Sequence accession numbers of 16S rRNA and hydrazine oxidoreductase genes (hzo) from the RRS James Cook cruise JC18 in the Montserrat, Caribbean, and from a UNCW 20-ft Center Console Boat in Cape Fear River Estuary, NC from 2007-2009

Website: https://www.bco-dmo.org/dataset/4051
Version: 08 Oct 2013
Version Date: 2013-10-08

Project
» Implication of ANAMMOX community structure and microbial interactions in estuarine N removal processes (Estuarine ANAMMOX)

Program
» Emerging Topics in Biogeochemical Cycles (ETBC)

Contributors	Affiliation	Role
Song, Bongkeun	Virginia Institute of Marine Science (VIMS)	Principal Investigator
O'Mullan, Gregory	Queens College (CUNY QC)	Co-Principal Investigator
Tobias, Craig	University of Connecticut (UConn - Avery Point)	Co-Principal Investigator
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Dataset Description

Links are provided to GenBank for 16S rRNA and hzo genes from samples collected at the Cape Fear River Estuary.

Related publications:
Hirsch, M.D., Long, Z.T, and Song, B. 2011. Anammox Bacterial Diversity in Various Aquatic Ecosystems Based on the Detection of Hydrazine Oxidase Genes (hzoA/hzoB). Environmental Microbiology 61:264-276.
DOI: 10.1007/s00248-010-9743-1

Methods & Sampling

Sampling for the Cape Fear River Estuary was conducted using 20-foot center console boats at UNCW. Sediment sampling around the Montserrat Island was done during a cruise of R.R.S. James Cook (JC18).

Sampling locations:
Cape Fear River Estuary located at the southeast of North Carolina (34 N 78 W depth range 1 to 20 m), and

Montserrat Island sites (16 N 62 W depth range 787 to 1133 m).

Sediment samples from the Cape Fear River Estuary were collected using a petite Ponar grab sampler, while the Montserrat sediments were collected using SMBA box and Bowers and Connelly Mega Corer sampling devices. DNA extraction and PCR of 16S rRNA and hzo genes in anammox bacterial communities were conducted as reported in Hirsh et al. (2011).

For detailed methods, see Hirsch et al. (2011) including the supplementary material (DOI: 10.1007/s00248-010-9743-1)

Data Processing Description

DNA sequences were examined and edited using SeqMan Program (DNASTAR, Inc., Madison, WI). Both 16S rDNA and hzo gene sequences were aligned using ClustalW (http://www.ebi.ac.uk/Tools/clustalw2/index.html). Phylogenetic analyses were conducted using the MEGA program. The sequences of 16S rRNA and hzo genes were deposited and available at the Genbank. The accession numbers are HM851535 to HM852029.

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Data Files

File
16SrRNA_and_hzo_accessions.csv (Comma Separated Values (.csv), 85.75 KB) MD5:5c13af64133ee0952d30b299493de901 Primary data file for dataset ID 4051

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Parameters

Parameter	Description	Units
description	Description of the sequence type (16S rRNA or hzo).	text
taxon	The source organism.	text
sample_name	The clone identifier.	text
accession_number_link	Unique sequence accession number and link out to GenBank.	text

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Instruments

Dataset-specific Instrument Name	Bottom Sediment Grab Samplers
Generic Instrument Name	Bottom Sediment Grab Samplers
Dataset-specific Description	A petite Ponar grab sampler was used to collect samples from the Cape Fear River Estuary.
Generic Instrument Description	These samplers are designed to collect an accurate representative sample of the sediment bottom. The bite of the sampler should be deep enough so all depths are sampled equally. The closing mechanism is required to completely close and hold the sample as well as prevent wash-out during retrieval. Likewise, during descent the sampler should be designed to minimize disturbance of the topmost sediment by the pressure wave as it is lowered to the bottom.

Dataset-specific Instrument Name	Box Corer
Generic Instrument Name	Box Corer
Dataset-specific Description	Sediments were collected at Montserrat using SMBA box corers.
Generic Instrument Description	General description of a box corer: A box corer is a marine geological tool that recovers undisturbed soft surface sediments. It is designed for minimum disturbance of the sediment surface by bow wave effects. Traditionally, it consists of a weighted stem fitted to a square sampling box. The corer is lowered vertically until it impacts with the seabed. At this point the instrument is triggered by a trip as the main coring stem passes through its frame. While pulling the corer out of the sediment a spade swings underneath the sample to prevent loss. When hauled back on board, the spade is under the box. (definition from the SeaVox Device Catalog) Box corers are one of the simplest and most commonly used types of sediment corers. The stainless steel sampling box can contain a surface sediment block as large as 50cm x 50cm x 75cm with negligible disturbance. Once the sediment is recovered onboard, the sediment box can be detached from the frame and taken to a laboratory for subsampling and further analysis. The core sample size is controlled by the speed at which the corer is lowered into the ocean bottom. When the bottom is firm, a higher speed is required to obtain a complete sample. A depth pinger or other depth indicator is generally used to determine when the box is completely filled with sediment. Once the core box is filled with sediment, the sample is secured by moving the spade-closing lever arm to lower the cutting edge of the spade into the sediment, until the spade completely covers the bottom of the sediment box. (definition from Woods Hole Oceanographic Institution).

