Composition and concentration of individual biomarkers collected by particle interceptor traps in the Amazon River plume during R/V Knorr cruise KN197-08 in 2010 and R/V Melville cruise MV1110 in 2011

Website: https://www.bco-dmo.org/dataset/936369
Data Type: Cruise Results
Version: 1
Version Date: 2024-09-04

Project
» Amazon iNfluence on the Atlantic: CarbOn export from Nitrogen fixation by DiAtom Symbioses (ANACONDAS)

Programs
» Integrated Marine Biogeochemistry and Ecosystem Research -US (IMBER-US)
» Ocean Carbon and Biogeochemistry (OCB)
» Emerging Topics in Biogeochemical Cycles (ETBC)
» Marine Microbiology Initiative (MMI)

Contributors	Affiliation	Role
Medeiros, Patricia M.	University of Georgia (UGA)	Principal Investigator
Utsumi, Giovanna A.	Federal University of São Paulo (UNIFESP)	Student
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
These data include composition and concentration of individual biomarkers collected during two cruises to the Amazon River plume. Particulate organic carbon (POC) was collected in 2010 (high discharge) on a cruise aboard the R/V Knorr between 2010-05-23 and 2010-06-21, and in 2011 (low discharge) on a cruise aboard the R/V Melville between 2011-09-05 and 2011-10-06. POC sinking vertically from the surface ocean was collected using 12-polycarbonated tube free-floating surface-tethered particle interceptor traps, capturing ~1 to 3-days of accumulated sinking material. Then, the particulate material was collected using 0.7 micrometer GF/F filters. These data help to clarify the Amazon River plume's impact on the biological pump of the tropical Atlantic Ocean, consistent with a river plume fueling primary production, and with increased zooplankton and bacteria contributions to POC composition at depth and in the POC that is vertically exported. Sediment trap collections were performed by Dr. William Berelson at the University of Southern California and POC samples were collected by Dr. Patricia Medeiros at the University of Georgia.

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Coverage

Location: Amazon River Plume and surrounding Atlantic Ocean
Spatial Extent: **N**:12.4055 **E**:-48.918 **S**:5.9938 **W**:-56.4252
Temporal Extent: 2010-06-03 - 2011-10-04

Methods & Sampling

Sinking particulate organic carbon (POC) samples were collected in the Amazon River plume and adjacent ocean using 12-polycarbonated tube free-floating surface-tethered particle interceptor traps, capturing ~1 to 3-days of accumulated sinking material (Chong, 2013; Haskell II et al., 2013) in May/June 2010 during high river discharge conditions and in September/October 2011 during low river discharge (onboard of the R/V Knorr and R/V Melville, respectively, as part of the ANACONDAS expeditions; Medeiros et al., 2015).

Stations sampled during high discharge conditions are labeled HT followed by the station number, while during low discharge they are labeled LT followed by the station number.

Five traps were deployed at ~150 meters (m) depth during high river discharge (2010). During low discharge conditions (2011), six traps were deployed either at 150 m or at 250 m below the surface. After swimmers were removed, trap material was filtered through 0.7-micrometer (µm) Whatman GF/F filters (pre-combusted at 450 degrees Celsius (°C) for 5 hours), carefully wrapped using pre-combusted aluminum foil, and kept frozen at -20°C until analysis. Samples were processed within 1-2 weeks after the end of the expeditions, minimizing the effects of any possible degradation that may have occurred during storage.

Prior to analyses, POC samples were allowed to dry at room temperature. Biomarkers were extracted from dried POC samples as in Medeiros et al. (2012) with a mixture of dichloromethane:methanol (2:1, v/v) using accelerated solvent extraction (ASE 350, Dionex) at 100°C and 1000 psi (3 static cycles). The extracts were concentrated in a RapidVap to about 2 milliliters (mL), then further concentrated to 500 microliters (µL) using a stream of ultra-high purity nitrogen gas. Aliquots of the total extracts were converted to their trimethylsilyl derivatives using N,O-bis-(trimethylsilyl)trifluoroacetamide (BSTFA) containing 1% trimethylchlorosilane (TMCS) and pyridine (Pierce) for 3 hours at 70°C. Aliquots of 1 µL of silylated total extracts were analyzed within 24 hours using an Agilent 6890 gas chromatograph interfaced with an Agilent 5975 mass selective detector (GC-MS). A DB5-MS capillary column (30 m x 0.25 mm I.D. and film thickness of 0.25 µm) was used with helium as the carrier gas. The injector and MS source temperatures were maintained at 280°C and 230°C, respectively. The column temperature program consisted of injection at 65°C and hold for 2 minutes, temperature increase of 6°C per minute to 300°C, followed by an isothermal hold at 300°C for 15 minutes. The MS was operated in electron impact (EI) mode with an ionization energy of 70 eV. The scan range was set from 50 to 650 Da and the samples were analyzed in splitless mode.

