Dissolved oxygen from 4 field sites in Bogue Sound, North Carolina from 2014 to 2015.

Website: https://www.bco-dmo.org/dataset/721344
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 oxygen from 4 field sites in Bogue Sound, North Carolina from 2014 to 2015.

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Coverage

Spatial Extent: **Lat**:34.710129 **Lon**:-76.867882

Dataset Description

Dissolved oxygen from 4 field sites in Bogue Sound, located in coastal North Carolina.

Acquisition Description

Water samples collected on-site. Dissolved oxygen concentrations were measured with Membrane Inlet Mass Spectrometer (MIMS). 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

Oxygen concentration data corrected using standard curves.

BCO-DMO Data Processing Notes:
- sorted by season, site

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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
TimePt	Time point of collection; 1 2 or 3	unitless
O2Flux	Oxygen concentration	milligrams per liter

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Instruments

Dataset-specific Instrument Name	Membrane inlet mass spectrometer
Generic Instrument Name	Membrane Inlet Mass Spectrometer
Dataset-specific Description	Used to measure oxygen concentrations
Generic Instrument Description	Membrane-introduction mass spectrometry (MIMS) is a method of introducing analytes into the mass spectrometer's vacuum chamber via a semipermeable membrane.

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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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