Dataset-specific Instrument Name	Multi Corer
Generic Instrument Name	Multi Corer
Dataset-specific Description	Bowers and Connelly Mega Corer sampling devices were used to collect sediments at Montserrat island.
Generic Instrument Description	The Multi Corer is a benthic coring device used to collect multiple, simultaneous, undisturbed sediment/water samples from the seafloor. Multiple coring tubes with varying sampling capacity depending on tube dimensions are mounted in a frame designed to sample the deep ocean seafloor. For more information, see Barnett et al. (1984) in Oceanologica Acta, 7, pp. 399-408.

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Deployments

JC18

Website	https://www.bco-dmo.org/deployment/59096
Platform	RRS James Cook
Report	http://dmoserv3.whoi.edu/data_docs/Estuarine_ANAMMOX/jc018_cruise_report.pdf
Start Date	2007-12-03
End Date	2007-12-16
Description	Sediment samples from around the Montserrat Island were analyzed as part of the project, "Implication of ANAMMOX community structure and microbial interactions in estuarine N removal processes".

CFRE_Song_2009

Website	https://www.bco-dmo.org/deployment/59111
Platform	UNCW 20-ft Center Console Boat
Start Date	2009-04-01
End Date	2009-10-01
Description	Sampling on the Cape Fear River Estuary (CFRE) was performed from 20-foot center console boats from the University of North Carolina at Wilmington (UNCW) in April and October of 2009 as part of the project "Implication of ANAMMOX community structure and microbial interactions in estuarine N removal processes".

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Project Information

Implication of ANAMMOX community structure and microbial interactions in estuarine N removal processes (Estuarine ANAMMOX)

From NSF Award Abstract:

This award is funded under the American Recovery and Reinvestment Act of 2009 (Public Law 111-5).

Estuaries, connecting the freshwater and marine environment, are among the most dynamic and the productive ecosystems on Earth. However, they are under threat from anthropogenic N loading, resulting in various symptoms of eutrophication. The intensity and duration of estuarine eutrophication and the rate of estuarine recovery strongly depend on microbial N removal processes (anaerobic ammonium oxidation (ANAMMOX) and denitrification). Denitrification has been intensively studied in various estuaries, while ANAMMOX as a recently discovered N removal pathway is much less studied in estuarine ecosystems. Existing studies indicate that ANAMMOX rates and its contribution to total N2 production (ANAMMOX significance) are system specific and controlled in part by reaction-scale substrate limitations and by environmental parameters. However, community structure (abundance and composition) of ANAMMOX bacteria have not been linked to their activities along environmental gradients. In addition, ANAMMOX community interactions with aerobic ammonia oxidizers and denitrifyers have not been adequately studied in estuarine and coastal environments.

The investigators will examine the importance of ANAMMOX community structure on their activities along estuarine gradients at the CFRE. In addition, microbial interactions among ANAMMOX, denitrifying and aerobic ammonia oxidizing (AAO) communities will be examined to gain a better understanding of sedimentary N cycles in the estuary. They will address the hypothesis that the total abundance of ANAMMOX bacteria will be linearly correlated to their activities, and that members of ANAMMOX communities are influenced differently by environmental parameters present along the estuarine gradients. Depending on the community structure of ANAMMOX bacteria, temporal and spatial variations of the ANAMMOX rates and its significance to N loss will be observed along the estuary. In addition, they will explore functional linkages among ANAMMOX, denitrifying and AAO communities in estuarine sediments that will alter the pathway of N loss. In order to test the proposed hypotheses, the investigators will conduct interdisciplinary and collaborative research by integrating molecular microbial techniques, 15N isotope tracer methods and multivariate statistic analyses. Thus, this project will address key gaps in our understanding of ANAMMOX ecology by understanding how the community structure of ANAMMOX bacteria influences their activities, and lead to a more complete understanding of estuarine N loss.

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Program Information

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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0851435

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