Pigment concentration data from AUV Clio dives conducted during R/V Atlantic Explorer cruise AE1913 in the Sargasso Sea in June of 2019

Website: https://www.bco-dmo.org/dataset/926546
Data Type: Cruise Results
Version: 1
Version Date: 2024-05-03

Project
» Collaborative Research: Direct Characterization of Adaptive Nutrient Stress Responses in the Sargasso Sea using Protein Biomarkers and a Biogeochemical AUV (Nutrient Stress Responses and AUV Clio)

Contributors	Affiliation	Role
Saito, Mak A.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Cohen, Natalie	Woods Hole Oceanographic Institution (WHOI)	Scientist
Johnson, Rodney J.	Bermuda Institute of Ocean Sciences (BIOS)	Scientist
York, Amber D.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Pigment concentration data from R/V Atlantic Explorer cruise AE1913 (June 2019) in which seawater was collected across a 1,050 km section in the western North Atlantic.

Table of Contents

- Coverage
- Dataset Description
  - Methods & Sampling
  - BCO-DMO Processing Description
- Data Files
- Supplemental Files
- Related Publications
- Related Datasets
- Parameters
- Instruments
- Deployments
- Project Information
- Funding

Coverage

Location: Sargasso Sea, beginning at Bermuda Atlantic Time-series Station (BATS) and ending in the northeast shelf of Woods Hole Oceanographic Institution (WHOI)
Spatial Extent: **N**:38.528372 **E**:-65.976848 **S**:32.995067 **W**:-70.84278
Temporal Extent: 2019-06

Dataset Description

See the "Related Datasets" section on this page for the ELOG from cruise AE1913 and other closely related data.
* Also see all datasets related to the same cruise AE1913: https://www.bco-dmo.org/deployment/916412

Methods & Sampling

Oceanographic samples were collected onboard the R/V Atlantic Explorer between June 16th - 28th 2019, along a transect beginning at the Bermuda Atlantic Time-series Study (BATS) site and terminating in northeast US continental shelf waters (Woods Hole Oceanographic Institution [WHOI]). Biomass was collected using the biogeochemical AUV Clio. Clio payloads contained SUPR cartridges housing 142 mm combusted GFF filters for pigment collection. GFF filter fractions were additionally preserved for high performance liquid chromatography pigment analyses throughout the surface transect.

Pigments were collected onto 142 mm GFF filters by AUV Clio at the same depths that proteins were collected on Supor filters. GFF 25 mm punchouts were used for the pigment analysis, and the estimated volume filtered through 25 mm was used to quantify pigments per volume. Concentrations are reported as ng/kg assuming the standard density of seawater (1025 kg/m3). At stations 1 and 3, GFF fractions for pigments were not collected by Clio. Instead, pigments were analyzed from the CTD rosette at these stations (though deployments and recoveries were the same) whereby samples (4 L) were filtered directly onto 25 mm GFF glass fiber filters and immediately frozen in liquid nitrogen. Samples were analyzed on an Agilent 1100 series high performance liquid chromatography (HPLC) using the method of Bidigare et al. 2005 and instrument calibration was performed with certified pigment standards from the Danish Hydraulic Institute.

Abbreviation,Pigment Name:

ChlC3, Chlorophyll C3
ChlC2, Chlorophyll C2
Per, Peridinin
NBut, 19'But-Fucoxanthin
Fux, Fucoxanthin
NHex, 19'Hex-Fucoxanthin
Prx, Prasinoxanthin
Vix, Violoxanthin
Ddx, Diadinoxanthin
Alx, Alloxanthin
Dtx, Diatoxanthin
Lut, Lutein
Zex, Zeaxanthin
ChlB, Chlorophyll b
DvA, Divinyl Chlorophyll a
Chla, Chlorophyll a
ABCar, Alpha & Beta Carotene

BCO-DMO Processing Description

* Sheet 1 of submitted file "CLIO_BV55.xls" was imported into the BCO-DMO data system for this dataset. Values "NA" imported as missing data values. Sheet 2 containing pigment abbreviations and names was added to Methods & Sampling section.
* Imported rows did not include comment outside of the data table "Pigment concentrations are reported in ng/kg", that information was added to the "parameters" section of metadata.
** Missing data values are displayed differently based on the file format you download. They are blank in csv files, "NaN" in MatLab files, etc.

* Column names adjusted to conform to BCO-DMO naming conventions designed to support broad re-use by a variety of research tools and scripting languages. [Only numbers, letters, and underscores. Can not start with a number]

* question mark in Depth value for CLIO_023_13 "110?" was removed after verification by the data submitter.

* After importing the table, a transformation to the long form of the table was made (going from column per pigment to one column for pigment_name, one column for pigment_conc). The long form was added to the dataset page as the primary form of the dataset, and the supplemental files section include the wide form as an alternate format of the same data.

[table of contents | back to top]

Data Files

File
Pigment data (long form) filename: 926546_v1_ae1913-clio-pigments.csv (Comma Separated Values (.csv), 26.25 KB) MD5:f894485b42a5c7a5426e13c86cb6529b Primary data file for dataset ID 926546, version 1. This is form of the data includes a column containing the pigment name, and a column containing the pigment concentration. See the Supplemental Files section for data in alternate format (wide form) which includes a separate column for each pigment type which contains the pigment concentration.

[table of contents | back to top]

Supplemental Files

File
Pigment data (wide form) filename: 926546_v1_AE1913-clio-pigments-wideform.csv (Comma Separated Values (.csv), 4.38 KB) MD5:47fb27d47f0c5db201792619d8b44b7c Data in alternate format (wide form). This form of the data includes a separate column for each pigment type which contains the pigment concentration. This table contains the same data provided in the primary data file for this dataset "926546_v1_ae1913-clio-pigments.csv."

