Station locations from R/V Cape Hatteras and R/V New Horizon multiple cruises from the Louisiana Shelf (hypoxic zone) and Gulf of Mexico (ENTP oxygen minimum zone) from 2012 to 2015 (OMZ_Sulfur_Cycling project)

Website: https://www.bco-dmo.org/dataset/629010
Version: 15 December 2015
Version Date: 2015-12-15

Project
» A phylogenetic and functional understanding of microbial sulfur cycling in oxygen minimum zones (OMZ_Sulfur_Cycling)

Contributors	Affiliation	Role
Stewart, Frank James	Georgia Institute of Technology (GA Tech)	Principal Investigator, Contact
Gegg, Stephen R.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Dataset Description

Stations Occupied

Methods & Sampling

Generated from CTD data files and Operational Logs by BCO-DMO staff

Data Processing Description

Generated from CTD data files and Operational Logs by BCO-DMO staff

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Data Files

File
Stations_Occupied.csv (Comma Separated Values (.csv), 4.30 KB) MD5:357ea2bdf0b4bd1f930cc39fe3fb8cee Primary data file for dataset ID 629010

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Parameters

Parameter	Description	Units
CruiseId	UNOLS Cruise ID	text
Station	Station Id	text
Date	Date	YYYYMMDD
Time	Local Time (CST, Z+7)	HHMM
Latitude	Latitude (South is negative)	decimal degrees
Longitude	Longitude (West is negative)	decimal degrees

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Deployments

CH0212

Website	https://www.bco-dmo.org/deployment/628336
Platform	R/V Cape Hatteras
Report	http://dmoserv3.whoi.edu/data_docs/OMZ_SulfurCycling/Cruise_plan_CH-02-12.pdf
Start Date	2012-07-22
End Date	2012-08-05
Description	CRUISE PLAN - CH-02-12_Stewart This cruise will involve a combination of metagenomic sampling, gene expression profiling, and shipboard microcosm experiments to characterize microbial sulfur cycling and microbial community transcriptional responses to oxygen depletion in the hypoxic “dead zone” on the Louisiana Shelf west of the Mississippi River. Proposed Sampling Stations Cruise information and original data are available from the NSF R2R data catalog.

NH1315

Website	https://www.bco-dmo.org/deployment/628427
Platform	R/V New Horizon
Start Date	2013-06-13
End Date	2013-06-28
Description	Oxygen Minimum Zone Microbial Biogeochemistry Expedition (OMZoMBiE) Proposed Sampling Stations Cruise information and original data are available from the NSF R2R data catalog.

NH1410

Website	https://www.bco-dmo.org/deployment/628491
Platform	R/V New Horizon
Report	http://dmoserv3.whoi.edu/data_docs/OMZ_SulfurCycling/Cruise_Report_NH1410.pdf
Start Date	2014-05-10
End Date	2014-06-08
Description	Oxygen Minimum Zone Microbial Biogeochemistry Expedition 2 (OMZoMBiE 2) Cruise Track (PDF) Cruise information and original data are available from R2R: https://www.rvdata.us/search/cruise/NH1410

PE16-01

Website	https://www.bco-dmo.org/deployment/628708
Platform	R/V Pelican
Report	http://dmoserv3.whoi.edu/data_docs/OMZ_SulfurCycling/Cruise_plan_summary_PE16-01.pdf
Start Date	2015-07-03
End Date	2015-07-13
Description	CRUISE PLAN Louisiana Shelf, 2015 This cruise will involve a combination of metagenomic sampling, gene expression profiling, and biogeochemical experiments to characterize microbial nitrogen, sulfur, and methane cycling in the hypoxic “dead zone” on the Louisiana Shelf. Cruise information and original data are available from the NSF R2R data catalog.

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Project Information

A phylogenetic and functional understanding of microbial sulfur cycling in oxygen minimum zones (OMZ_Sulfur_Cycling)

Website: http://omz.biology.gatech.edu/

Coverage: Gulf of Mexico; Louisiana Shelf hypoxic zone; approx. 28-29 N, 89-94 W

Oxygen concentration significantly impacts the community structure and function of marine ecosystems. In waters with low oxygen, including the major marine oxygen minimum zones (OMZs), biological diversity is dominated by a complex community of microorganisms whose anaerobic metabolisms mediate key steps in global nitrogen and carbon cycles. Surprisingly, new evidence indicates that OMZs also support diverse microorganisms capable of utilizing inorganic sulfur compounds for energy metabolism. This assemblage appears to include both sulfur-oxidizing autotrophs and sulfate-reducing heterotrophs, suggesting an active sulfur cycle with potentially substantial roles in organic carbon input and mineralization, as well as critical links to the OMZ nitrogen cycle. Our knowledge of the microorganisms driving OMZ sulfur cycling is based largely on the metagenome of a single bacterial lineage (SUP05) and on surveys of diagnostic marker genes, which have thus far targeted only a subset of the diverse low-oxygen regions in the global ocean. The metabolic diversity, activity, and biogeographic distribution of sulfur-metabolizing microorganisms in the OMZ water column remain largely unexplored.

This project uses an integrated molecular and experimental approach to critically examine the physiological and phylogenetic basis of microbial sulfur cycling in oxygen minimum zones. Combining targeted metagenomics with gene expression profiling, microcosm sulfur-addition experiments, and enrichment culturing, the PI will characterize sulfur-metabolizing microorganisms in two oceanographically and ecologically distinct low-oxygen regions: the Eastern Tropical North Pacific (ETNP) OMZ off Mexico, which represents the largest permanent OMZ in the world, and the seasonally hypoxic "dead zone" in the Gulf of Mexico (GOM). Specifically, they will

test the hypotheses that sulfur- oxidizing and -reducing bacterioplankton 1) are abundant and transcriptionally active in the ETNP OMZ, 2) are minor components of the hypoxic GOM, but increase in activity and abundance when oxygen decreases and sulfide increases, and 3) exhibit biogeographic variation in functional gene content and phylogenetic diversity over vertical profiles, among OMZs, and in response to environmental gradients.

OMZs are predicted to expand in response to future climate change, making it imperative to holistically understand the biology of low-oxygen regions. This project will establish a comprehensive framework for studying the genomics and physiology of an ecologically important, but poorly characterized, functional group(s) of marine bacterioplankton in OMZs. Results will be analyzed relative to existing metagenomic data from the permanent Eastern Tropical South Pacific (ETSP) OMZ, and a second seasonal OMZ (Saanich Inlet), thereby establishing a comparative basis for describing the ecological distribution of pelagic sulfur-metabolizing microorganisms and their relative role in OMZ community metabolism.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1151698

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