Data were acquired and processed with the Agilent-Chemstation software. Individual compounds were identified by comparison of mass spectra with literature and library data, comparison of mass spectra and GC retention times with those of authentic standards and/or interpretation of mass spectrometric fragmentation patterns. Compounds were quantified using the total ion current (TIC) peak area and converted to compound mass using calibration curves of standards.

Data Processing Description

Data were processed using 6890GC-5975 MS Agilent-Chemstation software.

BCO-DMO Processing Description

- Imported original file "BCO-DMO_Amazon_POC_traps_2010_2011_updated.xlsx" into the BCO-DMO system.
- Extracted station location information from the primary data table.
- Removed dashes from datasets (in final CSV file, missing data are empty/blank).
- Unpivoted the table to create columns for station number and depth.
- Joined the primary data table to the station location information to create columns for Latitude, Longitude, Date, and Time.
- Sorted by station number and depth.
- Renamed fields to comply with BCO-DMO naming conventions.
- Created date-time fields in ISO 8601 format (UTC and local).

- Saved the final file as "936369_v1_amazon_plume_trap_biomarkers.csv".

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Data Files

File
936369_v1_amazon_plume_trap_biomarkers.csv (Comma Separated Values (.csv), 121.77 KB) MD5:19fb2798caa3245b86985eee9ec255ab Primary data file for dataset ID 936369, version 1

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Supplemental Files

File
BCO-DMO_Amazon_POC_traps_2010_2011_final.xlsx (Microsoft Excel, 33.79 KB) MD5:89f08587112c98fc41d9119ef70bf2ea Supplemental file for dataset ID 936369, version 1. This is the original format of the data submitted to BCO-DMO. (Data are the same as in "936369_v1_amazon_plume_trap_biomarkers.csv" but in a different format.)

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Related Publications

Chong L. S. (2013). Diagenesis of C, N and Si in marine sediments from the western tropical North Atlantic and eastern subtropical North Pacific: Pore water models and sedimentary studies. Ph.D. Dissertation, University of Southern California, 357 p.
Methods

Haskell, W. Z., Berelson, W. M., Hammond, D. E., & Capone, D. G. (2013). Particle sinking dynamics and POC fluxes in the Eastern Tropical South Pacific based on 234Th budgets and sediment trap deployments. Deep Sea Research Part I: Oceanographic Research Papers, 81, 1–13. doi:10.1016/j.dsr.2013.07.001
Methods

Medeiros, P. M., Seidel, M., Ward, N. D., Carpenter, E. J., Gomes, H. R., Niggemann, J., Krusche, A. V., Richey, J. E., Yager, P. L., & Dittmar, T. (2015). Fate of the Amazon River dissolved organic matter in the tropical Atlantic Ocean. Global Biogeochemical Cycles, 29(5), 677–690. Portico. https://doi.org/10.1002/2015gb005115 https://doi.org/10.1002/2015GB005115
Methods

Medeiros, P. M., Sikes, E. L., Thomas, B., & Freeman, K. H. (2012). Flow discharge influences on input and transport of particulate and sedimentary organic carbon along a small temperate river. Geochimica et Cosmochimica Acta, 77, 317–334. https://doi.org/10.1016/j.gca.2011.11.020
Methods

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Parameters

Parameter	Description	Units
Station	Station number. H = high discharge; T = particle trap; L = low discharge.	unitless
Depth	Depth of sampling	meters
Compound	Compound name	unitless
Concentration	Concentration (µg g-1 OC) of individual compound in sediment trap POC	micrograms per gram organic carbon (ug g-1 OC)
Latitude	Latitude of station	decimal degrees
Longitude	Longitude of station	decimal degrees
ISO_DateTime_Local	Date and time of sampling in ISO 8601 format in the local time zone (Brasilia time zone, i.e., UTC -03:00)	unitless
ISO_DateTime_UTC	Date and time of sampling in ISO 8601 format in UTC	unitless

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Instruments

Dataset-specific Instrument Name	Accelerated Solvent Extraction (ASE 350)
Generic Instrument Name	Accelerated Solvent Extractor
Generic Instrument Description	Accelerated solvent extraction (ASE) is a method for extracting various chemicals from a complex solid or semisolid sample matrix. The process uses high temperature and pressure, which results in the extraction taking less time and requiring less solvent, and possibly also giving better analyte recovery, than traditional methods that use less extreme conditions.

