Experimental results on coral reef CO2 bleaching recovery in Florida during 2015 (Reef coral symbioses project)

Website: https://www.bco-dmo.org/dataset/616009
Data Type: experimental
Version: 2015-10-15

Project
» New insights into the response of reef corals to climate change using the symbiont to host cell ratio as a metric of bleaching susceptibility (Reef coral symbioses)

Contributors	Affiliation	Role
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Table of Contents

Dataset Description

Tissue biopsies were taken from control and bleached corals of *Montastraea cavernosa* during ~5 months of bleaching and recovery under two pCO2 levels. This experimental study was undertaken in tanks at the University of Miami.

Sample collection metadata is reported here. However, access to the samples themselves will be restricted until analysis is completed, typically within 2 years of collection.

Methods & Sampling

Coral tissue biopsies were taken from replicate, one-inch cores of *Montastraea cavernosa* as small scrapings along a polyp's calyx wall using a razor blade. The samples were immediately placed into 300uL of 1% SDS in DNA Buffer in 1.5mL Eppendorf tubes and heated to 65°C for one hour, where they are now stable at room temperature. Small aliquots of this lysate are then removed for DNA extraction on as as-needed basis.

We retain archived lysates (consisting of SDS-lysed tissue and a small piece of skeleton) that are stable long-term (>18 years) at room temperature.

Data for this project will ultimately include symbiont:host cell ratios for these samples using a variety of Symbiodinium clade-specific probes. In addition, data may also include the results of ITS2 genotyping using Denaturing Gradient Gel Electrophoresis (DGGE). Additional data, such as environmental data collected by dataloggers during experiments or field deployments, may also be contributed.

Data Processing Description

These samples are currently being extracted and analyzed.

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- reformatted dates from m/d/y to yyyy-mm-dd
- changed NA to nd

[table of contents | back to top]

Data Files

File
CO2_meta.csv (Comma Separated Values (.csv), 14.38 KB) MD5:8dc930466ece1e584922e691dc0dea4a Primary data file for dataset ID 616009

[table of contents | back to top]

Parameters

Parameter	Description	Units
treatment	either control or bleached coral tissue	unitless
sample	sample identification	unitless
CO2_level	pCO2 level: control of	unitless
tank	tank number	unitless
start_date	start date	yyyy-mm-dd
t_1	time 1 date post-bleaching	yyyy-mm-dd
t_2	time 2 date post-bleaching	yyyy-mm-dd
t_3	time 3 date post-bleaching	yyyy-mm-dd
t_4	time 4 date post-bleaching	yyyy-mm-dd

[table of contents | back to top]

Deployments

Baker_lab_2015

Website	https://www.bco-dmo.org/deployment/616016
Platform	UM-RSMAS
Start Date	2015-04-04
End Date	2015-09-01
Description	Coral studies

[table of contents | back to top]

Project Information

New insights into the response of reef corals to climate change using the symbiont to host cell ratio as a metric of bleaching susceptibility (Reef coral symbioses)

Coverage: Miami, Florida

Description from NSF award abstract:
The long-term future of reef ecosystems depends on the continued persistence of corals as essential habitat builders. Environmental threats facing coral reefs globally include chronic and acute thermal stress (which can result in "coral bleaching" as a result of the expulsion of their symbiotic algae), increasing CO2, and nutrient pollution. This project will assess the independent and interactive effects of these stressors using a new molecular based technique showing that coral bleaching susceptibility depends on the symbiont:host (S:H) cell ratio in coral tissues. Corals with higher ratios (more symbionts) are predicted to be more susceptible to thermal stress, suggesting that abiotic factors that affect symbiont densities can directly influence thermal tolerance. This new metric of symbiont density is of physiological relevance and has already revealed patterns that differ from currently used metrics, thus providing new insights into the dynamics of these symbioses. This project will also continue the development and application of these methods to further our understanding of the ecology of coral-algal symbioses, while helping to elucidate the responses of these critical ecosystem engineers to complex changes in their environment. The proposed activities will help us understand how tradeoffs in the regulation of symbiotic partners respond to the environment and relate to the differential susceptibility of corals to environmental stress.

From project proposal:
In the laboratory, we will experimentally test the effects of light, temperature, nutrients, and CO2 on the S:H cell ratio in five coral species from the Caribbean and Indo-Pacific. We will then expose these corals to thermal stress to test whether conditions which elevate the S:H ratio, such as elevated nutrients, also increase coral susceptibility to bleaching. We will also test whether conditions which decrease the ratio, such as elevated CO2, decrease bleaching susceptibility. We further hypothesize that higher S:H cell ratios result in higher levels of oxidative stress when exposed to bleaching stressors, and will test this in collaboration with a leading scientist in coral immunity. Complementing these laboratory experiments, we will also assess the degree of spatial and temporal variability in S:H ratios in the field by monitoring seasonal changes at several sites in the northern Florida Keys, and in a new educational coral nursery at the University of Miami's field station on Broad Key. In addition, we will also apply our molecular assay to existing long-term datasets in order to further test these hypotheses in a collaborative, cost-effective way.

These combined activities will help us understand how tradeoffs in symbiosis are regulated in response to the environment. By identifying the links between environment, S:H cell ratios, and stress susceptibility, we will be better able to understand and predict coral bleaching and mortality in response to climate change, while addressing the critical question of why there is so much variability in bleaching susceptibility among corals in space and time. Testing the hypothesis that the S:H ratio drives bleaching susceptibility may help us properly interpret a large body of previous and ongoing work testing the interactive effects of multiple stressors on corals.

Project-related links:
The Coral Reef Conservation Research Lab
Additional information about Dr. Andrew Baker

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1358699

[table of contents | back to top]