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/813210
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 - 2018-08

Methods & Sampling

These samples were collected according to the protocol published by Krediet et al. 2015: Article Rapid, Precise, and Accurate Counts of Symbiodinium Cells Using the Guava Flow Cytometer, and a Comparison to Other Methods

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). These nubbins were then airbrushed and the resulting tissue slurry was preserved in RNAlater. Tissue dissociation and preparation for analysis on the Guava EasyCyte flow cytometer followed the protocol by Krediet et al. 2015.

Procedures followed Krediet et al. 2015 (above), with the exception that protein concentration was not measured.

Data Processing Description

All data were processed with the software accompanying the Guava easyCyte flow cytometer.

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
* Renamed column headers and set types
* rounded decimal numbers to precision of 2
* 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
flowcyt.csv (Comma Separated Values (.csv), 450.49 KB) MD5:a682b435b2b69a8a8103be1f515b0edc Primary data file for dataset ID 813210

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Related Publications

Krediet, C. J., DeNofrio, J. C., Caruso, C., Burriesci, M. S., Cella, K., & Pringle, J. R. (2015). Rapid, Precise, and Accurate Counts of Symbiodinium Cells Using the Guava Flow Cytometer, and a Comparison to Other Methods. PLOS ONE, 10(8), e0135725. doi:10.1371/journal.pone.0135725
Methods

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Parameters

Parameter	Description	Units
Sample	Colony Number	dimensionless
Treatment	Treatment (C1 and C2 are control), all others are heat stress	unitless
Temperature	Specific Temperature treatment	degrees Celsius
Sample_ID	Unique sample ID (technical replicates have the same SampleID)	dimensionless
ALLEVENTS_Conc	Concentration (cells/ml) of events above gating threshold	cells/ml
SYMBIODINIUM_Conc	Concentration (cells/ml) of events above gating threshold that are also above the symbiodinium gating threshold	cells/ml
Number_of_Events	Number of events counted (max 5000)	unitless
Cell_Count	Concentration (cells/ul) of events above gating threshold	cells/ul
Total_Volume	Total volume of sample measured in microliters	microliters
Acquisition_Time	Total acquisition time on instrument in seconds	seconds
Negative_Total_Count	Number of events above gating threshold in negative control	various
Negative_Events	Concentration of cells (cells/ml) in negative control above gating threshold	cells/ml
Negative_Sym_Conc	Concentration of symbiont cells in negative control above gating threshold	various
Negative_Cells	Concentration of cells (cells/ul) in negative control above gating threshold	cell/ul
Negative_Total_Vol	Total volume of negative control measured in microliters	microliters
Negative_Acquisition_Time	Total acquisistion time on instrument for negative control in seconds	seconds

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Instruments

Dataset-specific Instrument Name	Guava easyCyte HT 2-laser flow cytometer (Millipore)
Generic Instrument Name	Flow Cytometer
Generic Instrument Description	Flow cytometers (FC or FCM) are automated instruments that quantitate properties of single cells, one cell at a time. They can measure cell size, cell granularity, the amounts of cell components such as total DNA, newly synthesized DNA, gene expression as the amount messenger RNA for a particular gene, amounts of specific surface receptors, amounts of intracellular proteins, or transient signalling events in living cells. (from: http://www.bio.umass.edu/micro/immunology/facs542/facswhat.htm)

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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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