Dataset-specific Instrument Name	Agilent 6890 gas chromatograph interfaced with an Agilent 5975 mass selective detector (GC-MS)
Generic Instrument Name	Agilent 6850 networked gas chromatograph
Generic Instrument Description	A single channel, networked, gas chromatograph that separates and analyses compounds into separate components and can be used for chemical, petrochemical and petroleum analyses. The sample is introduced into the injector and then vaporised in the instrument. A chemically inert gas (e.g. helium and nitrogen) carries the vaporised solute into the column that is maintained in a temperature controlled oven. As the solute elutes from the column, it enters the heated detector. An electronic signal is generated upon interaction of the solute with the detector. The Agilent 6850 has a similar performance to the Agilent 6890N GC, but is half as wide. The local interface provides run control and status information and the instrument comes network-ready with a built-in LAN communications interface. There is a choice of detectors available, the Flame Ionization Detector (FID), Thermal Conductivity Detector (TCD) or Mass Selective Detector (MSD). There is an option of split/splitless or packed inlets, a variety of automated sample introduction systems and products available for headspace analysis. This model is no longer in production.

Dataset-specific Instrument Name	12-polycarbonated tube free-floating surface-tethered particle interceptor traps
Generic Instrument Name	Sediment Trap - Particle Interceptor
Generic Instrument Description	A Particle Interceptor Trap is a prototype sediment trap designed in the mid 1990s to segregate 'swimmers' from sinking particulate material sampled from the water column. The prototype trap used 'segregation plates' to deflect and segregate 'swimmers' while a series of funnels collected sinking particles in a chamber (see Dennis A. Hansell and Jan A. Newton. September 1994. Design and Evaluation of a "Swimmer"-Segregating Particle Interceptor Trap, Limnology and Oceanography, Vol. 39, No. 6, pp. 1487-1495).

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Deployments

KN197-08

Website	https://www.bco-dmo.org/deployment/58043
Platform	R/V Knorr
Report	http://bcodata.whoi.edu/ANACONDAS/ANACONDAS1-FullCruiseReport.pdf
Start Date	2010-05-22
End Date	2010-06-24
Description	ANACONDAS: Amazon iNfluence on the Atlantic: CarbOn export from Nitrogen fixation by DiAtom Symbioses ROCA: River Ocean Continuum of the Amazon Cruise information and original data are available from the NSF R2R data catalog: https://www.rvdata.us/search/cruise/KN197-08 Cruise Track over Salinity Climatology (Image from Dr. Ajit Subramaniam)

MV1110

Website	https://www.bco-dmo.org/deployment/58945
Platform	R/V Melville
Start Date	2011-09-03
End Date	2011-10-08
Description	ANACONDAS: Amazon iNfluence on the Atlantic: CarbOn export from Nitrogen fixation by DiAtom Symbioses ROCA: River Ocean Continuum of the Amazon Original data are available from the NSF R2R data catalog: https://www.rvdata.us/search/cruise/MV1110 Cruise Track over Salinity Climatology (Image from Dr. Ajit Subramaniam)

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Project Information

Amazon iNfluence on the Atlantic: CarbOn export from Nitrogen fixation by DiAtom Symbioses (ANACONDAS)

Website: http://amazoncontinuum.org/

Coverage: Amazon River plume; NE coast of South America; Western Tropical North Atlantic - 15N-Equator and 60W to 45W - Region surrounding the Amazon River Plume

ANACONDAS is an IMBER endorsed project.
View list of all IMBER endorsed projects

View the ANACONDAS project GCMD DIF record

The ANACONDAS project was funded as part of the US National Science Foundation (NSF) Emerging Topics in Biogeochemical Cycles (ETBC) program (Directorate for Geosciences, NSF 07 -049, September 19, 2007) explicitly intended to support emerging areas of interdisciplinary research. The ETBC program aimed to foster transformational advances in the quantitative or mechanistic understanding of biogeochemical cycles that integrated physical-chemical-biological processes over the range of temporal and/or spatial scales in Earth's environments. The program especially sought proposals that addressed emerging topics in biogeochemical cycles, the water cycle or their coupling, across the interfaces of atmosphere, land, and oceans.

