

Temperature data from SeaBird SBE56 sensors 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/865073>

Data Type: Other Field Results

Version: 1

Version Date: 2021-11-17

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
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Abstract

These data are from SeaBird SBE56 sensors 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 kelp forests near the Monterey Peninsula, California, USA.

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Parameters](#)
- [Instruments](#)
- [Project Information](#)
- [Funding](#)

Coverage

Spatial Extent: N:36.63088 E:-121.897 S:36.61795 W:-121.9188

Temporal Extent: 2018-06-07 - 2019-10-08

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, SeaBird SBE56 sensors were deployed at PK at 2 and 5 meters above the bottom, at PO at 4 and 10 meters above the bottom, at EK at 2 and 4 meters above the bottom, and at EO at 4 and 10 meters above the bottom. In 2019, instruments were deployed at MK at 2 and 6 meters above the bottom, at MO at 2 to 6 and 9 to 13 meters above the bottom, at OK at 2 and 6 meters above the bottom, and at OO at 4 and 11 meters above the bottom. The SBE56 were calibrated on 14 April, 2018.

Data Processing Description

Data Processing:

Data were processed using R software version 1.4.1717 to exclude data outside of deployment time.

BCO-DMO Processing:

- converted local date to ISO8601 format;
- created the ISO8601 date-time field in UTC.

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

Data Files

File
SBE56.csv (Comma Separated Values (.csv), 218.87 MB) MD5:fe30722ea2a7bca8c852844c4ea96bc7 Primary data file for dataset ID 865073

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

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	Temperature	degrees Celsius

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

Instruments

Dataset-specific Instrument Name	SBE 56
Generic Instrument Name	Sea-Bird SBE 56 temperature recorder
Dataset-specific Description	SBE 56 calibrated on 14 April, 2018
Generic Instrument Description	This is a small (30 cm by 2.54 cm diameter) high-accuracy, battery-powered temperature and time logger capable of sampling intervals from 0.5 seconds to 9 hours. Temperature is measured by a pressure-protected (1500m depth) thermistor. Initial accuracy is 0.002C and drift is typically less than 0.002C per year.

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

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.

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

Funding

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

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