Temperature measured at artificial reefs in Kāneʻohe Bay, Oʻahu in 2022 and 2023 as part of a reef halo dynamics study

Website: https://www.bco-dmo.org/dataset/987237
Data Type: Other Field Results
Version: 1
Version Date: 2025-11-18

Project
» CAREER: Decoding seascape-scale vegetation patterns on coral reefs to understand ecosystem health: Integrating research and education from organismal to planetary scales (Coral Reef Halos)

Contributors	Affiliation	Role
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Abstract
The goal of this dataset was to survey temperature at three artificial reefs constructed in Kāneʻohe Bay, Oʻahu, Hawaiʻi, from September 2022-December 2023. Sea surface temperature was recorded once every six hours for the duration of the study period using HOBO Pendant Temperature Loggers attached to the central cinder block at each artificial reef.

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Coverage

Location: Kāneʻohe Bay, Oʻahu, Hawaiʻi
Spatial Extent: **Lat**:21.46402 **Lon**:-157.806783
Temporal Extent: 2022-09-20

Methods & Sampling

Sea surface temperature was recorded using HOBO Pendant Temperature Loggers attached to the central cinder block at each artificial reef. The logger recorded the temperature every six hours for the entire duration of September 2022-December 2023.

Data Processing Description

Combined temperature data (987237_v1_kaneohe-bay-halos-temperature.csv) was created by aggregating all data files together for ease of analysis. The first and last observation of each individual raw file was removed

since those may have been recorded before/after the logger was placed in the water. For some months, loggers were only placed at two of the artificial reef sites, but for most months, three loggers were placed.

The csv files named after each date when they began recording are the raw files extracted from the HOBO loggers (see Raw_temp_files.zip).

BCO-DMO Processing Description

* The data table within the submitted file "Temp_combined.csv" was imported into the BCO-DMO data system for this dataset. Values "NA" imported as missing data values. Table will appear as Data File: 987237_v1_kaneohe-bay-halos-temperature.csv (along with other download format options).
* Raw logger files submitted within a folder named "Raw temp files" were packaged into a Zip file and included as a supplemental file attached to this dataset: Raw_temp_files.zip

Missing Data Identifiers:
* In the BCO-DMO data system missing data identifiers are displayed according to the format of data you access. For example, in csv files it will be blank (null) values. In Matlab .mat files it will be NaN values. When viewing data online at BCO-DMO, the missing value will be shown as blank (null) values.

* Date column converted to ISO 8601 format.

Problem Description

Note that 2022_06_Logger 2 was removed from aggregation (in 987237_v1_kaneohe-bay-halos-temperature.csv) because someone removed the logger from the site (and later returned it to us), so it was not recording temperature at the correct location. The 2022_06_Logger 2 file is not included in Raw_temp_files.zip

Note: Apparent duplicate rows in the combined table 987237_v1_kaneohe-bay-halos-temperature.csv are not duplicates. They are repeated measures on each day/reef combination.

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Data Files

File	
987237_v1_kaneohe-bay-halos-temperature.csv	(Comma Separated Values (.csv), 105.66 KB) MD5:5ae234a6842bae84e23438cba57157d4
Primary data file for dataset ID 987237, version 1	

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Supplemental Files

File	
Raw_temp_files.zip	(ZIP Archive (ZIP), 49.59 KB) MD5:597f7cb0eff067e7f2db637e9a2c9b82

Raw temperature HOBO logger files. The csv files are named after each date when they began recording are the raw files extracted from the HOBO loggers. See the "Data Processing" section for more details and for information about how these relate to the combined temperature data table (987237_v1_kaneohe-bay-halos-temperature.csv).

Raw data files for each temperature logger at various time intervals. Columns include # (referring to the unique observation number), Date Time (reported as DD/MM/YYYY HH:MM (GMT-10:00) and time for most files, except a few when time did not record), temperature (degrees F), and light intensity (lux).

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Related Publications

Innes-Gold, A. A., McManus, L. C., Lester, E., Ong, T. W., Cook McNab, A., Rahnke, S. A., Brett Pablo, J., Tokoyoda, A., Watson, D., & Madin, E. M. P. (2025). Herbivory and temperature mediate coral reef halo dynamics. The American Naturalist. https://doi.org/10.1086/738015
Results

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Related Datasets

IsRelatedTo

Innes-Gold, A. (2025) **Fish community surveys at artificial reefs in Kāne‘ohe Bay, O‘ahu conducted in 2022 and 2023 as part of a reef halo dynamics study.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-11-21 doi:10.26008/1912/bco-dmo.985611.1 [view at BCO-DMO]
Relationship Description: Datasets collected at artificial reefs in Kāne‘ohe Bay, O‘ahu in 2022 and 2023 as part of a reef halo dynamics study (Innes-Gold, 2025; doi: 10.1086/738015).