[table of contents | back to top]

Related Publications

Bidigare, R. R., Van Heukelem, L., & Trees, C. C. (2005). Analysis of Algal Pigments by High-Performance Liquid Chromatography. Algal Culturing Techniques, 327–345. https://doi.org/10.1016/b978-012088426-1/50021-4 https://doi.org/10.1016/B978-012088426-1/50021-4
Methods

[table of contents | back to top]

Related Datasets

IsRelatedTo

Saito, M. A., Cohen, N. (2024) **Amended Rolling Deck to Repository (R2R) event log (ELOG) taken on the R/V Atlantic Explorer cruise AE1913 in the Sargasso Sea in June of 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-05-03 doi:10.26008/1912/bco-dmo.926526.1 [view at BCO-DMO]
Relationship Description: Data from coordinated deployments during the same cruise.

Saito, M. A., Cohen, N. (2024) **CTD profiles from R/V Atlantic Explorer cruise AE1913 in the Sargasso Sea in June of 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2024-10-30 doi:10.26008/1912/bco-dmo.916411.2 [view at BCO-DMO]
Relationship Description: Data from coordinated deployments during the same cruise.

Saito, M. A., Cohen, N. (2024) **Macronutrients and dissolved and particulate trace metals collected from the R/V Atlantic Explorer cruise AE1913 in the Sargasso Sea in June of 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-12-07 doi:10.26008/1912/bco-dmo.916429.1 [view at BCO-DMO]
Relationship Description: Data from coordinated deployments during the same cruise.

[table of contents | back to top]

Parameters

Parameter	Description	Units
SampleName	Sample identifier (e.g. CLIO_020_10) which includes the dive (station) and the pump filter number.	unitless
Latitude	latitude. Obtained from the trace metal rosette	decimal degrees
Longitude	longitude. Obtained from the trace metal rosette.	decimal degrees
Depth	sample depth	meters (m)
pigment_abbr	Pigment abbreviation (See "Methods & Sampling" for list of abrreviations and full pigment name).	unitless
pigment_conc	Pigment concentration	nanograms per kilogram (ng/kg)

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	AUV Clio
Generic Instrument Description	Clio is an autonomous underwater vehicle (AUV) created to accomplish the dual goals of global ocean mapping and biochemistry sampling. The ability to sample dissolved and particulate seawater biochemistry across ocean basins while capturing fine-scale biogeochemical processes sets it apart from other AUVs. Clio is designed to efficiently and precisely move vertically through the ocean, drift laterally to observe water masses, and integrate with research vessel operations to map large horizontal scales up to a depth of 6,000 meters. More information is available at https://www2.whoi.edu/site/deepsubmergencelab/clio/

Dataset-specific Instrument Name	Agilent 1100 series high performance liquid chromatography (HPLC)
Generic Instrument Name	High-Performance Liquid Chromatograph
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	X-Niskin bottles
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

AE1913

Website	https://www.bco-dmo.org/deployment/916412
Platform	R/V Atlantic Explorer
Start Date	2019-06-16
End Date	2019-06-28
Description	coordinated deployments: McLane pumps, AUV Clio, CTD, trace metal rosette

[table of contents | back to top]

Project Information

Collaborative Research: Direct Characterization of Adaptive Nutrient Stress Responses in the Sargasso Sea using Protein Biomarkers and a Biogeochemical AUV (Nutrient Stress Responses and AUV Clio)

Coverage: Bermuda Atlantic Time Series

NSF Award Abstract:
Microscopic communities in the ocean can be surprisingly diverse. This diversity makes it difficult to study the individual organisms and reactions that control specific reactions controlling nutrient cycles. Past studies confirm that iron and nitrogen are vital elements for biological growth. There is increasing evidence, however, that other chemicals such as silica, zinc, cobalt, and vitamin B12 may be just as important. This project will provide an unprecedented view of community distributions using new molecular methods to isolate and link active proteins to specific chemical cycles during the very first research deployment of a brand-new autonomous underwater vehicle (AUV). The AUV will collect samples in programed patterns by pumping water directly into its filtering mechanism and then return the samples to the ship for analysis. The Bermuda Atlantic Time-series Study (BATS) station, which provides abundant supporting data, is the site for this innovative investigation into the microbial ecology and chemistry of the open oceans. Additionally, data will be widely distributed to other scientists through the Ocean Protein Portal website being developed by the Woods Hole Oceanographic Institute (WHOI) and the Biological and Chemical Oceanography Data Management Office. Data will also contribute a new teaching module in the Marine Bioinorganic Chemistry course at WHOI.

This first scientific deployment of the newly engineered and constructed biogeochemical AUV, Clio, will generate a novel dataset to examine marine microbial biogeochemical cycles in the Northwestern Atlantic oligotrophic ocean in unprecedented detail and at high vertical resolution. First the project proposes to understand if the microbial community reflects the varying chemical composition and cyanobacterial species through nutrient

response adaptations. Additionally, the research will determine if iron stress in the low light Prochlorococcus ecotype found in the deep chlorophyll maximum is a persistent feature influenced by seasonal dust fluxes. The highly resolved vertical data from the in situ pumping capabilities of Clio are fundamental to a rigorous examination of these biogeochemical questions. This highly transformative dataset will greatly advance understanding of the nutrient and trace element cycling of this region and will be the first field validation of the potentially revolutionary capability these new approaches represent for the study of marine microbial biogeochemistry.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1658030

[table of contents | back to top]