Temperature data collected at Cerro Mundo Bay, San Cristobal, Galapagos from July 2019 to August 2022 using an Onset HOBO Water Temperature Pro v2 Data Logger

Website: https://www.bco-dmo.org/dataset/894125
Data Type: Other Field Results
Version: 1
Version Date: 2024-04-05

Project
» The Role of Temperature in Regulating Herbivory and Algal Biomass in Upwelling Systems (Temperature and Herbivory)

Contributors	Affiliation	Role
Bruno, John	University of North Carolina at Chapel Hill (UNC-Chapel Hill)	Principal Investigator
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Abstract
Increased standing macroalgal biomass in upwelling zones is generally assumed to be the result of higher nutrient flux due to upwelled waters. However, other factors can strongly impact macroalgal communities. For example, herbivory and temperature, via their effects on primary producers and the metabolic demands of consumers, can also influence macroalgal biomass and productivity, respectively. Although there are a fair number of studies looking at the interactive effects of herbivores and nutrients in both tropical and temperate regions, there is a lack of studies looking at these effects in tropical or subtropical upwelling regions. The purpose of this study was to measure the effects that herbivores, temperature, and nutrient availability have on standing macroalgal biomass. We manipulated nutrient availability and herbivory in six field experiments during contrasting productivity and thermal regimes (cool-upwelling and warm, non-upwelling season) on a subtidal nearshore rocky reef. Here, we present a set of temperature (°C) data collected at Cerro Mundo Bay, San Cristobal, Galapagos from July 2019 to August 2022. The environmental temperature was recorded every 15 minutes using a HOBO Water Temperature Pro v2 Data Logger (Onset®) attached to the seafloor at a 10 meters depth mark.

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Coverage

Location: Cerro Mundo, San Cristobal Island, Galapagos, Ecuador (0.87044°S, 89.58189°W)
Spatial Extent: **Lat**:-0.87044 **Lon**:-89.58189
Temporal Extent: 2019-07-28 - 2022-08-31

Methods & Sampling

A data logger was attached by cable ties to the seafloor to continuously record environmental temperature in the Cerro Mundo study site, a shallow (10 meters deep) rocky reef off the west side of San Cristobal Island, Galapagos (0.87044°S, 89.58189°W). The logger was replaced every 9 months, before running out of battery, to keep a continuous record of temperature.

BCO-DMO Processing Description

BCO-DMO Processing:
- Imported original file "Cerro Mundo Bay Temperature.csv" into the BCO-DMO system.
- Converted the date-time (local) field to ISO 8601 format.
- Created second column for date-time in UTC.
- Saved the final file as "894125_v1_cerro_mundo_temps.csv".

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Data Files

File
894125_v1_cerro_mundo_temps.csv (Comma Separated Values (.csv), 5.72 MB) MD5:e67345db66fe441a9caa017952f8f198 Primary data file for dataset ID 894125, version 1

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Parameters

Parameter	Description	Units
ISO_DateTime_Local	Date and time of measurement in ISO 8601 format; time zone: GMT-6	unitless
ISO_DateTime_UTC	Date and time of measurement in ISO 8601 format; time zone: UTC	unitless
Temp	Temperature recorded by the HOBO data logger	degrees Celsius

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Instruments

Dataset-specific Instrument Name	HOBO Water Temperature Pro v2
Generic Instrument Name	Onset HOBO Pro v2 temperature logger
Generic Instrument Description	The HOBO Water Temp Pro v2 temperature logger, manufactured by Onset Computer Corporation, has 12-bit resolution and a precision sensor for ±0.2°C accuracy over a wide temperature range. It is designed for extended deployment in fresh or salt water. Operation range: -40° to 70°C (-40° to 158°F) in air; maximum sustained temperature of 50°C (122°F) in water Accuracy: 0.2°C over 0° to 50°C (0.36°F over 32° to 122°F) Resolution: 0.02°C at 25°C (0.04°F at 77°F) Response time: (90%) 5 minutes in water; 12 minutes in air moving 2 m/sec (typical) Stability (drift): 0.1°C (0.18°F) per year Real-time clock: ± 1 minute per month 0° to 50°C (32° to 122°F) Additional information (http://www.onsetcomp.com/) Onset Computer Corporation 470 MacArthur Blvd Bourne, MA 02532

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Project Information

The Role of Temperature in Regulating Herbivory and Algal Biomass in Upwelling Systems (Temperature and Herbivory)

Website: http://github.com/johnfbruno/Galapagos_NSF.git

NSF Award Abstract:
A well-known pattern in coastal marine systems is a positive association between the biomass of primary producers and the occurrence or intensity of upwelling. This is assumed to be caused by the increase in nutrient concentration associated with upwelling, enabling higher primary production and thus greater standing algal biomass. However, upwelling also causes large, rapid declines in water temperature. Because the metabolism of fish and invertebrate herbivores is temperature-dependent, cooler upwelled water could reduce consumer metabolism and grazing intensity. This could in turn lead to increased standing algal biomass. Thus upwelling could influence both bottom-up and top-down control of populations and communities of primary producers. The purpose of this study is to test the hypothesis that grazing intensity and algal biomass are, in part, regulated by temperature via the temperature-dependence of metabolic rates. Broader impacts include the training and retention of minority students through UNC's Course Based Undergraduate Research program, support of undergraduate research, teacher training, and various outreach activities.

The investigators will take advantage of the uniquely strong spatiotemporal variance in water temperature in the Galápagos Islands to compare grazing intensity and primary production across a natural temperature gradient. They will combine field monitoring, statistical modeling, grazing assays, populations-specific metabolic measurements, and in situ herbivore exclusion and nutrient addition to measure the effects of temperature on pattern and process in shallow subtidal communities. The researchers will also test the hypothesis that grazer populations at warmer sites and/or during warmer seasons are less thermally sensitive, potentially due to acclimatization or adaptation. Finally, the investigators will perform a series of mesocosm experiments to measure the effect of near-future temperatures on herbivores, algae, and herbivory. This work could change the way we view upwelling systems, particularly how primary production is regulated and the temperature-dependence of energy transfer across trophic levels.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1737071

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