

Water temperature records for *Acropora hyacinthus* coral colonies located in either patch or fore reefs of the Palau Archipelago from November 2017 to January 2020

Website: <https://www.bco-dmo.org/dataset/772445>

Data Type: Other Field Results

Version: 2

Version Date: 2021-09-23

Project

» [Predicting the global location of heat tolerant corals: Palau patch reefs as a general model](#) (Heat Tolerant Corals)

Contributors	Affiliation	Role
Palumbi, Stephen R.	Stanford University	Principal Investigator
York, Amber D.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract

Water temperature records for *Acropora hyacinthus* coral colonies located in either patch or fore reefs of the Palau Archipelago from November 2017 to January 2020.

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Acquisition Description](#)
 - [Processing Description](#)
- [Parameters](#)
- [Instruments](#)
- [Project Information](#)
- [Funding](#)

Coverage

Spatial Extent: N:7.92908 E:134.66061 S:7.20388 W:134.21919

Temporal Extent: 2017-11-11 - 2020-01-20

Acquisition Description

Temperature data loggers were deployed next to individual colonies of *Acropora hyacinthus* located in either patch or fore reefs of the Palau Archipelago from November 2017 to January 2020. Multiple loggers were deployed on each reef (up to 5). Loggers were set to record water temperature every 10 minutes. Temperature data were trimmed at the very beginning and end of each recording so that all records have the same start and end point. Some records show missing data (labelled nd) because they were deployed at a later date or because they lost battery power towards the end of the deployment.

Location:

Patch and fore reefs of the Palau Archipelago, 7 N 134 E, depths ~0.5-6m

Processing Description

Issues:

Some individuals have a small amount of missing data for timepoints due to a later deployment date or due to device malfunction. This is rare, but these individuals were included to increase the total dataset. Missing data can be removed by trimming the start and/or end date, or by removing individuals.

Processing:

Raw data were exported as .csv files from the HOBOWare application. All individual records were aligned to the same timepoint and combined into one file using a custom script. The beginning and end of the combined data file was trimmed by eye to reduce the amount of missing data.

BCO-DMO Data Manager Processing Notes:

- * Original files submitted (2017-2018_Palau_coral_temperature_data.csv, 2017-2018_Palau_coral_temperature_meta_data.csv) combined and modified for reuse purposes. Changes described here. The originally submitted files can be found in the "Supplemental files" section of this page.
- * added a conventional header with dataset name, PI name, version date
- * modified parameter names to conform with BCO-DMO naming conventions
- * blank values in this dataset are displayed as "nd" for "no data." nd is the default missing data identifier in the BCO-DMO system.
- * Added latitude, longitude, reef number, and reef type, and coral species columns by joining with site information dataset. Joined water temperature file with a separate site information file to add the columns using colony_tag as the key.
- * Temperature columns unpivoted to transform the data from multiple temperature columns for each colony to one temperature column and an added column containing the associated colony tags.
- * Added ISO_DateTime_UTC in ISO 8601 format YYYY-mm-ddTHH:MMZ by converting date and time provided in local time (Pacific/Palau).

Data version 2:

- * Data from 2018 to 2020 added to the dataset.
- * Source files imported for data version 1: 2017-2020_Palau_coral_temperature_data_V2.csv
- * The above source files was processed in the same way as version 1.

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
Collection_date_time	Date and time of temperature sample (Time zone: Pacific/Palau) in format mm-dd-yy hh:mm	unitless
ISO_DateTime_UTC	Date and time of temperature sample (Time zone: UTC) in ISO 8601 format YYYY-mm-ddTHH:MMZ	unitless
Temperature	Water temperature recorded in 10-minute intervals	degrees Celsius
Colony_tag	Individual identifier for a coral colony	unitless
Latitude	Latitude (South is negative)	unitless
Longitude	Longitude (West is negative)	unitless
Reef_number	Identifier for the reef the coral was collected from	unitless
Reef_type	Reef type description	unitless
Species	Coral species name	unitless

Instruments

Dataset-specific Instrument Name	<input type="checkbox"/> Onset HOBO Pendant Temp logger, 64K (UA-001-64)
Generic Instrument Name	Temperature Logger
Generic Instrument Description	Records temperature data over a period of time.

Project Information

Predicting the global location of heat tolerant corals: Palau patch reefs as a general model (Heat Tolerant Corals)

Coverage: Palau

NSF Award Abstract:

When coral reefs heat up just a few degrees above normal summer temperatures, a reaction called coral bleaching can occur in which single celled plants living inside coral cells are expelled. The coral turns from its normal tan color to bleached white, and because it is deprived of the normal food supply from its plant partner, most of these corals die. Yet, some corals naturally can survive high temperatures that cause others in the same species to bleach. Identifying where these heat tolerant corals are common would provide a general tool for protecting and restoring heat tolerant reefs. The investigators will conduct experiments on 30 patch reefs in Palau of very different sizes in two lagoons, record local temperatures for 400 corals, and test coral heat tolerance using a newly designed coral stress tank. Because large patch reefs generally heat up during daytime low tides, The investigators hypothesize that they are commonly home to heat resistant corals. They will also move heat tolerant corals to cooler locations to test the stability of heat resistance among corals. The stress tank technologies can be widely used in remote settings, and will provide a set of generalizable, practical tools for communities and managers to find and protect heat tolerant corals in reefs around the world. The work will advance undergraduate STEM education in California and Palau. A partnership with the Palau Community College will facilitate the engagement of Pacific Island communities and students. Students will receive interdisciplinary training in field research, genomics and bioinformatics and learn practical skills that will enable them to collect and interpret stress tank and temperature data. Broader outreach efforts will include the production and dissemination of a series of microdocumentaries and blog posts designed to bring the concept of a world-wide search for heat tolerant corals to a global audience.

Previous coral reef research has demonstrated that periodic high water temperatures can induce high heat tolerance in reef building corals through a combination of acclimation and selection at many genetic loci. Key questions include whether these kinds of heat tolerant habitats are common or rare, and whether their locations can be predicted by identifying coral reefs where daily temperature spikes regularly occur at low tide. This project will examine heat tolerance of 400 corals in the *Acropora hyacinthus* species complex across 30 patch reefs in Palau that experience variable temperature and flow profiles. This study will utilize a variety of methods to characterize spatial and temporal patterns of heat tolerance including: (1) the development of low-cost, portable heat stress tanks to quickly and affordably assess in situ conditions, (2) genomic assays of physiological condition to identify the genes and gene expression mechanisms that are responsible for heat tolerance, (3) high resolution temperature mapping to trace the role of temperature variation in producing stable, high temperature tolerance in reef building corals, and (4) reciprocal transplant experiments to evaluate whether heat resistant corals retain heat resistance when moved to cooler locations. This research will expand the geographic map of habitats with known heat tolerance, and

expedite the ability to locate coral populations that may be most resistant to future ocean warming.

[[table of contents](#) | [back to top](#)]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1736736

[[table of contents](#) | [back to top](#)]