Event log from R/V Atlantic Explorer AE1319 in the NW Atlantic from Aug-Sept. 2013 (Biological C:N:P ratios project)

Website: https://www.bco-dmo.org/dataset/540354
Data Type: Cruise Results
Version: 1
Version Date: 2014-11-21

Project
» Biological Controls on the Ocean C:N:P ratios (Biological C:N:P ratios)

Programs
» Dimensions of Biodiversity (Dimensions of Biodiversity)
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Abstract
Event log from R/V Atlantic Explorer AE1319 in the NW Atlantic from Aug-Sept. 2013 (Biological C:N:P ratios project)

Table of Contents

Coverage

Spatial Extent: **N**:55.00382 **E**:-40.00282 **S**:5.17 **W**:-69.20828
Temporal Extent: 2013-08-15 - 2013-09-09

Dataset Description

Date, time, position, depth of each CTD sample, with list of analyses for each sample and scientist name.

Data Processing Description

Generated from original Excel file: AE1319_event_log.xlsx contributed by Mike Lomas.

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- reformated data from mmddyyyy to yyyy-mm-dd
- replaced spaces and other special characters with underscore
- replaced blank cells with nd
- converted lat/lon to decimal degrees

[table of contents | back to top]

Data Files

File
ctd_sample_log_AE1319.csv (Comma Separated Values (.csv), 199.82 KB) MD5:3127de16e48bffeccd918fe5a3a28cd7 Primary data file for dataset ID 540354

[table of contents | back to top]

Parameters

Parameter	Description	Units
date	UTC date	yyyy-mm-dd
time	UTC time	HH:MM
ISO_DateTime_UTC	Date/Time (UTC) ISO formatted	yyyy-mm-ddTHH:MMZ
yrday_utc	UTC day and decimal time: 326.5 for the 326th day of the year or November 22 at 1200 hours (noon)	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
sample	sample identification	unitless
depth	sample depth	meters
surface_sample	flag for surface sample; X=sampled; O=not sampled	unitless
Johnson_Metabolomics	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
van_Mooy_Lipids	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
van_Mooy_PolyP	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Bates_DIC	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless

Fawcett_delNO3	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Fawcett_delPON	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Dziallas_Severin_N2fix	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Dziallas_Severin_DNA	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Whitney_DNA_RNA	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Whitney_Nutrient_Bioassay	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Krause_SynSort	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Krause_DNA	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Krause_32Si	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Krause_SXRF	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Krause_Bsi	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_Nuts	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_SRP	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_TDP	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless

Lomas_POC_N	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_POP	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_FCM	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_Chla	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_Txn_POC_N_pP_nP	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_Txn_POP_pP_nP	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_biochem_by_fcm	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_Txn_POC_N_P_mP	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_Kinetics_amb_Uptake	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Lomas_Paytan_O18_phos	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Cetinic_Optics_Particles	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Bachman_NPP	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Martiny_WGA_DNA	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Martiny_RTE	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Garcia_NAE	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless

Garcia_VTE	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Martiny_test_filter	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
BATS_O2	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
BATS_salinity	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless
Pedersen_cilliates	flag for sample use: scientist name_analysis description; X=sampled; O=not sampled	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	GPS
Generic Instrument Name	Global Positioning System Receiver
Generic Instrument Description	The Global Positioning System (GPS) is a U.S. space-based radionavigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis. The U.S. Air Force develops, maintains, and operates the space and control segments of the NAVSTAR GPS transmitter system. Ships use a variety of receivers (e.g. Trimble and Ashtech) to interpret the GPS signal and determine accurate latitude and longitude.

[table of contents | back to top]

Deployments

AE1319

Website	https://www.bco-dmo.org/deployment/537979
Platform	R/V Atlantic Explorer
Report	http://dmoserv3.whoi.edu/data_docs/Bio_CNP_Ratios/AE1319_Cruise_Report_09182013_reduced2.pdf
Start Date	2013-08-14
End Date	2013-09-11
Description	Cruise for project 'Dimensions of Biodiversity: Biological Controls on the Ocean C:N:P ratios'.

