Nitrate and phosphate from various depths throughout the water column inside and outside a kelp forest near the Monterey Peninsula, California, USA from June to August 2018 and 2019

Website: https://www.bco-dmo.org/dataset/863702
Data Type: Other Field Results
Version: 1
Version Date: 2021-10-20

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
This dataset includes nitrate and phosphate from various depths throughout the water column collected at mooring sites inside and outside a kelp forest near the Monterey Peninsula, California, USA. Data were collected from June to August in 2018 and 2019.

Table of Contents

Coverage

Spatial Extent: **N**:36.63088 **E**:-121.897 **S**:36.61795 **W**:-121.9188
Temporal Extent: 2018-06-12 - 2019-08-02

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.

Sampling Depths:

1B = 1 meter above the bottom,
4B = 4 meters above the bottom,
10B = 10 meters above the bottom,
1T = 1 meter below the sea surface,
S = Sea surface.

Methodology:
Discrete water samples were collected bi-weekly at various depths at instrument mooring sites using Niskin bottles. Each sample collection was accompanied by a CTD cast at the time of collection. 60 mL samples were taken at the depths listed above using Niskin bottles. Samples were kept in a dark cooler and transported to the lab to be frozen until analysis. A WestCo SmartChem 200 discrete auto-analyzer was used to obtain nitrate and phosphate concentrations. Internal control seawater was used on each run sequence and was run after approximately every 10 unknowns with a precision of ± 0.022. Partial results of this data are reported in Traiger et al. (In review).

Data Processing Description

Data Processing:
Data were processed using R software version 1.4.1717. Seawater density from CTD casts was matched to each sample collected. Nitrate-nitrogen and phosphate-phosphorus were converted to to NO_3 and PO_4 in kg L^{-1} which was then converted to µmol L^{-1}.

BCO-DMO Processing:
- created the ISO8601 date-time field in UTC.

[table of contents | back to top]

Data Files

File
nutrients.csv (Comma Separated Values (.csv), 66.77 KB) MD5:c0530540edba92a9588d57f26156e6a8 Primary data file for dataset ID 863702

[table of contents | back to top]

Related Publications

Traiger, S. B., Cohn, B., Panos, D., Daly, M., Hirsh, H. K., Martone, M., Gutierrez, I., Mucciarone, D. A., Takeshita, Y., Monismith, S. G., Dunbar, R. B., & Nickols, K. J. (2021). Limited biogeochemical modification of surface waters by kelp forest canopies: Influence of kelp metabolism and site-specific hydrodynamics. Limnology and Oceanography, 67(2), 392–403. Portico. https://doi.org/10.1002/lno.11999
Results

[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
Date	Date (PST) in format YYYY-MM-DD	unitless
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
Sample_depth	Depth that each sample was collected: 1B = 1 meter above the bottom, 4B = 4 meters above the bottom, 10B = 10 meters above the bottom, 1T = 1 meter below the sea surface, S = Sea surface.	unitless
Niskin_Time	Time of sample collection (PST) in format hh:mm	unitless
Density	Seawater density from CTD cast	kilograms per liter (kg L-1)
Nitrate_N	Nitrate-nitrogen	milligrams per liter (mg L-1)
NO3_umolL	Nitrate	micromoles per liter (umol L-1)
Phosphate_P	Phosphate-phosphorus	milligrams per liter (mg/L)
PO4_umolL	Phosphate	micromoles per liter (umol L-1)
ISO_DateTime_UTC	Date and time (UTC) of sample collection in ISO8601 format: YYYY-MM-DDThh:mmZ	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	SeaBird Electronics 19Plus V2 SeaCAT
Generic Instrument Name	CTD Sea-Bird SBE SEACAT 19plus
Dataset-specific Description	Sensors: Temperature calibrated 14 Jan 2018, Conductivity calibrated 14 Jan 2018, Pressure calibrated 2 Jan 2018, Oxygen calibrated 18 Jan 2018, PAR log calibrated 30 Nov 2017, Fluorometer calibrated 26 December 2017, Turbidity calibrated 26 December 2017.
Generic Instrument Description	Self contained self powered CTD profiler. Measures conductivity, temperature and pressure in both profiling (samples at 4 scans/sec) and moored (sample rates of once every 5 seconds to once every 9 hours) mode. Available in plastic or titanium housing with depth ranges of 600m and 7000m respectively. Minature submersible pump provides water to conductivity cell.

Dataset-specific Instrument Name	WestCo SmartChem 200 discrete auto-analyzer
Generic Instrument Name	Discrete Analyzer
Generic Instrument Description	Discrete analyzers utilize discrete reaction wells to mix and develop the colorimetric reaction, allowing for a wide variety of assays to be performed from one sample. These instruments are ideal for drinking water, wastewater, soil testing, environmental and university or research applications where multiple assays and high throughput are required.

Dataset-specific Instrument Name	Niskin bottles
Generic Instrument Name	Niskin bottle
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

[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]