The ANACONDAS investigators hypothesize that large tropical river plumes with low N: P ratios provide an ideal niche for diatom-diazotroph assemblages (DDAs). They suggest that the ability of these organisms to fix N2 within the surface ocean is responsible for significant C export in the Amazon River plume. Their previous observations in the Amazon River plume helped reveal that blooms comprised of the endosymbiotic N2-fixing cyanobacterium Richelia and its diatom hosts (e.g. Hemiaulus) were a significant source of new production and carbon export. The previous work focused largely on the sensitivity of DDAs to external forcing from dust and riverine inputs, so the ecology of these organisms and the fate of their new production were largely unstudied. It is now known that DDAs are responsible for a significant amount of CO2 drawdown in the Amazon River plume, and floating sediment traps at 200 m measured 4x higher mass fluxes beneath the plume than outside the plume. This led the researchers to hypothesize that this greater export is due either to aggregation and sinking of DDAs themselves or to grazing of DDAs by zooplankton.

In this study the researchers will undertake a suite of field, satellite and modeling studies aimed at understanding the ecology and tracing the fate of C and N fixed by DDAs and other phytoplankton living in the plume. By examining C and silicate (Si) export from offshore surface waters, through the upper oceanic food web, the mesopelagic, and down to the deep sea floor, they will quantify the impact of the Amazon River on biological processes that control C sequestration and the implications of these regional processes on C, N and Si budgets. The study will go beyond previous research because they will quantify 1) the distribution, nutrient demands, and activity of DDAs in the context of phytoplankton species succession, 2) the sensitivity of the CO2 drawdown to the mix of phytoplankton, 3) the grazing and aggregation processes contributing to the sinking flux, 4) the composition of this flux, and 5) the proportion of this material that reaches the seafloor. This effort truly represents a measure of C sequestration and pump efficiency. Ecological modeling will be used

to place observational results from field studies and satellites into the context of the larger Atlantic basin with tropical climate variability on interannual and longer time scales.

Three cruises were carried out during the ANACONDAS project:
AN10/KN197-08 - R/V KNORR - May/June 2010 - Cruise Track over Salinity Climatology *(Image: Yager, et al, 2007)*
AN11/MV1110 - R/V MELVILLE - September/October 2011 - Cruise Track over Salinity Climatology *(Image: Yager, et al, 2007)*
AN12/AT21-04 - R/V ATLANTIS - July/2012 - Cruise Track over Salinity Climatology *(Image: Yager, et al, 2007)*

The ANACONDAS project builds on observations made by MANTRA/PIRANA in 2001 and 2003 (RV Knorr and Seward Johnson I cruises to the same region) to address specifically 1) how carbon cycling and sequestration in the western tropical North Atlantic (WTNA) is influenced by the Amazon River through its impact on pelagic ecosystem dynamics and 2) the sensitivity of this ecosystem to anthropogenic climate change. PIRANA revealed the importance of both riverine and atmospheric inputs for driving the high productivity of the WTNA through N2-fixation, and demonstrated the significance of the region to basin-wide biogeochemistry and C cycling. ANACONDAS will now focus on what drives phytoplankton community succession through the plume, light and nutrient requirements, factors limiting productivity, and the fate of production. These components are critical to understand the role of the plume in the regional C cycle, and to predict its response to climate variability and change.

The NSF-funded ANACONDAS project will also serve as a platform for additional measurements supported by the Gordon and Betty Moore Foundation's Marine Microbiology Initiative. ROCA (River-Ocean Continuum of the Amazon) brings additional focus on marine microbial community structure and activities, along with high-resolution measurements of organic matter along the river-ocean continuum.

ANACONDAS: Amazon iNfluence on the Atlantic: CarbOn export from Nitrogen fixation by DiAtom Symbioses
ROCA: River Ocean Continuum of the Amazon

The project is funded by NSF-OCE-0934095 and NSF-OCE-0934036: Collaborative Research: ETBC: Amazon iNfluence on the Atlantic: CarbOn export from Nitrogen fixation by DiAtom Symbioses and by the Gordon and Betty Moore Foundation through GBMF-MMI-2293: River Ocean Continuum of the Amazon.

