

Denitrification measurements from Hope Hole Creek, North Carolina in 2014 (Oyster Reef N2O Emission project)

Website: <https://www.bco-dmo.org/dataset/722357>

Version:

Project

» [Microbial Regulation of Greenhouse Gas N2O Emission from Intertidal Oyster Reefs](#) (Oyster Reef N2O Emission)

Contributors	Affiliation	Role
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Table of Contents

- [Dataset Description](#)
 - [Data Processing Description](#)
- [Parameters](#)
- [Deployments](#)
- [Project Information](#)
- [Funding](#)

Dataset Description

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

Flux measurements of dinitrogen (N₂), dissolved oxygen (O₂), dissolved inorganic nitrogen (DIN) and total dissolved nitrogen (TDN) and soluble reactive phosphate (SRP) in oysters, oyster shells and sediments collected at the Hoop Hole Creek, North Carolina.

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)
- * 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.

[[table of contents](#) | [back to top](#)]

Parameters

Parameters for this dataset have not yet been identified

[[table of contents](#) | [back to top](#)]

Deployments

Smith Island Song

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

[[table of contents](#) | [back to top](#)]

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.

[[table of contents](#) | [back to top](#)]

Funding

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

[[table of contents](#) | [back to top](#)]