Physical and chemical properties of surface seawater obtained by CTD from the R/V Melville (MV1405) cruise along the coast of California in July 2014.

Website: https://www.bco-dmo.org/dataset/663717
Data Type: Cruise Results
Version: 1
Version Date: 2016-10-28

Project
» Collaborative Research: Investigating the Ecological Importance of Iron Storage in Diatoms (Diatom Iron Storage)

Contributors	Affiliation	Role
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Abstract
Physical and chemical properties of surface seawater obtained by CTD from the R/V Melville (MV1405) cruise along the coast of California in July 2014.

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Dataset Description

Physical and chemical properties of surface seawater obtained by CTD (5m) in close proximity to where seawater was collected for incubation experiments.

Data Processing Description

BCO-DMO Data Processing Notes:

-reformatted column names to comply with BCO-DMO standards

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Data Files

File
CTD_seawaterSamples.csv (Comma Separated Values (.csv), 370 bytes) MD5:2fb87a673cc2792696fac128afda344e Primary data file for dataset ID 663717

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Parameters

Parameter	Description	Units
Q_ID	Incubation sample ID	unitless
date	Date sampling occurred (GMT); mm/dd/yy	unitless
start_time	Time sampling occurred (GMT); HH:MM	unitless
lat_incubations	Latitude where water samples for incubations were collected; N is positive	decimal degrees
lon_incubations	Longitude where water samples for incubations were collected; E is positive	decimal degrees
lat_CTD	Latitude where CTD samples were collected; N is positive	decimal degrees
lon_CTD	Longitude where CTD samples were collected; E is positive	decimal degrees
temp	Temperature of water at CTD sampling site	celsius
salinity	Salinity of water from CTD sampling site	practical salinity units (PSU)
conductivity	Conductivity from CTD sampling site	uS/cm
PAR	PAR from CTD sampling site	umol photons/square meter

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Instruments

Dataset-specific Instrument Name	CTD
Generic Instrument Name	CTD - profiler
Dataset-specific Description	Used to collect water samples
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.

Dataset-specific Instrument Name	GeoFish Sampler
Generic Instrument Name	GeoFish-type Near-surface Towfish Sampler
Dataset-specific Description	Used to collect seawater
Generic Instrument Description	This term describes a family of custom-designed, trace-metal-clean, near-surface seawater sampling systems based on the 'GeoFish' design developed by Geoffrey Smith and Ken Bruland at the University of California, Santa Cruz (UCSC). The systems consist of a weighted towed body or torpedo, clean intake tubing, a shipboard pneumatic pump, and a sampling manifold. They are deployed alongside a moving vessel, outside the ship's wake, with the intake typically positioned approximately 1 to 3 meters below the sea surface. Seawater is continuously pumped through the clean tubing to the ship for filtered and unfiltered sampling and, in some applications, direct connection to analytical instruments. This term includes the original GeoFish sampler, Super-GeoFISH variants, and subsequent modified towfish systems used on U.S. GEOTRACES cruises. These systems share the same basic sampling principle but may differ in body construction, depressor or stabilization design, deployment hardware, tubing, pump configuration, flow rate, and sampling manifold. The systems have been used for trace-metal, nutrient, biological, and other chemical measurements in both GEOTRACES and non-GEOTRACES studies, including Bruland et al. (2005).

Dataset-specific Instrument Name	Teflon dual-diaphragm pump
Generic Instrument Name	Pump
Dataset-specific Description	Pumped seawater directly into a positive pressure trace-metal clean bubble constructed in the main laboratory of the ship.
Generic Instrument Description	A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps

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Deployments

MV1405

Website	https://www.bco-dmo.org/deployment/559966
Platform	R/V Melville
Start Date	2014-07-03
End Date	2014-07-26
Description	Deployment MV1405 on R/V Melville. Cruise took place during July 2014.

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Project Information

Collaborative Research: Investigating the Ecological Importance of Iron Storage in Diatoms (Diatom Iron Storage)

Coverage: North Pacific, California coast and subarctic gyre

NSF Award Abstract:
Diatoms are responsible for a significant fraction of primary production in the ocean. They are associated with enhanced carbon export and usually dominate the response of phytoplankton to additions of the micronutrient iron in high-nutrient, low-chlorophyll (HNLC) regions. Diatoms, particularly those isolated from the open ocean, appear to have a significant capacity to store iron for later use, and in some groups of diatoms this ability is enabled by the iron storage protein ferritin. Such luxury uptake of iron has long been observed in laboratory cultures and hypothesized to provide diatoms with an ecological benefit in the low-iron waters that cover 40% of the global ocean. However iron storage has been difficult to observe in natural systems due to the methodological challenges of working with mixed plankton assemblages, and a physiological understanding of the impacts of iron on ocean diatoms is lacking. This project combines state-of-the-art high-throughput transcriptomic sequencing and single-cell element analysis with novel laboratory and field incubation experiments to quantify iron storage abilities of cultured and natural diatoms that either contain or lack ferritin and determine the ecological impacts of this process. The overall objective of this project is to examine the ecological importance of iron storage as a selective mechanism controlling the distributions of diatoms along iron gradients in marine ecosystems. The proposed research includes three specific objectives:

A. Determine if there is a consistent physiological difference in the ability of pennate versus centric diatoms to store iron.

B. Examine whether iron storage capacities across diverse diatom taxa consistently provide a mechanistic explanation for continued growth in the absence of iron.

C. Determine whether enhanced iron storage provides diatoms with a competitive within natural phytoplankton assemblages in both coastal and oceanic regions.

Transcriptomic sequencing on a variety of ecologically important pennate and centric diatoms will be used to survey for the presence of ferritin-like genes in order to establish biogeographical and/or phylogenetic patterns of occurrence of diatom ferritin. Laboratory culture experiments will be used to quantify the iron storage abilities of these diatoms, as well as the number of cell divisions that can be supported by the stored iron, providing valuable physiological data to inform the understanding of plankton ecology in iron-limited coastal and HNLC systems. The laboratory experiments will be complemented by measurements of ferritin expression and iron storage in coastal and ocean diatoms sampled across gradients of iron availability on two cruises-of-opportunity to the northeast Pacific Ocean.

The NCBI bioproject page can be found here.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1334935
NSF Division of Ocean Sciences (NSF OCE)	OCE-1334632

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