Planned Cruise Sampling

Water Column Characterization (hydrographic sampling with CTD/Rosette):
Nutrient (NO2, NO2+NO3, PO4, SiO4) concentrations
Chlorophyll a and pigments concentrations
Inorganic carbon (discrete DIC, ALK, underway pCO2)
Organic carbon, nitrogen, phosphorus
Phytoplankton and Diazotroph Abundance (using rosette and also small nets to collect)
Carbon and Nitrogen Fixation by plankton
Kinetic and Physiological Measurements of phytoplankton
Stable Isotopic Measurements of particulate material
Microbial heterotrophy
Microbial community structure and gene expression
Organic carbon and biomarker characterization

MOCNESS tows for zooplankton
Zooplankton collection for abundance and biomass
Zooplankton grazing and POC flux measurements

Multicorer for deep sea sediment analyses
Solid phase analysis
Pore water chemistry
Isotopic composition (Pb, Th, C)

Other instrumentation over the side:
The in-water light field will be characterized with a free-falling 14 channel spectroradiometer
Two "Carbon Explorers" - autonomous Sounding Oceanographic Lagrangian Observer profilers
Sediment Trap Studies (using 48h deployments of floating Particle Interceptor Traps; PITs)
Surface water pumps - directly bring large volumes of surface water to the deck of the ship for processing.

Shipboard Instrumentation:

ADCP 75 kHz
Bathymetry System 12 kHz
Bathymetry System 3.5 kHz
Deionized Water System
Fume Hood
HiSeasNet
Multibeam
Uncontaminated Seawater System
CTD/Water Sampling: 911+ Rosette 24-position, 10-liter bottle Rosette with dual T/C sensors
Biospherical underwater PAR (1000m depth limit)
SBE43 oxygen sensor
Wet Labs C*Star transmissometer (660nm wavelength)
Wet Labs ECO-AFL fluorometer
Dissolved Oxygen Titration System (Portable modified Winkler titration system)

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Program Information

Integrated Marine Biogeochemistry and Ecosystem Research -US (IMBER-US)

Website: http://www.imber.info/

Coverage: global

The BCO-DMO database includes data from IMBER endorsed projects lead by US funded investigators. There is no dedicated US IMBER project or data management office. Those functions are provided by US-OCB and BCO-DMO respectively.

The information in this program description pertains to the Internationally coordinated IMBER research program. The projects contributing data to the BCO-DMO database are those funded by US NSF only. The full IMBER data catalog is hosted at the Global Change Master Directory (GCMD).

IMBER Data Portal: The IMBER project has chosen to create a metadata portal hosted by the NASA's Global Change Master Directory (GCMD). The GCMD IMBER data catalog provides an overview of all IMBER endorsed and related projects and links to datasets, and can be found at URL http://gcmd.nasa.gov/portals/imber/.

IMBER research will seek to identify the mechanisms by which marine life influences marine biogeochemical cycles, and how these, in turn, influence marine ecosystems. Central to the IMBER goal is the development of a predictive understanding of how marine biogeochemical cycles and ecosystems respond to complex forcings, such as large-scale climatic variations, changing physical dynamics, carbon cycle chemistry and nutrient fluxes, and the impacts of marine harvesting. Changes in marine biogeochemical cycles and ecosystems due to global change will also have consequences for the broader Earth System. An even greater challenge will be drawing together the natural and social science communities to study some of the key impacts and feedbacks between the marine and human systems.

To address the IMBER goal, four scientific themes, each including several issues, have been identified for the IMBER project: Theme 1 - Interactions between Biogeochemical Cycles and Marine Food Webs; Theme 2 - Sensitivity to Global Change: How will key marine biogeochemical cycles, ecosystems and their interactions, respond to global change?; Theme 3 - Feedback to the Earth System: What are the roles of the ocean biogeochemistry and ecosystems in regulating climate?; and Theme 4 - Responses of Society: What are the relationships between marine biogeochemical cycles, ecosystems, and the human system?

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.

