Phytoplankton clone library matches collected from the R/V Atlantic Explorer and R/V Oceanus cruises along the Bermuda Atlantic Time Series Station (BATS) from 2008-2010 (Plankton particle flux project)

Website: https://www.bco-dmo.org/dataset/564859
Data Type: Cruise Results
Version: 1
Version Date: 2015-08-28

Project
» Composition of the plankton community and its contribution to particle flux in the Sargasso Sea (Plankton particle flux)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Abstract
This dataset includes links to GenBank accession of 18S rRNA gene clone library sequences with the closest sequence matches from the NCBI database. The samples are from the upper water column as well as from shallow drifting traps during regular BATS cruises from December 2008-April 2010.

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Coverage

Spatial Extent: **N**:32.4006 **E**:-63.7119 **S**:31.1715 **W**:-64.6504
Temporal Extent: 2008-12-14 - 2010-04-24

Dataset Description

This dataset includes links to GenBank accession of 18S rRNA gene clone library sequences with the closest sequence matches from the NCBI database. The samples are from the upper water column as well as from shallow drifting traps during regular BATS cruises from December 2008-April 2010.

Acquisition Description

Water column samples were collected at BATS during the 2009 and 2010 winter bloom periods from the upper 150 m in Niskin bottles attached to a sampling rosette. Particle interceptor traps (PITs) with both fixed (2% formalin final concentration, deployment time 72 hr) and unfixed (deployment time 24 hr) collection tubes were deployed at 150 m depth in close proximity to the station and during the same time period as the water column collection in order to collect sinking particles below the euphotic zone. Clone libraries were constructed from 2-L samples collected at two depths in the euphotic zone, one close to the surface (10 m) and one from either the bottom of the euphotic zone if the water column was well mixed (most stations sampled; around 120-130 m) or from the chlorophyll maximum if one was present (around 80 m; samples from March 24 and April 24, 2010). Libraries were also constructed from sinking particles collected in two tubes of the PITs from the trap array located at 150 m depth. Unfixed traps were selected unless the sample was unavailable or prior results using DGGE indicated that the fixed trap would be more suitable due to occurrence of fungi and metazoans in the unfixed traps. DNA was extracted from these samples and a region of the 18S ribosomal RNA gene was amplified by PCR using eukaryotic primers. Samples from selected dates and depths were cloned and sequenced and broad taxonomic groups were determined for each sequence using their closest similarity match from BLAST (Basic Local Alignment Search Tool, http://blast.ncbi.nlm.nih.gov/).

Processing Description

DNA was extracted from environmental samples, 18S rRNA amplified by PCR, cloned and sequenced. Sequences were assigned taxonomic groups using their closest match on NCBI BLAST.

BCO-DMO Processing:

- added conventional header with dataset name; PI name; version date
- renamed parameters to BCO-DMO standard
- sequences not served; see NCBI accession number links
- added columns for cruise_id; cruise_name; year; month; day; sample_type; depth
- added html links to accession numbers
- removed trailing blanks and unprintable characters

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Related Publications

Amacher, J., Neuer, S., & Lomas, M. (2013). DNA-based molecular fingerprinting of eukaryotic protists and cyanobacteria contributing to sinking particle flux at the Bermuda Atlantic time-series study. Deep Sea Research Part II: Topical Studies in Oceanography, 93, 71–83. doi:10.1016/j.dsr2.2013.01.001
Results

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Parameters

Parameter	Description	Units
cruise_id	official rvdata cruise name	unitless
cruise_name	original cruise number	unitless
year	year of sampling	YYYY
month	month of sampling	MM
day	day of sampling	DD
sample_type	type of sample: from the water column (CTD) or from a sediment trap	unitless
depth	sampling depth	meters
clone_id	clone identification	unitless
accession_number	GenBank accession number	unitless
super_grp_1	first rank super group	unitless
phylogenetic_grp	phylogenetic group	unitless
acc_closest_match	accession number of closest match	unitless
closest_match_id	closest match	unitless
match_pcent	% match	percent
acc_cl_cult_match	accession number of closest cultured match	unitless
closest_cultured_match	closest cultured match	unitless
closest_match_cultur_pcent	% match closest cultured	percent

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Samples were collected using 10-Liter Niskin bottles attached to a CTD rosette.
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.

Dataset-specific Instrument Name	CTD
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 and permits scientists observe the physical properties in real time via a conducting cable connecting the CTD to a deck unit and computer on the 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 instrument designation is used when specific make and model are not known.

