

# Dissolved N<sub>2</sub>O 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

Version: 1

Version Date: 2017-12-14

## Project

» [Microbial Regulation of Greenhouse Gas N<sub>2</sub>O Emission from Intertidal Oyster Reefs](#) (Oyster Reef N<sub>2</sub>O Emission)

Contributors	Affiliation	Role
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## Abstract

Dissolved N<sub>2</sub>O 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

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## Dataset Description

Dissolved N<sub>2</sub>O and nutrient concentrations from 4 field sites in Bogue Sound, located in coastal North Carolina.

## Acquisition Description

Water samples were collected on-site and transported to UNC IMS. Water samples were collected in vented N<sub>2</sub>-sparged glass vials. N<sub>2</sub>O 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.

## Processing Description

Dissolved N<sub>2</sub>O 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 N<sub>2</sub>O concentration in the water sample. Nutrient concentration data corrected using standard curves.

### **BCO-DMO Data Processing Notes:**

- N<sub>2</sub>O 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

## 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

## Instruments

<b>Dataset-specific Instrument Name</b>	Lachat Autoanalyzer
<b>Generic Instrument Name</b>	Nutrient Autoanalyzer
<b>Dataset-specific Description</b>	Used to determine nutrient concentrations
<b>Generic Instrument Description</b>	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.

<b>Dataset-specific Instrument Name</b>	Gas Chromatograph
<b>Generic Instrument Name</b>	Gas Chromatograph
<b>Dataset-specific Description</b>	Used to analyze N <sub>2</sub> O
<b>Generic Instrument Description</b>	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)

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## **Project Information**

## **Microbial Regulation of Greenhouse Gas N<sub>2</sub>O Emission from Intertidal Oyster Reefs (Oyster Reef N<sub>2</sub>O 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 (N<sub>2</sub>O), a greenhouse gas, as an end product of incomplete denitrification by gut microbes. *C. virginica* could be another source of N<sub>2</sub>O flux from intertidal habitats. Preliminary work indicated substantial N<sub>2</sub>O production from individual oysters. The estimated N<sub>2</sub>O production from high density oyster reefs may exceed the N<sub>2</sub>O flux measured from some estuaries. With the new discovery of N<sub>2</sub>O emission and uncertainty regarding eutrophication control, the ecological value of oyster reef restoration may become equivocal. This project will quantify N<sub>2</sub>O fluxes to understand the factors controlling N<sub>2</sub>O emission from oyster reefs. Sedimentary N processes will be examined to develop an oyster reef N model to estimate N<sub>2</sub>O emission from tidal creek estuaries relative to other N cycling processes. The PIs hypothesize that intertidal oyster reefs are a substantial source of N<sub>2</sub>O emission from estuarine ecosystems and the magnitude of emission may be linked to water quality. If substantial N<sub>2</sub>O 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 N<sub>2</sub>O production, elucidate microbial sources of N<sub>2</sub>O emission from oysters and sediments, and estimate seasonal variation of N<sub>2</sub>O 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 N<sub>2</sub>O flux from oyster reefs as an additional source of greenhouse gases from estuaries, 2) a better understanding of the environmental and microbial factors influencing N<sub>2</sub>O and N<sub>2</sub> 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
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1233327</a>

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