Innes-Gold, A. (2025) **Vegetation surveys at artificial reefs in Kāne‘ohe Bay, O‘ahu conducted in 2022 and 2023 as part of a reef halo dynamics study.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-11-18 doi:10.26008/1912/bco-dmo.987227.1 [view at BCO-DMO]
Relationship Description: Datasets collected at artificial reefs in Kāne‘ohe Bay, O‘ahu in 2022 and 2023 as part of a reef halo dynamics study (Innes-Gold, 2025; doi: 10.1086/738015).

Innes-Gold, A. (2025) **Water nutrients measured at artificial reefs in Kāne‘ohe Bay, O‘ahu in 2022 and 2023 as part of a reef halo dynamics study.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-10-16 doi:10.26008/1912/bco-dmo.987232.1 [view at BCO-DMO]
Relationship Description: Datasets collected at artificial reefs in Kāne‘ohe Bay, O‘ahu in 2022 and 2023 as part of a reef halo dynamics study (Innes-Gold, 2025; doi: 10.1086/738015).

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Parameters

Parameter	Description	Units
Month	Month of observation	unitless
Year	Year of observation	unitless
Date	Observation date (ISO format)	unitless
Temp_S1	Water temperature at sensor 1	degrees Fahrenheit
Intensity_S1	Light intensity at sensor 1	lux
Temp_S2	Water temperature at sensor 2	degrees Fahrenheit
Intensity_S2	Light intensity at sensor 2	lux
Temp_S3	Water temperature at sensor 3	degrees Fahrenheit
Intensity_S3	Light intensity at sensor 3	lux
Latitude	latitude	decimal degrees
Longitude	longitude	decimal degrees

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Instruments

Dataset-specific Instrument Name	HOBO Pendant Temperature/Light 64K Data Loggers (UA-002-64)
Generic Instrument Name	Temperature Logger
Generic Instrument Description	Records temperature data over a period of time.

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Project Information

CAREER: Decoding seascape-scale vegetation patterns on coral reefs to understand ecosystem health: Integrating research and education from organismal to planetary scales (Coral Reef Halos)

Website: http://oceansphere.org

Coverage: Hawai'i (field components) and global (synthetic components)

NSF Award Abstract:
Coral reefs worldwide are under increasing threat from a range of human-induced stressors. Climate change is understood to be a key global stressor threatening reefs, but the only proven levers for ecosystem managers to increase reef resilience is to mitigate local and regional stressors such as fishing pressure. A vexing question persists, however, which is how to measure the effects of fishing on ecosystems, particularly over the large spatial (e.g., >10s of meters) and temporal (multi-year) scales over which fishing occurs. One promising approach to doing so is using the large-scale vegetation patterns found on coral reefs globally, called “halos”, to remotely observe when, where, and to what extent fishing pressure is affecting community structure and function. This program combines lab- and field-based experiments with cutting-edge satellite imaging technology and computer science approaches to provide a leap forward in our understanding of how species-level interactions can scale up in space and time to shape coral reef seascapes around the world. By drawing on these approaches, the synergistic education program: 1) integrates science and art (i.e., murals and satellite imagery) to educate and inspire Hawai‘i’s students and general public about coral reef ecology; 2) builds technological capacity in Hawai‘i’s underrepresented minority high school to graduate students, and 3) empowers these students with science communication skills to communicate with diverse audiences. By leveraging this research program and the cutting-edge technologies it will involve, the investigator establishes a strong foundation for long-term teaching and mentoring activities focused on increasing capacity within STEM-underrepresented minorities with Hawaiian and other Pacific Islander backgrounds. Decoding what coral reef halos can tell us about the effects of fishing on reef ecosystem health provides valuable knowledge to reef ecosystem managers and conservation practitioners as reefs continue to rapidly change due to human stressors.

This project combines lab- and field-based experiments with cutting-edge satellite imaging technology and computer science approaches to address the goals of: 1) determining the mechanisms that create the “halos” that form around coral patch reefs, and 2) testing the predictions arising from these mechanisms in a global arena. This project uses a transdisciplinary approach – spanning ecology, oceanography, geospatial science, and computer science – to address these goals. This program has three scientific objectives: to determine 1) which species interaction mechanisms and environmental factors cause reef halos and what their relative importance is; 2) whether these mechanisms are globally consistent or vary geographically; and 3) whether halos can therefore be used as an indicator of aspects of coral reef ecosystem health. In the process, this research advances our understanding of how remote observation tools (satellite and drone imagery; camera traps) can be integrated with computer science (machine learning) and ecological approaches (mechanistic experiments) to generate emergent insights that would not otherwise be possible.

This project is jointly funded by the Biological Oceanography Program, the Established Program to Stimulate Competitive Research (EPSCoR), and Ocean Education Programs.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1941737

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