Underwater fluorescence on nearshore reefs in Guam during 2014 (Reef Resilience in Guam project)

Website: https://www.bco-dmo.org/dataset/639986
Data Type: Other Field Results
Version: 2
Version Date: 2021-01-28

Project
» Documenting bleaching susceptibility and resilience in Guam, Micronesia (Reef Resilience in Guam)

Contributors	Affiliation	Role
Kim, Kiho	American University (AU)	Principal Investigator
Baker, David M.	University of Hong Kong (HKU-SBS)	Co-Principal Investigator
Raymundo, Laurie J	University of Guam Marine Laboratory (UOGML)	Co-Principal Investigator
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Maximum excitation pressure of Symbiodinium assemblages was assessed as an indicator for holobiont photosynthetic performance of Pocillopora damicornis in shallow (1-2m), back reef and P. eydouxi in deeper fore reef (>3m).

Table of Contents

Coverage

Spatial Extent: **N**:13.54853 **E**:144.81 **S**:13.24061 **W**:144.63631
Temporal Extent: 2014-01-16 - 2014-08-14

Methods & Sampling

Maximum excitation pressure of Symbiodinium assemblages was assessed as an indicator for holobiont photosynthetic performance of Pocillopora damicornis in shallow (1-2m), back reef and P. eydouxi in deeper fore-reef (>3m). Effective quantum yield (F/Fm') was measured using a Walz Diving Pam Fluorometer (Germany) via saturation pulse fluorometry at 1cm away from branch tips during midday. Maximum quantum yield (Fv/Fm) was measured under custom shading devices which were designed to dark-acclimate corals in situ for 30 minutes. Maximum excitation pressure (Q) was calculated using the formula, Q = 1-(F/Fm')/(Fv/Fm).

Data Processing Description

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- replaced spaces with underscores
- added site_code, zone, lat and lon columns
- reformatted date from d-Mon-yy to yyyy-mm-dd
- replaced blank cells with 'nd' (no data)

Version 2 (2021-01-28) replaced version 1 (2016-06-17) - revised site lat/lon

[table of contents | back to top]

Data Files

File
PAM_fluor.csv (Comma Separated Values (.csv), 143.08 KB) MD5:e351b750d48d431969f6cb1e693f9920 Primary data file for dataset ID 639986

[table of contents | back to top]

Related Datasets

IsSupplementedBy

Kim, K., Baker, D. M., Raymundo, L. J. (2021) **Temperature and light intensity at 7 locations from the nearshore reefs in Guam during 2014 (Reef Resilience in Guam project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2021-01-28 doi:10.26008/1912/bco-dmo.640026.2 [view at BCO-DMO]

[table of contents | back to top]

Parameters

Parameter	Description	Units
date	survey date	yyyy-mm-dd
time_local	local time	HH:MM:SS
data_recorder	initials of person recording data: Code Data = Recorder; Home Institution DMB = David Baker;U Hong Kong DRB = David Burdick; U of Guam / NOAA JC = Jeried Calor; U of Guam KK = Kiho Kim; American University LRJ = Laurie Raymundo; U of Guam ND = Nicolas Duprey; U of Hong Kong PT = Phil Thompson; U of Hong Kong SV = Susie Vulpas; American University	unitless

colony_id	individual colony identification number	unitless
site	survey location near Guam Island	unitless
site_code	site code	unitless
zone	part of reef surveyed	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
taxon_code	taxonomic code of corals. See related dataset https://www.bco-dmo.org/dataset/639865	unitless
light_dark	whether measurement was taken with light (L) or dark (D) adapted corals	unitless
F	chlorophyll florescence (excess energy from a photon re-emitted as light) while reactions centers of photosystem II are at a steady state	unitless
Fm_prime	maximum chlorophyll florescence based on whichever light environment the chlorophyll is adapted to	unitless
PAR	photosynthetic active radiation; measure of light intensity	micromol quanta m-2 s-1
Y_II	maximum photochemical yield of photosystem II; measure of overall photochemical efficiency	unitless
ETR	electron transport rate; measure of overall photosynthetic capacity	micromol electrons m-2 s-1

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Fluorometer
Dataset-specific Description	Diving PAM Underwater Fluorometer (Walz), an instrument for studying in situ photosynthesis of underwater plants.
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]

Deployments

Guam_Reef_Surveys_2014

Website	https://www.bco-dmo.org/deployment/639854
Platform	shoreside Guam
Start Date	2014-01-15
End Date	2014-08-15
Description	Coral reef bleaching was surveyed/studied near Guam in 2014 as part of the project "Documenting bleaching susceptibility and resilience in Guam, Micronesia" (NSF OCE-1418673).

[table of contents | back to top]

Project Information

Documenting bleaching susceptibility and resilience in Guam, Micronesia (Reef Resilience in Guam)

Coverage: Nearshore waters of Guam (13.5000° N, 144.8000° E)

Note: This project is funded by an NSF RAPID award.

