were experimentally bleached at temperatures of 34, 34.5 and 35 degrees Celsius as well as two control treatments (30 deg. C). Experimental bleaching treatments lasted for 3 hours a day for 2 days (a total of 6 hours). Nubbins from each colony were assessed at the beginning of the experiment before bleaching stress (Day 0), as well as on the subsequent 2 days. Tissue from each colony was preserved for later analysis.

Colonies were sampled from 40 reefs (10 colonies per reef) across the Palauan archipelago. These colonies are tagged and their locations are recorded by GPS. We sampled each colony using garden clippers to break off 5 nubbins that we transported back to the Palau International Coral Reef Center where they were subjected to the experimental procedures outlined above.

Data Processing Description

BCO-DMO Data Manager Processing Notes:
* added a conventional header with dataset name, PI name, version date

* modified parameter names to conform with BCO-DMO naming conventions
* removed Ramp_Started_Day_1 column which contained no data at submitter request.
* converted dates to ISO format.
* Renamed column headers and set types
* blank values in this dataset are displayed as "nd" for "no data." nd is the default missing data identifier in the BCO-DMO system.

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Data Files

File
bleaching.csv (Comma Separated Values (.csv), 218.13 KB) MD5:f7fa3198d2f50db3624a768d3418cefa Primary data file for dataset ID 813187

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Parameters

Parameter	Description	Units
Tank_Number	Tank Number	dimensionless
Cycle_Number	Experimental Round	dimensionless
Date_Collected	Date Collected in the format YYYY-MM-DD	unitless
Reef	Reef Number	dimensionless
Temperature	Temperature Treatment	degrees Celsius
Colony_Number	Colony Number	dimensionless
Day	Day of Experiment that Colony was Assessed (0,1 or 2)	dimensionless
Score	Visual Score - N (None), V (Visual), M (Moderate), S (Severe), T (Total), corals falling in between scores were given intermediate scores (e.g. V/M)	text
Scorer_1	Initials of Scorer 1	unitless
Scorer_2	Initials of Scorer 2	unitless
Scorer_3	Initials of Scorer 3 (if applicable)	unitless

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Project Information

Predicting the global location of heat tolerant corals: Palau patch reefs as a general model (Heat Tolerant Corals)

Coverage: Palau

NSF Award Abstract:
When coral reefs heat up just a few degrees above normal summer temperatures, a reaction called coral bleaching can occur in which single celled plants living inside coral cells are expelled. The coral turns from its normal tan color to bleached white, and because it is deprived of the normal food supply from its plant partner, most of these corals die. Yet, some corals naturally can survive high temperatures that cause others in the same species to bleach. Identifying where these heat tolerant corals are common would provide a general tool for protecting and restoring heat tolerant reefs. The investigators will conduct experiments on 30 patch reefs in Palau of very different sizes in two lagoons, record local temperatures for 400 corals, and test coral heat tolerance using a newly designed coral stress tank. Because large patch reefs generally heat up during daytime low tides, The investigators hypothesize that they are commonly home to heat resistant corals. They will also move heat tolerant corals to cooler locations to test the stability of heat resistance among corals. The stress tank technologies can be widely used in remote settings, and will provide a set of generalizable, practical tools for communities and managers to find and protect heat tolerant corals in reefs around the world. The work will advance undergraduate STEM education in California and Palau. A partnership with the Palau Community College will facilitate the engagement of Pacific Island communities and students. Students will receive interdisciplinary training in field research, genomics and bioinformatics and learn practical skills that will enable them to collect and interpret stress tank and temperature data. Broader outreach efforts will include the production and dissemination of a series of microdocumentaries and blog posts designed to bring the concept of a world-wide search for heat tolerant corals to a global audience.

Previous coral reef research has demonstrated that periodic high water temperatures can induce high heat tolerance in reef building corals through a combination of acclimation and selection at many genetic loci. Key questions include whether these kinds of heat tolerant habitats are common or rare, and whether their locations can be predicted by identifying coral reefs where daily temperature spikes regularly occur at low tide. This project will examine heat tolerance of 400 corals in the Acropora hyacinthus species complex across 30 patch reefs in Palau that experience variable temperature and flow profiles. This study will utilize a variety of methods to characterize spatial and temporal patterns of heat tolerance including: (1) the development of low-cost, portable heat stress tanks to quickly and affordably assess in situ conditions, (2) genomic assays of physiological condition to identify the genes and gene expression mechanisms that are responsible for heat tolerance, (3) high resolution temperature mapping to trace the role of temperature variation in producing stable, high temperature tolerance in reef building corals, and (4) reciprocal transplant experiments to evaluate whether heat resistant corals retain heat resistance when moved to cooler locations. This research will expand the geographic map of habitats with known heat tolerance, and expedite the ability to locate coral populations that may be most resistant to future ocean warming.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1736736

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