Dataset-specific Instrument Name	Sediment Trap
Generic Instrument Name	Sediment Trap
Generic Instrument Description	Sediment traps are specially designed containers deployed in the water column for periods of time to collect particles from the water column falling toward the sea floor. In general a sediment trap has a jar at the bottom to collect the sample and a broad funnel-shaped opening at the top with baffles to keep out very large objects and help prevent the funnel from clogging. This designation is used when the specific type of sediment trap was not specified by the contributing investigator.

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Deployments

AE0901

Website	https://www.bco-dmo.org/deployment/58920
Platform	R/V Atlantic Explorer
Start Date	2009-02-07
End Date	2009-02-11
Description	Cruise information and original data are available from the NSF R2R data catalog.

AE0902

Website	https://www.bco-dmo.org/deployment/58919
Platform	R/V Atlantic Explorer
Start Date	2009-02-21
End Date	2009-02-23

AE1001

Website	https://www.bco-dmo.org/deployment/58906
Platform	R/V Atlantic Explorer
Start Date	2010-02-02
End Date	2010-02-06
Description	Cruise information and original data are available from the NSF R2R data catalog.

AE1006

Website	https://www.bco-dmo.org/deployment/58903
Platform	R/V Atlantic Explorer
Start Date	2010-03-23
End Date	2010-03-27

AE1009

Website	https://www.bco-dmo.org/deployment/58901
Platform	R/V Atlantic Explorer
Start Date	2010-04-20
End Date	2010-04-24
Description	Sampling was conducted monthly from May 2008-April 2010 at the Bermuda Atlantic Time-Series (BATS). Samples were collected for DNA analysis from four depths in the upper water column and from 150 m particle traps. Cruise information and original data are available from the NSF R2R data catalog.

OC449-10

Website	https://www.bco-dmo.org/deployment/59029
Platform	R/V Oceanus
Start Date	2008-12-14
End Date	2008-12-18
Description	Cruise information and original data are available from the NSF R2R data catalog.

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Project Information

Composition of the plankton community and its contribution to particle flux in the Sargasso Sea (Plankton particle flux)

Coverage: BATS site: Bermuda Atlantic Time-Series Study: 31° 45’N, 64° 10’W

The overall objective of this proposal is to investigate linkages between the presence of different key groups of phytoplankton in the euphotic zone and their contribution to particle flux at the subtropical North Atlantic time-series station BATS (Bermuda Atlantic Time-series Study) by applying a range of traditional and novel molecular techniques. The 'biological pump', the photosynthetically mediated transformation of dissolved inorganic carbon into particulate and dissolved organic carbon in surface ocean waters and its subsequent export to deep water, is a significant driver of the atmospheric carbon uptake by the oceans. But this "biologically pumped" production, inasmuch as it depends on the composition and activity of planktonic organisms, is susceptible to long-term climatic changes in surface ocean properties such as increased temperature and changes in nutrient supply, especially in subtropical gyres. The sub-tropical gyres and the transition zones at their boundaries play an important role in the global carbon cycle because of their vast size and generally high per area export production. As evidenced in recent studies, the biological mechanisms driving regional to basin scale variability in carbon export in these biomes is far from understood, thus limiting our ability to mechanistically explain the biological pump and to predict its possible responses in the face of environmental change. In an effort to improve this situation with an accurate assessment of the contribution of different plankton groups to overall fluxes, the investigators will test the following two specific hypotheses: 1. The long held notion that large cells and those with mineral tests are major contributors to downward particle flux needs to be re-evaluated. We hypothesize that pico and nanoplankton (also those without mineral tests) are generally important contributors to downward particle flux at BATS. Consequently, the diversity of taxonomic groups contributing to particle flux is greater than previously expected. 2. The relative contribution of taxonomic groups to downward particle flux is a function of physical forcing. We hypothesize that episodic events (e.g., winter storms and eddies) lead to a reduction in diversity of sedimenting phytoplankton (e.g., dominance by a single group such as diatoms) compared to periods marked by more stable conditions in the water column. The broader impacts include furthering knowledge of the diversity and biology of phytoplankton groups that have a significant impact on the carbon export in subtropical gyres, thereby advancing our understanding of regional to basin scale variability in the biogeochemistry of these biomes. The project provides new opportunities for undergraduate and graduate education, as well as offer research opportunities to local high school students and teachers as part of the "Ask-a-Biologist" initiative. The project also includes an international component through collaboration with a molecular ecology group in Barcelona, Spain.

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Program Information

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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0752592

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