Traits of five Symbiodinium genotypes measured at three different nitrogen levels

Website: https://www.bco-dmo.org/dataset/738228
Data Type: experimental
Version: 1
Version Date: 2018-05-23

Project
» RUI: Collaborative Research: Genetic variation as a driver of host and symbiont response to increased temperature on coral reefs (Host Symbiont Temp Response)

Contributors	Affiliation	Role
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Abstract
Replicates of each Symbiodinium genotype were grown in low (25mg/L), medium (75mg/L), or high (150mg/L) nitrogen environments, after which were measured physiological parameters, including the number of cells, quantum yield, variable fluorescence, and chlorophyll content.

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Coverage

Spatial Extent: **N**:25.1326 **E**:-80.26195 **S**:24.54955 **W**:-81.75458
Temporal Extent: 2016-01-03 - 2016-02-28

Dataset Description

Replicates of each Symbiodinium genotype were grown in low (25mg/L), medium (75mg/L), or high (150mg/L) nitrogen environments, after which were measured physiological parameters, including the number of cells, quantum yield, variable fluorescence, and chlorophyll content.

Methods & Sampling

Cultures initially isolated from Antillogorgia bipinnata coral colonies collected at Looe Key (N 24° 32.973' W 81° 22.849; cultures 08-0689.4, 08-0689.6, 08-0691.1) in 2008 and the middle keys new Tennessee Reef (N 24° 45.150' W 81° 45.275'; cultures 13-121, 13-126) in 2013. Culture isolations were performed in the Coffroth lab, University at Buffalo. Physiological measurements were measured in the terHorst lab, California State University, Northridge. Quantum yield and fluorescence yield were measured in an AquaPen-C (Photon Systems Instruments). Chlorophyll concentration was quantified in a Triology Fluorometer. Culture growth

rates were quantified by visual counts under a microscope at the beginning and end of the experiment. See Bayliss et al (2019) for further details and results.

Data Processing Description

BCO-DMO Processing notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions

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Data Files

File	
genotypes_nitrogen.csv	(Comma Separated Values (.csv), 2.77 KB) MD5:48fed25fc13fd427a8bc1d5ff499a6e4
Primary data file for dataset ID 738228	

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Related Publications

Bayliss, S. L. J., Scott, Z. R., Coffroth, M. A., & terHorst, C. P. (2019). Genetic variation in Breviolum antillogorgium, a coral reef symbiont, in response to temperature and nutrients. Ecology and Evolution, 9(5), 2803–2813. doi:10.1002/ece3.4959
Results

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Parameters

Parameter	Description	Units
Genotype	Genetic idenetifier	unitless
Ntreatment	Nitrogen level	unitless
Growthrate	Population growth rate	cells/day
QY	Quantum Yield	unitless ratio
Vfl	Variable Fluorescence	unitless
Chla	Total Chlorophyll per sample	Relative Fluorescence Units
Chlapercell	Chlorophll per cell	Relative Fluorescence Units
lncells	Log of Cell Count	Ln(#cells)

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Instruments

Dataset-specific Instrument Name	microscope
Generic Instrument Name	Fluorescence Microscope
Dataset-specific Description	Used to count cells for growth rate calculations.
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of fluorescence and phosphorescence instead of, or in addition to, reflection and absorption of visible light. Includes conventional and inverted instruments.

Dataset-specific Instrument Name	Trilogy Laboratory Fluorometer
Generic Instrument Name	Fluorometer
Dataset-specific Description	Used to measure chlorophyll concentrations.
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

Dataset-specific Instrument Name	AquaPen-C (Photon Systems Instruments)
Generic Instrument Name	Fluorometer
Dataset-specific Description	Used to measure quantum yield and fluorescence yield.
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

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Deployments

Coffroth_2016

Website	https://www.bco-dmo.org/deployment/683693
Platform	SUNY-Buffalo
Start Date	2016-08-25
End Date	2016-10-23

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Project Information

RUI: Collaborative Research: Genetic variation as a driver of host and symbiont response to increased temperature on coral reefs (Host Symbiont Temp Response)

Coverage: Florida Keys, Caribbean

Description from NSF award abstract:

Description from NSF award abstract:
On coral reefs, mutualisms with single celled algae (Symbiodinium) and reef species literally and figuratively form the foundation of reef ecosystems. Coral reefs are among the most threatened ecosystems under a changing climate and are rapidly declining due to increasing levels of environmental stress, namely increased temperatures. Climate change is resulting in even warmer ocean temperatures that threaten associations between Symbiodinium and their hosts. In this project the investigators examine the genetic diversity of Symbiodinium and the potential for this important species to evolve in response to temperature. The project will also address whether the ecological and evolutionary dynamics of the Symbiodinium population affect the performance of their host. If so, this suggests that the evolution of microscopic organisms with short generation times could confer adaptation to longer-lived host species on ecologically and economically vital coral reefs. Given that diversity is already being lost on many reefs, considering how evolutionary changes in Symbiodinium will affect reef species is crucial for predicting the responses of reefs to future climate change. This project provides training for two graduate students and several undergraduates at a Hispanic-serving institution. This work includes outreach to the students and the general public through the Aquarium of Niagara, local K-12 schools, and web-based education modules.

The effects of evolution on contemporary ecological processes are at the forefront of research in evolutionary ecology. This project will answer the call for experiments elucidating the effects of genetic variation in Symbiodinium performance and the effect on the response of the holobiont (host and symbiont) to increased temperature. These experiments examine the effects of temperature through both ecological and evolutionary mechanisms and will determine the relative importance of adaptation and acclimatization in replicated experimental populations. The investigators will examine how genetic variation within a species (Symbiodinium antillogorgium) affects symbiont performance in culture and in the host and how this affects the response of the holobiont to increased temperature. Further, the project examines whether holobiont response to increased temperature associated with climate change depends on particular GxG host-symbiont combinations. Moreover, the investigators will examine the effects of symbiont history on mutualist hosts, which have been largely ignored in eco-evolutionary studies. These experiments provide a first step in predicting whether invertebrate hosts on coral reefs will respond to global change via adaptation of their symbionts.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1559105

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