Water column environmental parameters from a restored oyster reef in Lynnhaven River, Virginia in 2014 using a continuous flow system (Oyster Reef N2O Emission project)

Website: https://www.bco-dmo.org/dataset/722385
Version:
Version Date: 2018-01-05

Project
» Microbial Regulation of Greenhouse Gas N2O Emission from Intertidal Oyster Reefs (Oyster Reef N2O Emission)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **Lat**:36.89735 **Lon**:-76.088683

Dataset Description

Note: This dataset has been submitted to BCO-DMO and is in the process of being served.

Measurements of nutrient flux, denitrification and N_2O production rates in a restored oyster reef in Lynnhaven River, Virginia in 2014 from a continuous flow system.

Data Processing Description

BCO-DMO Data Manager Processing Notes:
* added a conventional header with dataset name, PI name, version date
* modified parameter names to conform with BCO-DMO naming conventions (no spaces, hyphens, names that start with numbers)
* Split mmm.yyyy into two separate month and year column to be consistent with other datasets in the project.
* Changed site names to match other Lynnhaven site names (e.g. Lynnhaven.M changed to Lynnhaven Middle)
* added site latitude and longitude (Lat,Lon) supplied by the contributor. Values were converted from degrees decimal minutes to decimal degrees and rounded to five decimal places.

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Parameters

Parameters for this dataset have not yet been identified

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Deployments

Smith_Island_Song

Website	https://www.bco-dmo.org/deployment/721959
Platform	shoreside Virginia

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Project Information

Microbial Regulation of Greenhouse Gas N2O Emission from Intertidal Oyster Reefs (Oyster Reef N2O Emission)

Extracted from the NSF award abstract:

Oyster reefs are biogeochemical hot spots and prominent estuarine habitats that provide disproportionate ecological function. Suspension-feeding eastern oysters, Crassostrea virginica, are capable of improving water quality and diminishing eutrophication by filtering nutrients and particles from the water and depositing them in the sediments. Remineralization of these deposits may enhance sedimentary denitrification that facilitates nitrogen removal in tidal estuaries. However, the scientific underpinning of oyster reef function has been challenged in various studies. In addition, recent studies of filter feeding invertebrates reported the production of nitrous oxide (N2O), a greenhouse gas, as an end product of incomplete denitrification by gut microbes. C. virginica could be another source of N2O flux from intertidal habitats. Preliminary work indicated substantial N2O production from individual oysters. The estimated N2O production from high density oyster reefs may exceed the N2O flux measured from some estuaries. With the new discovery of N2O emission and uncertainty regarding eutrophication control, the ecological value of oyster reef restoration may become equivocal.

This project will quantify N2O fluxes to understand the factors controlling N2O emission from oyster reefs. Sedimentary N processes will be examined to develop an oyster reef N model to estimate N2O emission from tidal creek estuaries relative to other N cycling processes. The PIs hypothesize that intertidal oyster reefs are a substantial source of N2O emission from estuarine ecosystems and the magnitude of emission may be linked to water quality. If substantial N2O flux from oyster reefs is validated, ecological benefits of oyster reef restoration should be reevaluated. This interdisciplinary research team includes a microbial ecologist, a biogeochemist, an ecologist and an ecosystem modeler. They will utilize stable isotope and molecular microbiological techniques to quantify oyster N2O production, elucidate microbial sources of N2O emission from oysters and sediments, and estimate seasonal variation of N2O fluxes from oyster reefs. Measurements from this study will be integrated into a coupled oyster bioenergetics-sediment biogeochemistry model to compare system level rates of N cycling on oyster reefs as a function of oyster density and water quality. Modeling results will be used to assess the relative trade-offs of oyster restoration associated with N cycling. They expect to deliver the following end products:1) estimation of annual N2O flux from oyster reefs as an additional source of greenhouse gases from estuaries, 2) a better understanding of the environmental and microbial factors influencing N2O and N2 fluxes in tidal estuaries, 3) transformative knowledge for the effect of oyster restoration on water quality enhancement and ecosystem function, 4) direct guidance for oyster restoration projects whose goals include water quality enhancement, and 5) a modeling tool for use in research and restoration planning.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1321373

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