Eukaryotic phytoplankton abundance and composition from nitrate and vitamin-B enriched treatments, from up-welled coastal waters off Southern California, March 2015 (B-vitamin plankton succession project)

Website: https://www.bco-dmo.org/dataset/726283
Data Type: experimental
Version: 1
Version Date: 2018-02-05

Project
» Can the availability of B-vitamins control phyto-and-bacterioplankton successions in a coastal upwelling region? (B-vitamin plankton succession)

Contributors	Affiliation	Role
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Abstract
This dataset includes abundance and percent composition for eukaryote phytoplankton collected in water samples from the San Pedro Ocean Time-series (SPOT), 2015. They were incubated with six treatments of nitrate and vitamin B.

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Coverage

Spatial Extent: **Lat**:33.5478 **Lon**:-118.3983
Temporal Extent: 2015-03 - 2015-03

Dataset Description

This dataset includes abundance and percent composition for eukaryote phytoplankton collected in water samples from the San Pedro Ocean Time-series (SPOT), 2015. They were incubated with six treatments of nitrate and vitamin B.

Methods & Sampling

Water samples were collected from 3 meters depth at the San Pedro Ocean Time-series (SPOT) station (33°33'N, 118°24'W) off the coast of Southern California in March 2015. Six treatments were used: control, nitrate, nitrate+B1, nitrate+B7, nitrate+B12, and nitrate+B1+B7+B12 with triplicate 10L incubations. Growth was tracked daily. Samples were collected initially, and at two points during the experiment: exponential growth and stationary phase. Exponential growth occurred at day 7 and stationary growth varied between treatment ranging from 10-12 days. The incubations were co-limited by nitrate and B12. Samples were flash frozen and stored at -80C until analysis. For further details on the methodology, see Suffridge et al (2017).

Samples of 50 ml volume were collected from each replicate of six treatments and preserved at 4°C in the dark with the addition of acidified Lugol's solution an enumerated using an Accu-Scope 3032 inverted microscope.

Data Processing Description

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- reduced decimal precision
- changed proportions to percents

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Data Files

File	
Vitacopss_taxon_abund.csv	(Comma Separated Values (.csv), 2.30 KB) MD5:bbc2a71bce820379f3c27e6d6209d687
Primary data file for dataset ID 726283	

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Related Publications

Hobbie, J. E., Daley, R. J., & Jasper, S. (1977). Use of nuclepore filters for counting bacteria by fluorescence microscopy. Applied and Environmental Microbiology, 33(5), 1225–1228. https://aem.asm.org/content/33/5/1225.short
Methods

Sanudo-Wilhelmy, S. A., Cutter, L. S., Durazo, R., Smail, E. A., Gomez-Consarnau, L., Webb, E. A., … Karl, D. M. (2012). Multiple B-vitamin depletion in large areas of the coastal ocean. Proceedings of the National Academy of Sciences, 109(35), 14041–14045. doi:10.1073/pnas.1208755109
General

Suffridge, C., Cutter, L., & Sañudo-Wilhelmy, S. A. (2017). A New Analytical Method for Direct Measurement of Particulate and Dissolved B-vitamins and Their Congeners in Seawater. Frontiers in Marine Science, 4. doi:10.3389/fmars.2017.00011
Methods

