Algal pigment concentrations measured by HPLC from RVIB Nathaniel B. Palmer cruise in the Ross Sea, Southern Ocean from 2017-2018.

Website: https://www.bco-dmo.org/dataset/778881
Data Type: Cruise Results
Version: 2
Version Date: 2019-12-24

Project
» Collaborative Research: Cobalamin and Iron Co-Limitation Of Phytoplankton Species in Terra Nova Bay (CICLOPS)

Contributors	Affiliation	Role
DiTullio, Giacomo	College of Charleston (CofC)	Principal Investigator
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Abstract
Algal pigment concentrations as measured by HPLC from RVIB Nathaniel B. Palmer cruise in the Ross Sea, Southern Ocean from 2017-2018.

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Coverage

Spatial Extent: **N**:-72.44818 **E**:-116.9882 **S**:-78.6294 **W**:167.5528
Temporal Extent: 2017-12-31 - 2018-02-19

Dataset Description

Algal pigment concentrations as measured by HPLC from RVIB Nathaniel B. Palmer cruise in the Ross Sea, Southern Ocean from 2017-2018.

Acquisition Description

Algal HPLC samples were collected by gentile filtration under low vacuum through GF/F filters and frozen at -80C for on-shore analysis. Samples were extracted in acetone and analyzed using an Agilent 1100 HPLC system equipped with autosampler, photodiode array and fluorescence detectors. The gradient elution program utilized was a slight modification of the Zapata et al. method (2000). Complete details of the HPLC method are described elsewhere (DiTullio and Geesey 2002).

High Performance Liquid Chromatograph (HPLC) Agilent 1100 equipped with autosampler, photodiode array and fluorescence detectors

Processing Description

Pigment concentrations were determined using standard peak integration procedures with Agilent's ChemStation (version B.03.02), and entered into Microsoft Excel Spreadsheets for submission to BCO-DMO. Parameters reported were: chlorophyll c3, chlorophyllide, magnesium-2,4-divinyl phaeoporphyrin a5 monomethyl ester, chlorophyll c2, chlorophyll c1, peridinin, pheophorbide a, 19-prime butanoyloxyfucoxanthin, fucoxanthin, neoxanthin, prasinoxanthin, violaxanthin, 19-prime hexanoyloxyfucoxanthin, diadinoxanthin, cis-fucoxanthin, alloxanthin, diatoxanthin, monadoxanthin, zeaxanthin, lutein, crocoxanthin, chlorophyll b, divinyl chlorophyll a, chlorophyll a, pheophytin a, carotene-alpha and carotene-beta.

BCO-DMO processing notes:

- Adjusted column names

- Adjusted date format to yyyy-mm-dd for increased interoperability
- Version 2: An updated calibration curve was used to recalculate the chlorophyll a concentrations

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Related Publications

DiTullio, G., & Geesey, M. E. (2003). Photosynthetic Pigments in Marine Algae and Bacteria. Encyclopedia of Environmental Microbiology. doi:10.1002/0471263397.env185

Zapata, M., Rodríguez, F., & Garrido, J. (2000). Separation of chlorophylls and carotenoids from marine phytoplankton:a new HPLC method using a reversed phase C8 column and pyridine-containing mobile phases. Marine Ecology Progress Series, 195, 29–45. doi:10.3354/meps195029

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Parameters

Parameter	Description	Units
Date	Date (UTC) - format: yyyy-mm-dd	unitless
Station	Station Identifier	unitless
Latitude	Latitude (South is negative)	decimal degrees
Longitude	Longitude (West is negative)	decimal degrees
Depth	Sample depth	meters (m)
Niskin	Niskin Bottle Number	unitless
Sample	Sample Number	unitless
Fltr_Vol	Volume Filtered	liter (L)
Chl_C3	Chlorophyll c3	nanogram per liter (ng/L)
Chl_lide	Chlorophyllide	nanogram per liter (ng/L)
MgDVP	Magnesium-2;4-divinyl	nanogram per liter (ng/L)
Chl_C2	Chlorophyll c2	nanogram per liter (ng/L)

