CTD sensor data from two cruises from R/V Robert Gordon Sproul SP1714 in the California Current waters off the coast of Southern California and Baja California from 2017-2018

Website: https://www.bco-dmo.org/dataset/774459
Data Type: Cruise Results
Version: 1
Version Date: 2023-11-29

Project
» Collaborative Research: Biogeochemical significance of the abundant, uncultivated symbiotic cyanobacteria UCYN-A (BSUCS)

Contributors	Affiliation	Role
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Abstract
CTD sensor data from two cruises from R/V Robert Gordon Sproul SP1714 in the California Current waters off the coast of Southern California and Baja California from 2017-2018

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Coverage

Spatial Extent: **N**:33.82444 **E**:-114.92768 **S**:28.28743 **W**:-120.25384
Temporal Extent: 2017-05-03 - 2018-05-12

Dataset Description

CTD sensor data from two cruises on which experiments were conducted. The experimental data related to this dataset can be found at BCO-DMO dataset UCYN-A Host activity (see related dataset).

Methods & Sampling

Samples were collected using standard oceanographic techniques. A CTD Rosette with 24 10L Niskin bottles was lowered to the maximum sampling depth and then brought back to the surface. Data submitted from CTD is downcast data only.

Data Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- removed duplicate depth columns
- removed duplicate sigma_theta columns

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Data Files

File
774459_v1_arrigo_ctd.csv (Comma Separated Values (.csv), 709.83 KB) MD5:c77e499d4702bec9477f68742684a02a Primary data file for dataset ID 774459, version 1

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Related Datasets

IsRelatedTo

Arrigo, K. R., Zehr, J. P. (2023) **Experimental data testing the N2 and CO2 fixing activity of the UCYN-A/haptophyte symbiosis in nitrate and ammonium rich waters in the California Current from May to October 2017.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-11-29 doi:10.26008/1912/bco-dmo.774585.1 [view at BCO-DMO]
Relationship Description: Experimental data using the CTD sensor data.

Bronk, D. A., Wawrik, B., Yang, Z., Stanley, B. (2023) **Field physiochemical parameters including nutrient concentrations and nitrogen specific uptake rates from samples collected between 2017 and 2019 from the Arctic Ocean, California Coastal Current, and a Chesapeake Bay estuary.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-05-17 doi:10.26008/1912/bco-dmo.896181.1 [view at BCO-DMO]
Relationship Description: Additional data from the SP1714 and SP1727 cruises in the Baja region.

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Parameters

Parameter	Description	Units
Cruise	cruise identifier	unitless
Station	station identifier	unitless
Cast	cast identifier	unitless
Lat	latitude of observation. Positive values indicate North	decimal degrees

Lon	longitude of observation. Positive values indicate East	decimal degrees
Depth	depth of observation	meters (m)
Press	pressure of observation	decibars (db)
Temp1	Water temperature from first sensor	degrees Celsius
Temp2	water temperature from second sensor	degrees Celsius
Sal1	salinity from first sensor	practical salinity units (PSU)
Sal2	salinity from second sensor	practical salinity units (PSU)
O2	oxygen from SBE 43	mililiters per liter (ml/L)
Fluor	fluorescence	miligrams per meter cubed (mg/m3)
Par	Photosythetically active radiation (PAR)	percent
SigTheta1	sigma-theta density from first sensor	kilograms per meter cubed (kg/m3)
SigTheta2	sigma-theta density from second sensor	kilograms per meter cubed (kg/m3)
Time_elapsed	time elapsed	seconds (s)
Depth_bot	bottom depth	meters (m)
Density	density sigma-theta	kilograms per meter cubed (kg/m3)
Pot_temp1	Potential temperature sensor 1	degrees Celsius
Pot_temp2	Potentia temperature sensor 2	degrees Celsius

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Instruments

Dataset-specific Instrument Name	CTD Rosette
Generic Instrument Name	CTD - profiler
Dataset-specific Description	A CTD Rosette with 24 10L Niskin bottles was lowered to the maximum sampling depth and then brought back to the surface.
Generic Instrument Description	The Conductivity, Temperature, Depth (CTD) unit is an integrated instrument package designed to measure the conductivity, temperature, and pressure (depth) of the water column. The instrument is lowered via cable through the water column. It permits scientists to observe the physical properties in real-time via a conducting cable, which is typically connected to a CTD to a deck unit and computer on a ship. The CTD is often configured with additional optional sensors including fluorometers, transmissometers and/or radiometers. It is often combined with a Rosette of water sampling bottles (e.g. Niskin, GO-FLO) for collecting discrete water samples during the cast. This term applies to profiling CTDs. For fixed CTDs, see https://www.bco-dmo.org/instrument/869934.