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Parameters

Parameter	Description	Units
sample_id	sample identifier	unitless
treatment	treatments: control; nitrate (N); nitrate+B1 (N+B1); nitrate+B7 (N+B7); nitrate+B12 (N+B12); and nitrate+B1+B7+B12 (All)	unitless
timepoint	code for sampling period during one of three growth phases of the population: 0=initial sampling; 1=exponential phase; 2=stationary phase. Dates: 2015-03-12 (time 0); 2015-03-20 (time 1); 2015-03-25 (time 2)	unitless
taxon	taxon that was counted	unitless
organisms_ml	abundance of the organism/taxon	individuals/milliliter
organisms_ml_sd	standard deviation of abundance	individuals/milliliter
percent_composition	relative abundance (percent) of each taxon in the sample	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	CTD - profiler
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	Accu-Scope 3032 inverted microscope
Generic Instrument Name	Inverted Microscope
Dataset-specific Description	Used for cell counts: Samples of 50 ml volume were collected from each replicate of six treatments and preserved at 4°C in the dark with the addition of acidified Lugol's solution an enumerated using an Accu-Scope 3032 inverted microscope.
Generic Instrument Description	An inverted microscope is a microscope with its light source and condenser on the top, above the stage pointing down, while the objectives and turret are below the stage pointing up. It was invented in 1850 by J. Lawrence Smith, a faculty member of Tulane University (then named the Medical College of Louisiana). Inverted microscopes are useful for observing living cells or organisms at the bottom of a large container (e.g. a tissue culture flask) under more natural conditions than on a glass slide, as is the case with a conventional microscope. Inverted microscopes are also used in micromanipulation applications where space above the specimen is required for manipulator mechanisms and the microtools they hold, and in metallurgical applications where polished samples can be placed on top of the stage and viewed from underneath using reflecting objectives. The stage on an inverted microscope is usually fixed, and focus is adjusted by moving the objective lens along a vertical axis to bring it closer to or further from the specimen. The focus mechanism typically has a dual concentric knob for coarse and fine adjustment. Depending on the size of the microscope, four to six objective lenses of different magnifications may be fitted to a rotating turret known as a nosepiece. These microscopes may also be fitted with accessories for fitting still and video cameras, fluorescence illumination, confocal scanning and many other applications.

Dataset-specific Instrument Name	
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.

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Deployments

lab_Sanudo_2015

Website	https://www.bco-dmo.org/deployment/653467
Platform	R/V Yellowfin
Start Date	2015-03-01
End Date	2016-06-01

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Project Information

Can the availability of B-vitamins control phyto-and-bacterioplankton successions in a coastal upwelling region? (B-vitamin plankton succession)

Coverage: Southern California Bight

Description from NSF award abstract:
B-vitamins (thiamin (B1), biotin (B7), and cobalamin (B12)) are organic molecules used by all organisms for many biochemical reactions ranging from DNA and amino acid synthesis to carbon dioxide assimilation. Despite their metabolic importance, many marine organisms cannot make them and need to obtain them from the environment. Because the requirement for a specific vitamin is different for different organisms, changes in the species composition of algae could be explained by their different B-vitamin requirements. For example, changes in the biological properties of waters during an algal bloom (removal of needed vitamins and release of other vitamins) may favor algae that require the vitamin released by the previous bloom (setting up a floral succession). This selective preconditioning of the waters may be one factor in the seasonal succession of algal species. However, evaluating the role of vitamins in marine ecology has been difficult. No study to date has been comprehensive enough to estimate the importance of vitamins in primary productivity and species succession. This is especially true in coastal upwelling regions that although relatively small in area, are orders of magnitude more productive than their open-ocean counterparts. In fact, those regions contribute a significant portion of the world fisheries. Therefore, in order to try to predict future changes in the world ocean due to human activity, the variables that influence or control the algal communities that dominate the very productive food chains of upwelling regions need to be identified.

This study will investigate how the availability of B-vitamins affects the dynamics of algal- and bacterioplankton population growth in coastal waters of an upwelling region off Southern California. This comprehensive field investigation will determine in situ temporal concentrations of several dissolved and particulate B-vitamins, inorganic micro- and macronutrients, concurrently with seasonal changes in phytoplankton and bacterial abundances and species composition at a long-term time series station within the San Pedro Basin near Los Angeles. Those measurements will be complemented with field incubation experiments with natural plankton assemblages to study the effect of organic and inorganic nutrient amendments on phytoplankton and bacterial community structure. This study will establish for the first time that the availability of ambient B-vitamins influence algal and bacterial species succession in a highly productive coastal upwelling region and that multiple and differing B-vitamin requirements limit growth of some phytoplankton species in those areas. Furthermore, this study will try to show that coastal upwelling transports some B-vitamins to the phytoplankton community in the photic zone from bacterially-influenced source waters within the upper mesopelagic zone.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1435666

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