[table of contents | back to top]

Project Information

Biological Controls on the Ocean C:N:P ratios (Biological C:N:P ratios)

Coverage: western North Atlantic; 60N to 20N along 66W longitude; 20N to 15S in the tropical Pacific

One of the fundamental patterns of ocean biogeochemistry is the Redfield ratio, linking the stoichiometry of surface plankton with the chemistry of the deep ocean. There is no obvious mechanism for the globally consistent C:N:P ratio of 106:16:1 (Redfield ratio), especially as there is substantial elemental variation among plankton communities in different ocean regions. Thus, knowing how biodiversity regulates the elemental composition of the ocean is important for understanding the ocean and climate as a whole -- now and in the future.

The conceptual hypotheses for this study are as follows: 1. The C:N:P ratio of a cell is constrained by its broad taxonomic group, which determines, for example, whether it has an outer shell, its size, functional metabolism, membrane lipid composition. 2. Within a taxon, there is high genetic diversity. Some of this genetic diversity is potentially laterally transferred, or can be lost within taxa, and confers various functional abilities (organic phosphate assimilation, nitrate assimilation, photoheterotrophy, etc.). Functional diversity provides the cell with further flexibility, such as the ability to respond to varying nutrient supply rates/ratios, and affects a cell's C:N:P ratio within the range specified by the taxon. 3. Given these taxonomic and genetic constraints, a cell is physiologically plastic and modifies how it allocates cellular resources in response to nutrient supply rates/ratios in the environment. 4. The microbial diversity (taxonomic, genetic, and functional) of the surface ocean varies over time and space, driven by many factors in addition to nutrients. The sum of this mixture composes the ecosystem C:N:P, the ratio that Redfield described.

Based on this framework, the CoPIs will make field observations of taxon-specific stoichiometry and growth rates, genomic analyses, and conduct laboratory chemostat experiments to improve understanding of how ocean taxonomic, genetic, and functional biodiversity control the stoichiometry of the surface ocean plankton. Their analyses of these data would lead to a mechanistic understanding of variations in the Redfield ratio, both spatially and temporally.

This study will greatly expand knowledge of the genomic diversity among ocean microbes and how this diversity affects biogeochemistry. The stoichiometry of the ocean's microbes is a parameter that nearly every chemical or biological oceanographer uses, from converting measurements made in one element to another, to estimating regional and global nitrogen budgets. The research also has important implications for the global carbon budget and any changes that might result from climate change.

To understand mechanistically temporal and spatial variability of the plankton C:N:P ratio, biodiversity must be studied not only at the traditional taxonomic level, but at the genetic and functional levels which dictate organism response to their environment. Data will be integrated into a combined ocean ecological, evolutionary, and biogeochemical model, with flexible stoichiometry, including cellular biochemical allocations. Seeding a coupled physical-biological model of the oceans with multiple competing genotypes enables the exploration of ecological and evolutionary patterns of resource acquisition and C:N:P ratios. Developing a more mechanistic examination of the course of ecology and evolution, in which laboratory and field data define tradeoffs between different growth and nutrient acquisition strategies, would estabblish the framework of adaptive dynamics for determining "evolutionarily convergence". Finally, model outcomes will be evaluated against field data.

The field work planned for this project includes several cruises: BV46 (September/October 2011), BV48 (September 2012), a June 2013 cruise from Bermuda to the Labrador Sea, and a cruise from Hawaii to Tahiti (May 2014). Additionally, samples will be be acquired during cruises of opportunity.

[table of contents | back to top]

Program Information

Dimensions of Biodiversity (Dimensions of Biodiversity)

Website: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503446

Coverage: global

(adapted from the NSF Synopsis of Program)

Dimensions of Biodiversity is a program solicitation from the NSF Directorate for Biological Sciences. FY 2010 was year one of the program. [MORE from NSF]

The NSF Dimensions of Biodiversity program seeks to characterize biodiversity on Earth by using integrative, innovative approaches to fill rapidly the most substantial gaps in our understanding. The program will take a broad view of biodiversity, and in its initial phase will focus on the integration of genetic, taxonomic, and functional dimensions of biodiversity. Project investigators are encouraged to integrate these three dimensions to understand the interactions and feedbacks among them. While this focus complements several core NSF programs, it differs by requiring that multiple dimensions of biodiversity be addressed simultaneously, to understand the roles of biodiversity in critical ecological and evolutionary processes.

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1046001
NSF Division of Ocean Sciences (NSF OCE)	OCE-1046368
NSF Division of Ocean Sciences (NSF OCE)	OCE-1046297
NSF Division of Ocean Sciences (NSF OCE)	OCE-1045966

[table of contents | back to top]