Chl_C1	Chlorophyll c1	nanogram per liter (ng/L)
Peridinin	Peridinin	nanogram per liter (ng/L)
Ph_ide	Pheophorbide a	nanogram per liter (ng/L)
But_19	19'-butanoyloxyfucoxanthin	nanogram per liter (ng/L)
Fuco	Fucoxanthin	nanogram per liter (ng/L)
Neo	Neoxanthin	nanogram per liter (ng/L)
Prasino	Prasinoxanthin	nanogram per liter (ng/L)
Viola	Violaxanthin	nanogram per liter (ng/L)
Hex_19	19'-hexanoyloxyfucoxanthin	nanogram per liter (ng/L)
Diadino	Diadinoxanthin	nanogram per liter (ng/L)
cis_fuco	cis-Fucoxanthin	nanogram per liter (ng/L)
Allo	Alloxanthin	nanogram per liter (ng/L)
Diato	Diatoxanthin	nanogram per liter (ng/L)
Monad	Monadoxanthin	nanogram per liter (ng/L)
Zea	Zeaxanthin	nanogram per liter (ng/L)
Lutein	Lutein	nanogram per liter (ng/L)
Croco	Crocoxanthin	nanogram per liter (ng/L)
Chl_b	Chlorophyll b	nanogram per liter (ng/L)
Chl_a_allomer	Chlorophyll a allomer	nanogram per liter (ng/L)
Chl_C2_MGDG	Chlorophyll c2 MGDG	nanogram per liter (ng/L)
DV_Chl_a	Divinyl chlorophyll a	nanogram per liter (ng/L)
Chl_a	Chlorophyll a	nanogram per liter (ng/L)
Ph_tin	Phaeophytin a	nanogram per liter (ng/L)
a_Car	Alpha-carotene	nanogram per liter (ng/L)
b_Car	Beta-carotene	nanogram per liter (ng/L)

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Instruments

Dataset-specific Instrument Name	Agilent 1100
Generic Instrument Name	High Performance Liquid Chromatograph
Dataset-specific Description	High Performance Liquid Chromatograph (HPLC) Agilent 1100 equipped with autosampler, photodiode array and fluorescence detectors.
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.

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Deployments

NBP1801

Website	https://www.bco-dmo.org/deployment/778919
Platform	RVIB Nathaniel B. Palmer
Start Date	2017-12-16
End Date	2018-03-03
Description	Chief Scientist: Saba, Grace Start Port: Punta Arenas End Port: Hobart

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Project Information

Collaborative Research: Cobalamin and Iron Co-Limitation Of Phytoplankton Species in

Terra Nova Bay (CICLOPS)

Coverage: Amundsen Sea, Ross Sea, Terra Nova Bay

NSF abstract: Phytoplankton blooms in the coastal waters of the Ross Sea, Antarctica are typically dominated by either diatoms or Phaeocystis Antarctica (a flagellated algae that often can form large colonies in a gelatinous matrix). The project seeks to determine if an association of bacterial populations with Phaeocystis antarctica colonies can directly supply Phaeocystis with Vitamin B12, which can be an important co-limiting micronutrient in the Ross Sea. The supply of an essential vitamin coupled with the ability to grow at lower iron concentrations may put Phaeocystis at a competitive advantage over diatoms. Because Phaeocystis cells can fix more carbon than diatoms and Phaeocystis are not grazed as efficiently as diatoms, the project will help in refining understanding of carbon dynamics in the region as well as the basis of the food web webs. Such understanding also has the potential to help refine predictive ecological models for the region. The project will conduct public outreach activities and will contribute to undergraduate and graduate research. Engagement of underrepresented students will occur during summer student internships. A collaboration with Italian Antarctic researchers, who have been studying the Terra Nova Bay ecosystem since the 1980s, aims to enhance the project and promote international scientific collaborations. The study will test whether a mutualistic symbioses between attached bacteria and Phaeocystis provides colonial cells a mechanism for alleviating chronic Vitamin B12 co-limitation effects thereby conferring them with a competitive advantage over diatom communities. The use of drifters in a time series study will provide the opportunity to track in both space and time a developing algal bloom in Terra Nova Bay and to determine community structure and the physiological nutrient status of microbial populations. A combination of flow cytometry, proteomics, metatranscriptomics, radioisotopic and stable isotopic labeling experiments will determine carbon and nutrient uptake rates and the role of bacteria in mitigating potential vitamin B12 and iron limitation. Membrane inlet and proton transfer reaction mass spectrometry will also be used to estimate net community production and release of volatile organic carbon compounds that are climatically active. Understanding how environmental parameters can influence microbial community dynamics in Antarctic coastal waters will advance an understanding of how changes in ocean stratification and chemistry could impact the biogeochemistry and food web dynamics of Southern Ocean ecosystems.

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Funding

Funding Source	Award
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1644073

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