Pilot study with three unique genotypes of Acropora cervicornis coral to determine survival probability after exposure to temperature treatments at Mote Marine Laboratory in September and October 2019

Website: https://www.bco-dmo.org/dataset/871719
Data Type: Other Field Results, experimental
Version: 1
Version Date: 2022-03-18

Project
» CAREER: Applying phenotypic variability to identify resilient Acropora cervicornis genotypes in the Florida Keys (Resilient Acerv)

Contributors	Affiliation	Role
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Abstract
** Please write a dataset-specific abstract **

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Coverage

Spatial Extent: **Lat**:24.6616 **Lon**:-81.4541
Temporal Extent: 2019-09-25 - 2019-10-28

Methods & Sampling

A pilot study was completed to determine the survival probability of 3 unique genotypes of *Acropora cervicornis* at three different temperature profiles (29, 32, or 33 degrees Celsius). Corals (n=72) were held at their respective temperature treatments until the corals experienced signs of bleaching activity or mortality.

After >2 weeks (on Day 16 or Day 22), half of the corals were transferred to new tanks with different treatment conditions while the others remained in the original tanks and maintained their initial conditions.

Data was collected pertaining to the time (days) till mortality which would later be incorporated into a survival analysis (see dataset XXXXXX). Each fragment was assessed for its relative color index (ranging from D1 as pale color to D5 as full color) at 0900 daily to document the rate of observable change in health. The coral health chart/ color index card was provided by CoralWatch.

A full factorial experiment was completed subsequently--see Related Datasets section below for details.

Data Processing Description

(??? Much processing was done for the full factorial study, but what was done for this study ???)

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Related Publications

R Core Team (2020). R: A language and environment for statistical computing. R v4.0.3. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/
Software

Siebeck, U. E., Marshall, N. J., Klüter, A., & Hoegh-Guldberg, O. (2006). Monitoring coral bleaching using a colour reference card. Coral Reefs, 25(3), 453–460. doi:10.1007/s00338-006-0123-8
Methods

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Related Datasets

IsSupplementTo

Muller, E. M., Petrik, C. (2022) **Temperature and pCO2 effects on survivability of 25 genotypes of Acropora cervicornis coral at Mote Marine Laboratory in Nov-Dec 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-03-18 http://lod.bco-dmo.org/id/dataset/871765 [view at BCO-DMO]
Relationship Description: Full-factorial experiment after the pilot study.

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Parameters

Parameter	Description	Units
Latitude	Latitude	decimal degrees
Longitude	Longitude	decimal degrees
Experiment	Experiment identification	unitless
Genotype	Number of coral genotype	unitless
Replicate	Number of replicate	unitless
Tank_num	Tank number	unitless
Starting_Temp	Starting water temperature	degrees Celsius
Temp_Treatment	Aquarium temperature conditions (ambient or high temperature)	unitless
pCO2_Treatment	Aquarium pCO2 conditions (ambient or high pCO2)	unitless
Start_Health_Index	Starting coral color quantification based on color index	unitless
Start_Date_Exposure	Date when coral was placed in tank	unitless
Event_Date	Date when coral was moved to a new tank	unitless
Event	Description of event	unitless
New_Tank_num	Tank number of new tank where coral was transferred	unitless
Temp_New_Tank	Temperature of the new tank where coral was transferred	degrees Celsius
Notes	Comments about tank changes	unitless
End_Date_Exposure	Date when exposure to treatment ended	unitless
End_Exposure_Reason	Reason why exposure to treatment ended	unitless
End_Health_Index	Ending coral color quantification based on color index	unitless
Outcome	Status of the coral replicate at the end of the experiment (i.e. Dead, Pale, Sampled, Alive)	unitless
Days_until_mortality	Time in days from start date of experiment until date of mortality	days

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Instruments

Dataset-specific Instrument Name	treatment tanks
Generic Instrument Name	Aquarium
Dataset-specific Description	Coral fragments were placed into treatment tanks (raceways)
Generic Instrument Description	Aquarium - a vivarium consisting of at least one transparent side in which water-dwelling plants or animals are kept

Dataset-specific Instrument Name	YSI Professional Plus (Pro Plus) Multi-parameter handheld
Generic Instrument Name	YSI Professional Plus Multi-Parameter Probe
Dataset-specific Description	Treatment tank water quality was monitored using a YSI Professional Plus (Pro Plus) Multi-parameter handheld with a quarto containing a Pro Series Galvanic Dissolved Oxygen Sensor, a Pro Series pH Sensor, and a Pro Series temperature and conductivity sensor
Generic Instrument Description	The YSI Professional Plus handheld multiparameter meter provides for the measurement of a variety of combinations for dissolved oxygen, conductivity, specific conductance, salinity, resistivity, total dissolved solids (TDS), pH, ORP, pH/ORP combination, ammonium (ammonia), nitrate, chloride and temperature. More information from the manufacturer.

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Project Information

CAREER: Applying phenotypic variability to identify resilient Acropora cervicornis genotypes in the Florida Keys (Resilient Acerv)

Coverage: Florida Keys, Summerland Key, FL 24.563595°, -81.278572°

NSF Award Abstract:
Caribbean staghorn coral was one of the most common corals within reefs of the Florida Keys several decades ago. Over the last 40 years disease, bleaching, overfishing and habitat degradation caused a 95% reduction of the population. Staghorn coral is now listed as threatened under the U.S. Endangered Species Act of 1973. Within the past few years, millions of dollars have been invested for the purpose of restoring the population of staghorn coral within Florida and the U.S. Virgin Islands. Significant effort has been placed on maintaining and propagating corals of known genotypes within coral nurseries for the purpose of outplanting. However, little is known about the individual genotypes that are currently being outplanted from nurseries onto coral reefs. Are the genotypes being used for outplanting resilient enough to survive the three major stressors affecting the population in the Florida Keys: disease, high water temperatures, and ocean acidification? The research within the present study will be the first step in answering this critically important question. The funded project will additionally develop a research-based afterschool program with K-12 students in the Florida Keys and U.S. Virgin Islands that emphasizes an inquiry-based curriculum, STEM research activities, and peer-to-peer mentoring. The information from the present study will help scientists predict the likelihood of species persistence within the lower Florida Keys under future climate-change and ocean-acidification scenarios. Results of this research will also help guide restoration efforts throughout Florida and the Caribbean, and lead to more informative, science-based restoration activities.

Acropora cervicornis dominated shallow-water reefs within the Florida Keys for at least the last half a million years, but the population has recently declined due to multiple stressors. Understanding the current population level of resilience to three major threats - disease outbreaks, high water temperatures, and ocean acidification conditions - is critical for the preservation of this threatened species. Results from the present study will answer the primary research question: will representative genotypes from the lower Florida Keys provide enough phenotypic variation for this threatened species to survive in the future? The present proposal will couple controlled laboratory challenge experiments with field data and modeling applications, and collaborate with local educators to fulfill five objectives: 1) identify *A. cervicornis* genotypes resistant to disease, 2) identify *A. cervicornis* genotypes resilient to high water temperature and ocean acidification conditions, 3) quantify how high water temperature and ocean acidification conditions impact disease dynamics on *A. cervicornis*; 4) determine tradeoffs in life-history traits because of resilience factors; and 5) apply a trait-based model, which will predict genotypic structure of a population under different environmental scenarios.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1452538

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