# Particulate B vitamins from Vitacopss, San Pedro Ocean Time series (SPOT), 2015 from R/V Yellowfin near Los Angeles, California from 2015-2016 (B-vitamin plankton succession project)

**Website**: https://www.bco-dmo.org/dataset/653453
**Data Type**: experimental
**Version**:
**Version Date**: 2016-08-08

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

| Contributors | Affiliation | Role |
|---|---|---|
| Sanudo-Wilhelmy, Sergio A. | University of Southern California (USC-WIES) | Principal Investigator |
| Fu, Feixue | University of Southern California (USC-WIES) | Co-Principal Investigator |
| Hutchins, David A. | University of Southern California (USC-HIMS) | Co-Principal Investigator |
| Cutter, Lynda | University of Southern California (USC) | Contact |
| Copley, Nancy | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager |

## Table of Contents



## Dataset Description

Access to this data set is restricted until 2017-12-31. Please contact L. Cutter for further information.

**Related Datasets:**
vitamin B dissolved - Hotmix 2014
vitamin B particulate - Hotmix 2014

### Methods & Sampling

Water was 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. Particulate B-vitamin samples were collected initially, and at two points during the experiment: exponential growth and stationary phase. Exponential growth occurred at day 7. Stationary growth varied between treatment ranging from 10-12 days. The incubations were co-limited by nitrate and B12. Samples were collected from two size fractions (0.2um-3um, and >3um) using in-line peristaltic filtration. Samples were

flash frozen and stored at -80C until analysis. B-vitamin extraction was performed as described in Suffridge et. al (2017).

Particulate B-vitamins were extracted in acidic methanol (pH 3.5, 5% MeOH, 95% LC/MS Grade water) using bead-beating for cell lysis and a 30C incubation for B-vitamin extraction. A liquid phase extraction using chloroform (1:1 v/v) was used to clean up the samples prior to analysis.

Analysis was conducted using a Thermo TSQ Quantum Access triple quadrupole LC/MS with an ESI interface and a $C_{18}$ column (Discovery HS $C_{18}$ 10cm x 2, 1mm, 5µm column, Supelco Analytical) Sanudo 2012. Quantification conducted using an internal standard. Triplicate injections were used to increase precision.

Cited References:

Suffridge, Christopher; Cutter, Lynda; Sanudo-Wilhelmy, Sergio (2017) A New Analytical Method for Direct Measurement of Particulate and Dissolved B-vitamins and Their Congeners in Seawater. Front. Mar. Sci. vol.4 doi.org/10.3389/fmars.2017.00011

Sanudo 2012 - Proc Natl Acad Sci U S A. 2012 Aug 28;109(35):14041-5. doi: 10.1073/pnas.1208755109. Epub 2012 Jul 23

**Data Processing Description**

**BCO-DMO Processing:**

- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- replaced blank cells with nd (no data)
- added cruise_id, lat, lon, date
- mean_pM and std_dev: reduced digits right of decimal from 9 to 1 to take measurement precision into consideration

[ table of contents | back to top ]

## Parameters

| Parameter | Description | Units |
|---|---|---|
| site | sample source | unitless |
| lat | latitude; north is positive | decimal degrees |
| lon | longitude; east is positive | decimal degrees |
| analyte | dissolved vitamin-B form: AB12: Adenosyl Cobalamin B1: Thiamine B7: Biotin CB12: Cyanocobalamin HB12: Hydroxycobalamin HMP: 4-Amino-2-methyl-5-pyrimidinyl methanol MB12: Methylcobalamin MET: Methionine TMP: Thiamine monophosphate TPP: Thiamine pyrophosphate | unitless |
| sizefrac_um | sample size fraction | microns |
| day | days since start of incubation | days |
| treatment | Nutrients added to incubation: Control: no added nutrients N: Nitrogen as sodium nitrate, 20 µmoles/L B1: Thiamine, 300 picomolar/L B7: Biotin, 100 picomoles/L B12: Cyanocobalamin, 100 picomoles/L All: Nitogen + Thiamine,+Cyanocobalamin, concentrations as above | unitless |
| mean_pM | particulate analyte concentration | picomoles per liter |
| std_dev | concentration standard deviation | picomoles per liter |

[ table of contents | back to top ]

## 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** | |
| **Generic Instrument Name** | High-Performance Liquid Chromatograph |
| **Dataset-specific Description** | Thermo Accela High Speed Liquid Chromatography system |
| **Generic Instrument Description** | A High-performance liquid chromatograph (HPLC) is a type of liquid chromatography used to separate compounds that are dissolved in solution. HPLC instruments consist of a reservoir of the mobile phase, a pump, an injector, a separation column, and a detector. Compounds are separated by high pressure pumping of the sample mixture onto a column packed with microspheres coated with the stationary phase. The different components in the mixture pass through the column at different rates due to differences in their partitioning behavior between the mobile liquid phase and the stationary phase. |

| | |
|---|---|
| **Dataset-specific Instrument Name** | |
| **Generic Instrument Name** | Mass Spectrometer |
| **Dataset-specific Description** | ThermoTSQ Quantum Access electro-spray ionization triple quadrupole mass spectrometer |
| **Generic Instrument Description** | General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components. |

| | |
|---|---|
| **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. |

[ table of contents | back to top ]

## 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 |

[ table of contents | back to top ]

## 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.

[ table of contents | back to top ]

## Funding


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


[ table of contents | back to top ]