Dissolved N2O and aquatic nutrient concentrations from 4 field sites in Bogue Sound, North Carolina collected from 2014 to 2015.

Website: https://www.bco-dmo.org/dataset/720183
Data Type: Other Field Results
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Project
» Microbial Regulation of Greenhouse Gas N2O Emission from Intertidal Oyster Reefs (Oyster Reef N2O Emission)

Contributors	Affiliation	Role
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Abstract
Dissolved N2O and aquatic nutrient concentrations from 4 field sites in Bogue Sound, North Carolina collected from 2014 to 2015.

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Coverage

Spatial Extent: **Lat**:34.710129 **Lon**:-76.867882
Temporal Extent: 2014 - 2015

Dataset Description

Dissolved N_2O and nutrient concentrations from 4 field sites in Bogue Sound, located in coastal North Carolina.

Methods & Sampling

Water samples were collected on-site and transported to UNC IMS. Water samples were collected in vented N2-sparged glass vials. N2O concentrations in the headspace were measured using a GC. They were analyzed for nutrient concentrations with Lachat Autoanalyzer. The 4 field sites are sites of oyster reef and salt marsh restoration. Identified in data as UNC Institute of Marine Sciences (IMS), Carrot Island (Carrot), NOAA Beaufort (NOAA), and Army Marsh (Army). All sites located in Bogue Sound near Morehead City, NC.

Data Processing Description

Dissolved N2O concentrations were calculated from the headspace data based on assumptions of Henry’s

Law. The Henry's Law solubility constant was used to calculate the Bunsen solubility coefficient, which was in turn used to determine the N2O concentration in the water sample. Nutrient concentration data corrected using standard curves.

BCO-DMO Data Processing Notes:

-N2O and nutrient data were combined into one table as they had the same first few columns
-blank cells replaced with nd
-data sorted by season, site

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Data Files

File
N2O_nutrients.csv (Comma Separated Values (.csv), 30.61 KB) MD5:de94ef8fc922c3df9ec63bcb8646d0b7 Primary data file for dataset ID 720183

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Parameters

Parameter	Description	Units
Season	Season data were collected	unitless
Site	Site where data were collected	unitless
CoreName	Core name	unitless
CoreNo	Core ID number	unitless
NOx	NOx concentration	micromoles per liter
NH3	NH3 concentration	micromoles per liter
PO4	PO4 concentration	micromoles per liter
TN	TN concentration	micromoles per liter
ON	ON concentration	micromoles per liter
N2O_conc_uM	N2O concentration in uM	micromoles
N2O_conc_nM	N2O concentration in nM	nanomoles
N2O_flux	N2O concentration flux	micromoles

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Instruments

Dataset-specific Instrument Name	Gas Chromatograph
Generic Instrument Name	Gas Chromatograph
Dataset-specific Description	Used to analyze N2O
Generic Instrument Description	Instrument separating gases, volatile substances, or substances dissolved in a volatile solvent by transporting an inert gas through a column packed with a sorbent to a detector for assay. (from SeaDataNet, BODC)

Dataset-specific Instrument Name	Lachat Autoanalyzer
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	Used to determine nutrient concentrations
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

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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-1233327

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