Coral pulse amplitude modulation (PAM) throughout a heat temperature study conducted in aquaria at Brewer's Bay, St. Thomas, The U.S. Virgin Islands in June of 2017

Website: https://www.bco-dmo.org/dataset/840941
Version: 1
Version Date: 2021-02-17

Project
» Immunity to Community: Can Quantifying Immune Traits Inform Reef Community Structure? (Coral Immune Traits)

Contributors	Affiliation	Role
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Abstract
Coral pulse amplitude modulation (PAM) throughout a heat temperature study conducted in aquaria at Brewer's Bay, St. Thomas, The U.S. Virgin Islands in June of 2017. The coral species used in the experiments were Orbicella faveolata and Porites astreoides.

Table of Contents

Coverage

Spatial Extent: **Lat**:18.34403 **Lon**:-64.98435
Temporal Extent: 2017-06-29 - 2017-06-30

Methods & Sampling

Location: Brewer's Bay (18.34403, -64.98435), St. Thomas, The U.S. Virgin Islands

PAM recorded twice a day in the mid morning and mid afternoon.

Data Processing Description

BCO-DMO Data Manager Processing notes:
* Data submitted in file "Caspase 2 PAM Data Submission.xlsx" sheet 1 extracted to csv

* Time format altered so it can be described accurately. A space added between "A" or "P" and an "M" added to each values so for example "10:12A" changed to "10:12 AM"
* An additional column added to the dataset for the ISO Date Time in ISO 8601 format in UTC time using date and time provided in local time zone "Atlantic Standard Time (GMT-4)"

[table of contents | back to top]

Related Datasets

References

Mydlarz, L., Brandt, M. (2021) **Aquaria temperatures throughout a heat temperature coral study conducted at Brewer's Bay, St. Thomas, The U.S. Virgin Islands in June of 2017.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-02-17 http://lod.bco-dmo.org/id/dataset/840932 [view at BCO-DMO]
Relationship Description: Aquaria temperatures from the same experiment.

[table of contents | back to top]

Parameters

Parameter	Description	Units
BUCKET	Bucket ID	unitless
SPECIES	Coral species abbreviation (OFAV = Orbicella faveolata, PAST =Porites astreoides)	unitless
CORE	Coral fragment ID	unitless
DATE	Local sample date (Atlantic Standard Time, GMT-4) in format mm-dd-yy	unitless
TIME	Local sample time (Atlantic Standard Time, GMT-4) in format HH:MM AM/PM	unitless
MEMORY	PAM datapoint ID	unitless
PULSE	Light Pulse ID	unitless
Fv	Variable fluorescence	unitless
Fm	Max fluorescence	unitless
Yield	Quantum yield (Fv/Fm)	dimensionless
ETR	Electron Transport Rate (ETR)	unknown
PAR	Pulse Amplitude Radiation	unknown
TEMP	Bucket temperature	degrees Celsius
TREATMENT	Treatment ("Control" or "Heat")	unitless
ISO_DateTime_UTC	ISO DateTime (UTC time zone) in ISO 8601 format yyyy-mm-ddTHH:MMZ	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Diving Pulse amplitude modulation (Diving PAM)
Generic Instrument Name	Fluorometer
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.

[table of contents | back to top]

Project Information

Immunity to Community: Can Quantifying Immune Traits Inform Reef Community Structure? (Coral Immune Traits)

Coverage: US Virgin Islands

NSF abstract:

Coral diseases have increased significantly throughout the past 30 years. Climate change and other detrimental environment factors are likely to blame. Unhealthy coral reefs cannot support the fish and other life that make the reef a vibrant and diverse ecosystem. Corals reefs in the Caribbean Sea are disease hotspots and many reefs have experienced population collapses due to outbreaks of disease. Importantly, coral species vary in their susceptible to disease, but the reasons behind this variation are unknown. This project will quantify coral susceptibility to disease by examining coral immunity using several novel approaches and experiments. Seven species of coral that differ in disease susceptibility, growth rates, growth form and reproductive strategies will be used. Immune responses of each species of coral will be measured by exposing the corals to bacterial immune stimulators. Susceptibility to white plague disease, a prevalent disease affecting many species of corals, will also be measured by exposing the corals to active white plague disease and calculating disease transmission rates. The immune response and disease transmission data for each coral species will be used to develop a predictive model to determine how different coral communities will respond to disease threats under climate change scenarios. This project will support graduate students at University of Texas, Arlington (Hispanic-serving Institution) and University of Virgin Islands (Historically Black University) and many undergraduate students at all three institutions (Mote Marine Laboratory). This research will be highlighted at outreach events at all three institutions which take place regularly and include Earth Day Texas in Dallas, TX, Mote's Living Reef Exhibit and Aquarium in Sarasota, FL and "Reef Fest" and Agricultural fairs in the U.S. Virgin Islands.

Environmental changes, such as ocean warming, have led to an increase in the prevalence of coral diseases, causing region-wide population collapses in some locations. However, not all coral species, or even populations within species, are affected by disease equally. Some species are host to many different types of diseases, but have limited mortality. Other species suffer significant disease-related mortality. How and why disease susceptibility differs among species and the effects of this differential susceptibility on reef community structure and composition are currently unknown. This project will use immune-challenge experiments that will quantify novel components of the innate immune system of corals, coupled with the application of a trait-based model, to fulfill three goals: 1) Determine variability of coral immune traits in seven common coral species found on Caribbean reefs, 2) Determine the variability in resistance to white plague disease transmission in the same coral species 3) Develop a predictive model of coral community assemblage that incorporates immune traits. Quantification of coral immunity will also incorporate unique approaches, such as combining full transcriptome sequencing with protein activity assays for a gene-to-phenotype analysis. Data will be mapped onto immune pathways for comprehensive pathway evaluation between coral species and these will serve as trait inputs into a "traitspace" model. These traits will provide continuous data within the model, which will create a probability density function (PDF) for the trait distributions of each species. These PDFs will then be

used to determine the probability of species under different disease exposure scenarios. Model analyses will determine which traits influence community structure and characterize how disease exposure and the immune response will predict community assemblages through space and time. The completion and application of a trait-base model that incorporates extensive immunity parameters (none of which have been applied to trait models within coral ecosystems) is a distinct product from this project.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1712134
NSF Division of Ocean Sciences (NSF OCE)	OCE-1712240
NSF Division of Ocean Sciences (NSF OCE)	OCE-1712540

[table of contents | back to top]