Description from NSF award abstract:
Coral reef ecosystems are experiencing unprecedented levels of environmental stress. Guam, Micronesia is currently experiencing an island-wide coral bleaching event unprecedented in recent decades. The available evidence suggests that the severity and extent of this event is linked to extended high sea surface temperature and a delay in the onset of the rainy season. Initial surveys of coral reefs around the island indicate that the impacts are broad in both geographic extent and the number of coral species affected. This project will support a quantitative examination of the patterns of mortality and recovery of corals from this event in the context of reef resilience, or their ability to recover. Specifically, the project will examine whether: (a) exposure differences between the east and west sides of the island result in differential recovery, and (b) do sites that showed lower bleaching severity during initial surveys show higher recovery post-bleaching? It is predicted that differential bleaching is due, in part, to genetic differences in both the coral host and its symbiotic algae and identifying unique host-symbiont combinations that are less sensitive to extreme temperature anomalies will be a primary goal of this project. These hypotheses and predictions will be

addressed by returning to a select subset of reef sites over time by a rapid response team using survey methods as employed at the NSF funded Moorea Coral Reef Long Term Ecological Research (LTER) site which includes permanent transects and fixed quadrats, and computer software to document changes in the percent cover of corals over time. Additionally, long-term monitoring of tagged colonies in the genera Acropora and Pocillopora, specifically for their recovery, and for detailed genetic analyses to examine host and symbiont genetic diversity, will help determine which combinations of host-symbiont genotypes are exhibiting recovery versus mortality.

The proposed work will reveal which specific sites, environmental conditions, and genotypes are associated with resilience to coral bleaching and will allow establishment of a system whereby long-term recovery can be documented and also compared to the Moorea LTER data on coral reef resilience. Such data sets are rare or non-existent in Micronesia and the ability to identify resilient populations can provide information to help prioritize management efforts and evaluate the performance of existing marine parks and preserves.

Further description from PI:

Survey Methods: The investigators will address these hypotheses and predictions by returning to a select subset of sites visited by the rapid response team and using survey methods as employed at the Moorea Coral Reef LTER (i.e., http://mcr.lternet.edu). On each coast, the investigators will select reef sites that have shown high (n=2) and low (n=2) levels of bleaching for a total of 8 sites. At each of the sites, they will establish permanent transacts (five 10 m transects) with fixed quadrat (0.25 m2) locations (n=40 total) for quarterly photomonitoring (see Edmunds 2013). The investigators will also deploy temperature loggers along the transects for the duration of the proposed study. Photographed quadrats will be analyzed using CPCe software as described in Adam et al (2011) to document changes in benthic cover.

To examine individual colony responses more closely, a subset of colonies from specific genera will be tagged at each site and re-assessed periodically for one year. At present, the investigators are considering *Acropora* spp and *Pocillopora* spp, as these are ecologically important, highly impacted by this event, and common to many of the sites being surveyed at present. The tagged colonies will be identified to species, and their health status documented: i.e., bleached, fully pigmented, re-sheeting, partial mortality, full mortality. The investigators will also look for signs of disease at the same time.

Genetic Analyses: The species selected above will be sampled for genetic analysis, to identify zooxanthellae clades present in each colony (see Gates 2011), examine host genetic diversity (e.g., Combosch & Voller 2011), and determine which combinations of host-symbiont genotypes are exhibiting recovery vs. mortality. As the event is coming to a close, and the investigators are already seeing mortality in certain species, they may be unable to sample certain highly susceptible colonies, but they will work under the assumption that surviving colonies represent the most resilient host-symbiont genotypes and certain colonies with partial mortality will allow sampling of remaining tissue.

The investigators will determine if there are associations between resilient genotypes and site-specific environmental conditions, obtaining secondary data on sea surface temperatures along the east vs. west coasts, rainfall, and wave height from NOAA and the National Weather Service. They will also document degree of exposure and distance to point sources of terrestrial inputs at each site.

Bibliography

Adam, T.C., Schmitt, R.J., Holbrook, S.J., Brooks, A.J., Edmunds, P.J., Carpenter, R.C., Bernardi, G., 2011. Herbivory, Connectivity, and Ecosystem Resilience: Response of a Coral Reef to a Large-Scale Perturbation. Plos One 6. DOI: 10.1371/journal.pone.0023717

Combosch, D.J., Vollmer, S.V., 2011. Population Genetics of an Ecosystem-Defining Reef Coral *Pocillopora damicornis* in the Tropical Eastern Pacific. Plos One 6. DOI: 10.1371/journal.pone.0021200

Edmunds, P of Moorea Coral Reef LTER. 2013. MCR LTER: Coral Reef: Long-term Population and Community Dynamics: Corals. knb-lter-mcr.4.29 (http://metacat.lternet.edu/knb/metacat/knb-lter-mcr.4.29/lter).

Gates, R of Moorea Coral Reef LTER. 2011. MCR LTER: Coral Reef: Population Dynamics: Time-series of *Symbiodinium* populations in corals of Moorea. knb-lter-mcr.15.11 (http://metacat.lternet.edu/knb/metacat/knb-lter-mcr.15.11/lter).

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1418673

[table of contents | back to top]