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Deployments

SP1714

Website	https://www.bco-dmo.org/deployment/699986
Platform	R/V Robert Gordon Sproul
Start Date	2017-05-03
End Date	2017-05-11
Description	R/V Robert Gordon Sproul Cruise SP1714 May 3 - 11, 2017 Chief Scientist - Matthew Mills (mmmills@stanford.edu) See more cruise information from R2R: https://www.rvdata.us/search/cruise/SP1714

SP1727

Website	https://www.bco-dmo.org/deployment/774496
Platform	R/V Robert Gordon Sproul
Start Date	2017-10-04
End Date	2017-10-11
Description	R/V Robert Gordon Sproul Cruises SP1727 October 4 - 11, 2017 Chief Scientist - Matthew Mills (mmmills@stanford.edu) See more cruise information from R2R: https://www.rvdata.us/search/cruise/SP1727

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Project Information

Collaborative Research: Biogeochemical significance of the abundant, uncultivated symbiotic cyanobacteria UCYN-A (BSUCS)

Coverage: California Current waters off the Southern California shelf

NSF Award Abstract:
Nitrogen is a nutrient whose availability limits growth and productivity of ecosystems. Nitrogen is extremely abundant in the atmosphere in the inert form of gaseous N2, but most organisms cannot reduce N2 into a biologically available form. In all environments, including agricultural soils, there are microorganisms that can make available the N from gaseous N2 by reducing it to the biologically available form, ammonium. In the vast expanses of the open ocean, few organisms are known to have this ability, and recently a unique symbiosis between a single-celled cyanobacterium and a single-celled algae was discovered, which appears to be very widely distributed and likely of global biogeochemical significance. The cyanobacterium in this symbiotic partnership has very unusual metabolism and genomic streamlining. Little is known of the symbiosis because it is not detectable except by modern molecular biological techniques. Recent work has shown this symbiosis to be very widely spread through the oceans, and that there is previously unrecognized diversity in both the cyanobacterial and algal hosts. This research will examine the environmental distributions and the biogeochemical significance of this diversity in coastal US waters. The investigators will engage the public in ocean sciences through internship programs at local high schools and for undergraduate students at Stanford, and by documenting their field research in a 'virtual cruise' blog.

In the marine environment, the contribution of N2 fixation to the fixed nitrogen (N) pool is poorly quantified, in part due to an incomplete understanding on the abundance, activity, and physiology of diazotrophs. The symbiotic unicellular cyanobacteria (UCYN-A) is a poorly characterized, yet globally important, group of marine diazotrophs. UCYN-A is widely distributed in the marine environment, and lives symbiotically with a picoeukaryotic prymnesiophyte alga. We now know that there are multiple ecotypes of UCYN-A, which may be adapted to specific locations in the water-column and different oceanic provinces. Typically N2 fixation was considered unimportant in coastally influenced and non-tropical waters, however recent data shows that multiple subclades of UCYN-A are present. The distribution and rate of N2 fixation by UCYN-A subclades in coastal/nearshore environments is a major unknown in the oceanic N cycle. Its presence in nearshore waters may change the paradigm of the balance between basin N sources (N2 fixation) and sinks (denitrification). Likewise, significant N2 fixation by UCYN-A will need to be considered when determining estimates of new production in coastally influenced waters. This project aims to quantify the significance of different UCYN-A subclades to coastal/nearshore N budgets. It tackles the issue of determining N2 fixation rates by different UCYN-A subclades in coastal waters through rigorous fieldwork off the west coast of North America. The temporal and spatial distribution of UCYN-A subclades, as well as the rates of N2 fixation, will be determined by coupling N2 fixation measurements of bulk communities and individual cells (nanoSIMS) with molecular assays to study these widespread, but dilute, diazotrophic symbionts and their hosts. Additionally the investigators will conduct experiments aimed at constraining the effects of light and nutrient ratios (N/P) on UCYN-A N2 fixation rates, and the prymnesiophyte host's rate of carbon fixation. They will conduct this work through seasonal sampling of a coastal site in the Southern California Bight (Scripps Pier) and on two process cruises in the coastal waters between central California and the Baja Peninsula. The cruise work will provide an opportunity to understand the temporal dynamics of the UCYN-A/prymnesiophyte associations over larger spatial scales. Finally, evidence suggests that unidentified UCYN-A subclades and hosts exist and the investigators have developed a strategy to identify and quantify their temporal and spatial distributions as well as their N2 fixation activities. Data on the coastal distribution, ecology and activity of UCYN-A is critical for obtaining a better understanding of their contribution to fixed N to the marine environment. The group-specific and bulk rates of N2 fixation measured in this study of coastally influenced waters, will provide data for future modeling efforts, which will make an important contribution to constraining oceanic N2 fixation inputs.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1559165
NSF Division of Ocean Sciences (NSF OCE)	OCE-1559152

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