Emerging Topics in Biogeochemical Cycles (ETBC)

Website: http://www.nsf.gov/pubs/2007/nsf07049/nsf07049.jsp

Coverage: global

The original call for proposals for Emerging Topics in Biogeochemical Cycles (ETBC) was issued in September 2007 by the US NSF Directorate for Geosciences (NSF 07-049).

The Geosciences Directorate (GEO) is substantially augmenting our past funding sources to explicitly support emerging areas of interdisciplinary research. We seek to foster transformational advances in our quantitative or mechanistic understanding of biogeochemical cycles that integrate physical-chemical-biological processes over the range of temporal and/or spatial scales in Earthâ€™s environments. We encourage submission of proposals that address emerging topics in biogeochemical cycles, the water cycle or their coupling, across the interfaces of atmosphere, land, and oceans. Proposals must cross the disciplinary boundaries of two or more divisions in Geosciences (e.g. ATM, EAR, OCE) or of at least one division in Geosciences and a division in another NSF directorate.

Although funding programmatic disciplines continues to provide a robust and adaptable framework to build our understanding of the geosciences and the earth as a system, there are classes of emerging and challenging problems that require integration of concepts and observations across diverse fields. Our goal is to enhance such integration. Successful proposals need to develop intellectual excitement in the participating disciplinary communities. Also encouraged are proposals that have broader educational, diversity, societal, or infrastructure impacts that capitalize on this interdisciplinary opportunity.

Marine Microbiology Initiative (MMI)

Website: https://www.moore.org/initiative-strategy-detail?initiativeId=marine-microbiology-initiative

A Gordon and Betty Moore Foundation Program.

Forging a new paradigm in marine microbial ecology:

Microbes in the ocean produce half of the oxygen on the planet and remove vast amounts of carbon dioxide, a greenhouse gas, from the atmosphere. Yet, we have known surprisingly little about these microscopic organisms. As we discover answers to some long-standing puzzles about the roles that marine microorganisms play in supporting the ocean's food webs and driving global elemental cycles, we realized that we still need to learn much more about what these organisms do and how they do it—including how they evolved and contribute to our ocean's health and productivity.

The Marine Microbiology Initiative seeks to gain a comprehensive understanding of marine microbial communities, including their diversity, functions and behaviors; their ecological roles; and their origins and evolution. Our focus has been to enable researchers to uncover the principles that govern the interactions among microbes and that govern microbially mediated nutrient flow in the sea. To address these opportunities, we support leaders in the field through investigator awards, multidisciplinary team research projects, and efforts to create resources of broad use to the research community. We also support development of new instrumentation, tools, technologies and genetic approaches.

Through the efforts of many scientists from around the world, the initiative has been catalyzing new science through advances in methods and technology, and to reduce interdisciplinary barriers slowing progress. With our support, researchers are quantifying nutrient pools in the ocean, deciphering the genetic and biochemical bases of microbial metabolism, and understanding how microbes interact with one another. The initiative has five grant portfolios:

Individual investigator awards for current and emerging leaders in the field.
Multidisciplinary projects that support collaboration across disciplines.
New instrumentation, tools and technology that enable scientists to ask new questions in ways previously not possible.
Community resource efforts that fund the creation and sharing of data and the development of tools, methods and infrastructure of widespread utility.
Projects that advance genetic tools to enable development of experimental model systems in marine microbial ecology.
We also bring together scientists to discuss timely subjects and to facilitate scientific exchange.

Our path to marine microbial ecology was a confluence of new technology that could accelerate science and an opportunity to support a field that was not well funded relative to potential impact. Around the time we began this work in 2004, the life sciences were entering a new era of DNA sequencing and genomics, expanding possibilities for scientific research – including the nascent field of marine microbial ecology. Through conversations with pioneers inside and outside the field, an opportunity was identified: to apply these new sequencing tools to advance knowledge of marine microbial communities and reveal how they support and influence ocean systems.

After many years of success, we will wind down this effort and close the initiative in 2021. We will have invested more than $250 million over 17 years to deepen understanding of the diversity, ecological activities and evolution of marine microbial communities. Thanks to the work of hundreds of scientists and others involved with the initiative, the goals have been achieved and the field has been profoundly enriched; it is now positioned to address new scientific questions using innovative technologies and methods.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0934095
Gordon and Betty Moore Foundation: Marine Microbiology Initiative (MMI)	GBMF2293
Gordon and Betty Moore Foundation: Marine Microbiology Initiative (MMI)	GBMF2928

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