Water column temperature measurements from 2017-2019 on coral reefs around the island of Mo'orea, French Polynesia

Website: https://www.bco-dmo.org/dataset/842938
Data Type: Other Field Results
Version: 1
Version Date: 2021-03-02

Project
» Collaborative Research: Viral Reefscapes: The Role of Viruses in Coral Reef Health, Disease, and Biogeochemical Cycling (Moorea Virus Project)

Contributors	Affiliation	Role
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Abstract
Water column temperatures were recorded around the island of Mo'orea, French Polynesia from September 2017 through March 2019. Three reef zones (fore reef, back reef, fringing reef) were sampled to help characterize environmental conditions affecting reef health and resilience, and to increase understanding of the factors that trigger viral outbreaks on reefs.

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Coverage

Spatial Extent: **N**:-17.4721 **E**:-149.762 **S**:-17.58 **W**:-149.921
Temporal Extent: 2017-09-12 - 2019-03-25

Methods & Sampling

Water column temperatures were recorded around the island of Mo'orea, French Polynesia from September 2017 through March 2019. Onset HOBO temperature loggers were deployed by divers at nine sites within three reef zones, and replaced at six month intervals. The average (mean) temperature per hour was calculated and is reported, but no calibration was done for individual sensors.

Reef zones are designated by their location with respect to the reef:
1) Fore = offshore or outside part of reef;
2) Back = inside of the reef crest; or
3) Fringing = adjacent to the shore.

Data Processing Description

BCO-DMO processing description:
- Separated latitude and longitude into individual columns
- Corrected the missing digits in year field (for 25,161 entries)
- Converted date and time fields to ISO date format (yyyy-mm-dd)
- Converted date nad time fields to UTC time zone
- Adjusted field/parameter names to comply with database requirements
- Added a conventional header with dataset name, PI names, version date

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Data Files

File
water_temp_data.csv (Comma Separated Values (.csv), 7.92 MB) MD5:70f182c61fd03f78c81a15bb1489abcf Primary data file for dataset ID 842938

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Parameters

Parameter	Description	Units
ISO_DateTime_UTC	Sampling Date in ISO format (yyyy-mm-ddThh:mm:ssZ)	unitless
Site	Site identifier	unitless
Reef_zone	Location on the reef (Fore reef, Back reef, or Fringing)	unitless
Latitude	Latitude of sampling location	decimal degrees
Longitude	Longitude of sampling location	decimal degrees
Temperature	Mean temperature	degrees Celsius
DateTime_local	Local datetime of sampling	unitless

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Instruments

Dataset-specific Instrument Name	HOBO Pendant® Temperature/Light 8K Data Logger Part # UA-002-08
Generic Instrument Name	Onset HOBO Pendant Temperature/Light Data Logger
Dataset-specific Description	Onset HOBO temperature loggers were deployed by divers, but no calibration was done for individual sensors.
Generic Instrument Description	The Onset HOBO (model numbers UA-002-64 or UA-001-64) is an in-situ instrument for wet or underwater applications. It supports light intensity, soil temperature, temperature, and water temperature. A two-channel logger with 10-bit resolution can record up to approximately 28,000 combined temperature and light measurements with 64K bytes memory. It has a polypropylene housing case. Uses an optical USB to transmit data. A solar radiation shield is used for measurement in sunlight. Temperature measurement range: -20 deg C to 70 deg C (temperature). Light measurement range: 0 to 320,000 lux. Temperature accuracy: +/- 0.53 deg C from 0 deg C to 50 deg C. Light accuracy: Designed for measurement of relative light levels. Water depth rating: 30 m.

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Project Information

Collaborative Research: Viral Reefscapes: The Role of Viruses in Coral Reef Health, Disease, and Biogeochemical Cycling (Moorea Virus Project)

Coverage: Moorea, French Polynesia, Pacific 17 S 150 W

Ecologically and economically, coral reefs are among the most valuable ecosystems on Earth. These habitats are estimated to harbor up to nine million species, contribute ~30 billion US dollars annually to the global economy, and are tropical epicenters of biogeochemical cycling. Global (climate change) and local (nutrient pollution and overfishing) stressors are drivers of coral reef decline that can disrupt the symbiotic associations among corals and resident microbial communities, including dinoflagellate algae, bacteria, and viruses. Viruses interact with all living cellular organisms, are abundant in oceans, and integral to marine ecosystem functioning. This project will be the first to quantify the variability of viral infection in corals across different reef habitats and across time. This will increase our understanding of the total diversity of coral viruses and illuminate the full suite of factors that trigger viral outbreaks on reefs. At the same time the project will evaluate how carbon and nitrogen cycling are altered on coral reefs as a result of global and local stressors that trigger viral infection. This project will ultimately broaden our understanding of the impacts of viruses on reefs beyond their role as putative disease agents. Results of the project will be communicated broadly in scientific arenas, in K-12, undergraduate, and graduate education and training programs, and to the general public through video and multimedia productions, as well as outreach events. 2-D Reef Replicas from our field sites across Moorea will be constructed, allowing children and adults in the US and French Polynesia to 'become' marine scientists and use quadrats, transect tapes, and identification guides to quantify metrics of reef change. Three graduate students will be involved in all aspects of the research and an effort will be made to recruit and support minority students. All datasets will be made freely available to the public and newly developed methods from this project will serve as an important set of springboard tools and baselines for future lines of inquiry into the processes that influence reef health.

Coral reefs, found in nutrient-poor shallow waters, are biodiversity and productivity hotspots that provide substantial ecological and societal benefits. Corals energetically subsidize these oligotrophic ecosystems by releasing significant amounts of mucus (an organic carbon and nitrogen-rich matrix) into the surrounding seawater. Viral production in reef waters can be a significant portion of total reef carbon cycling, accounting for ~10% of gross benthic carbon fixation in reef ecosystems. Viruses are also ~10 times more abundant on coral surfaces than in the water column meaning that viral infection experienced by corals during stress likely results is an increase in carbon and perhaps nitrogen flux to the water column. Thus phages and eukaryotic

viruses may be responsible for shifting reef health and function directly via coral and symbiont infection and by altering biogeochemical cycling in host colonies and the adjacent reef system. The main goal of this project is to experimentally interrogate and then model the links among viral infections, declines in coral and reef health, and associated shifts in biogeochemical cycling in reef ecosystems. Lab and field experiments will be conducted at the Moorea Coral Reef LTER to characterize the spatiotemporal dynamics of viruses within two dominant reef-building coral species that differ in their susceptibility to abiotic stress. A novel viral infection and induction approach will be coupled with stable isotopic pulse-chase experiments to quantify and track carbon and nitrogen flux out of coral holobionts (host and microbial symbionts) and into dissolved and particulate pools. In these experiments, virus, bacteria, and symbiont abundance, diversity, and function will be measured simultaneously with the health and activity of the host. Pulse-chase techniques, as well as flux- and niche-based modeling, will result in a holistic understanding of how corals and associated viruses impact reef energy budgets and the ramifications of carbon and nitrogen flux for reef communities. Ultimately, this project will quantify and describe an integrated mechanism by which environmental stressors alter viral, microbial, and coral diversity and, consequently, ecosystem function.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1635798
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