Temperature data from Onset HOBO U22 loggers deployed at various depths on instrument moorings inside and outside of kelp forests near the Monterey Peninsula, California, USA from June to August 2018 and 2019

Website: https://www.bco-dmo.org/dataset/864813
Data Type: Other Field Results
Version: 1
Version Date: 2021-11-15

Project
» Collaborative Research: RUI: Building a mechanistic understanding of water column chemistry alteration by kelp forests: emerging contributions of foundation species (Kelp forest biogeochemistry)

Contributors	Affiliation	Role
Nickols, Kerry J.	California State University Northridge (CSUN)	Principal Investigator
Dunbar, Robert B.	Stanford University	Co-Principal Investigator
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
These data are from Onset HOBO U22 data loggers recording at 1-minute intervals deployed at various depths on instrument moorings from June to August in 2018 and 2019. Moorings were located inside and outside of a kelp forests near the Monterey Peninsula, California, USA.

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Coverage

Spatial Extent: **N**:36.63088 **E**:-121.897 **S**:36.61795 **W**:-121.9188
Temporal Extent: 2018-06-07 - 2019-08-05

Methods & Sampling

Sampling Locations:
Sampling was conducted near the Monterey Peninsula near Pacific Grove and Monterey, California, USA. Kelp sites ranged from 8.8 to 10.3 meters deep and offshore sites ranged from 13.1 to 16.5 m deep.

Instrument moorings were deployed in 2018 in the following areas: a wave-protected kelp forest, ~100 meters offshore of the protected site, in a wave-exposed site devoid of kelp (historically has had kelp), and ~100 meters offshore of the exposed site.

Instrument moorings were deployed in 2019 in the following areas: a wave-protected kelp forest, ~175 meters offshore of the protected site, in a wave-exposed kelp site, and ~180 meters offshore of the exposed site.

Location Abbreviations:
PK = Protected kelp 2018,

PO = Protected offshore 2018,
EK = Exposed ‘kelp’ 2018,
EO = Exposed offshore 2018,
MK = Protected kelp 2019,
MO = Protected offshore 2019,
OK = exposed kelp 2019,
OO = Exposed offshore 2019.

Methodology:
In 2018, HOBO U22 temperature loggers were deployed at PK at 6.5 and 7.3 meters above the bottom, at PO at 15.5 and 17 meters above the bottom, at EK at 9.5 and 10.7 meters above the bottom, and at EO at 12.75 and 13.7 meters above the bottom. In 2019, instruments were deployed at MK at 8 meters above the bottom, at MO at 15 meters above the bottom, at OK at 9.5 meters above the bottom, and at OO at 14 meters above the bottom.

Instruments had to be swapped out periodically during deployment due to data storage capacity. Time and depth of deployment were recorded each time a sensor deployed.

Data Processing Description

Data Processing:
Data were processed using R software version 1.4.1717. Data from all sites and years combined into one file.

BCO-DMO Processing:
- converted local date to ISO8601 format;
- created the ISO8601 date-time field in UTC;
- replaced "NA" with "nd" (no data).

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Data Files

File
HOBO_U22.csv (Comma Separated Values (.csv), 84.36 MB) MD5:9d3051e10b1a26e760c8bdfdf0fd325c Primary data file for dataset ID 864813

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Parameters

Parameter	Description	Units
Site	Site code: PK = Protected kelp 2018, PO = Protected offshore 2018, EK = Exposed kelp 2018, EO = Exposed offshore 2018, MK = Protected kelp 2019, MO = Protected offshore 2019, OK = exposed kelp 2019, OO = Exposed offshore 2019.	unitless
ISO_DateTime_Local	Date and time (PST) in ISO8601 format: YYYY-MM-DDThh:mm:ss	unitless
Time_zone	Indicates the local time zone (PST)	unitless
ISO_DateTime_UTC	Date and time (UTC) in ISO8601 format: YYYY-MM-DDThh:mm:ssZ	unitless
Meters_above_bottom	Instrument height above the seafloor	meters (m)
Site_depth_0_tide	Depth of the site at at 0 tide	meters (m)
Latitude	Latitude	decimal degrees North
Longitude	Longitude	decimal degrees West
Location	Indicates if the location is Kelp or Offshore	unitless
Temperature_C	Temperature	degrees Celsius

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Instruments

Dataset-specific Instrument Name	HOBO U22 temperature logger
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

Collaborative Research: RUI: Building a mechanistic understanding of water column chemistry alteration by kelp forests: emerging contributions of foundation species (Kelp forest biogeochemistry)

Coverage: Central California 36.6 N 122 W

NSF Award Abstract:
Kelp forest ecosystems are of ecological and economic importance globally and provide habitat for a diversity of fish, invertebrates, and other algal species. In addition, they may also modify the chemistry of surrounding waters. Uptake of carbon dioxide (CO2) by giant kelp, Macrocystis pyrifera, may play a role in ameliorating the effects of increasing ocean acidity on nearshore marine communities driven by rising atmospheric CO2. Predicting the capacity for kelp forests to alter seawater chemistry requires understanding of the oceanographic and biological mechanisms that drive variability in seawater chemistry. The project will identify specific conditions that could lead to decreases in seawater CO2 by studying 4 sites within the southern Monterey Bay in Central California. An interdisciplinary team will examine variations in ocean chemistry in the context of the oceanographic and ecological characteristics of kelp forest habitats. This project will support an early career researcher, as well as train and support a postdoctoral researcher, PhD student, thesis master's student, and up to six undergraduate students. The PIs will actively recruit students from underrepresented groups to participate in this project through Stanford University's Summer Research in Geosciences and Engineering (SURGE) program and the Society for Advancement of Hispanics/Chicanos and Native Americans in Science (SACNAS). In addition, the PIs and students will actively engage with the management community (Monterey Bay National Marine Sanctuary and California Department of Fish and Wildlife) to advance products based on project data that will assist the development of management strategies for kelp forest habitats in a changing ocean.

This project builds upon an extensive preliminary data set and will link kelp forest community attributes and hydrodynamic properties to kelp forest biogeochemistry (including the carbon system and dissolved oxygen) to understand mechanistically how giant kelp modifies surrounding waters and affects water chemistry using unique high-resolution measurement capabilities that have provided important insights in coral reef biogeochemistry. The project sites are characterized by different oceanographic settings and kelp forest characteristics that will allow examination of relationships between kelp forest inhabitants and water column chemistry. Continuous measurements of water column velocity, temperature, dissolved oxygen, pH, and photosynthetically active radiation will be augmented by twice-weekly measurements of dissolved inorganic carbon, total alkalinity, and nutrients as well as periods of high frequency sampling of all carbonate system parameters. Quantifying vertical gradients in carbonate system chemistry within kelp forests will lead to understanding of its dependence on seawater residence time and water column stratification. Additional biological sampling of kelp, benthic communities, and phytoplankton will be used to 1) determine contributions of understory algae and calcifying species to bottom water chemistry, 2) determine contributions of kelp canopy growth and phytoplankton to surface water chemistry, and 3) quantify the spatial extent of surface chemistry alteration by kelp forests. The physical, biological, and chemical data collected across multiple forests will allow development of a statistical model for predictions of kelp forest carbonate system chemistry alteration in different locations and under future climate scenarios. Threshold values of oceanographic conditions and kelp forest characteristics that lead to alteration of water column chemistry will be identified for use by managers in mitigation strategies such as targeted protection or restoration.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1737096
NSF Division of Ocean Sciences (NSF OCE)	OCE-1737176

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