Nutrient concentrations, microbiology (Vibrio abundance), trace metals, and environmental conditions from collection sites in the Florida Keys National Marine Sanctuary, 2014-2016

Website: https://www.bco-dmo.org/dataset/663707
Data Type: Other Field Results
Version: 1
Version Date: 2016-11-03

Project
» Vibrio as a model microbe for opportunistic heterotrophic response to Saharan dust deposition events in marine waters (Vibrio-dust deposition)

Contributors	Affiliation	Role
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Abstract
Nutrient concentrations, microbiology (Vibrio abundance), trace metals, and environmental conditions from collection sites in the Florida Keys National Marine Sanctuary, 2014-2016.

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Coverage

Spatial Extent: **N**:24.74287 **E**:-80.68487 **S**:24.54322 **W**:-81.41115
Temporal Extent: 2014-07-22 - 2016-07-31

Dataset Description

Nutrient concentrations, microbiology (Vibrio abundance), trace metals, and environmental conditions from collection sites in the Florida Keys National Marine Sanctuary, 2014-2016.

Methods & Sampling

Samples were collected offshore from Alligator Reef (2014) and Looe Key Reef (2015-2016). Measurements included temperature, salinity, pH, abundance of Vibrio, chlorophyll-a, DOC, TDN, DON, NH4, NO3, NO2, Orthophosphate ,SiO4, and dFe.

Dissolved organic carbon (DOC) and total dissolved nitrogen (TDN) were determined using the filtrate of water samples that were passed through precombusted 25 mm GF/F filters and stored frozen (-20C) until analysis. Samples were subsequently analyzed using the High Temperature Catalytic Oxidation method on a Shimadzu TOC-Vs analyzer with nitrogen module. Standard curves were run twice daily using a DIW blank and five concentrations of either acid potassium phthalate solution or potassium nitrate for DOC and TDN, respectively. Three to five subsamples were taken from each standard and water sample and injected in sequence. Reagent grade glucosamine was used as a laboratory check standard and inserted throughout each run, as were Certified Reference Material Program (CRMP) deep-water standards of known DOC/TDN concentration.

Nutrients data went through internal lab QAQC process. BDL means below detection limit. The method detection limit (MDL) was determined using 9 samples on two different runs and correct student-T value.

Data Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- nd (no data) was entered into all blank cells
- reduced number of significant digits of Vibrio and nutrient values to 2 digits to right of decimal and lat/lon to 5 digits.
- re-formatted date from m/d/yyyy to yyyy-mm-dd
- replaced spaces with underscores

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Data Files

File
Vibrio_collection2.csv (Comma Separated Values (.csv), 24.65 KB) MD5:cd65d623398ec2c71031b35db5a08b03
Primary data file for dataset ID 663707

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Related Publications

Clesceri, Lenore S., Arnold E. Greenberg, and Andrew D. Eaton. "Standard methods for the examination of water and wastewater." APHA, AWWA and WPCF, Washington DC(1996). 978-0875532356
Methods

Westrich, J. R., Ebling, A. M., Landing, W. M., Joyner, J. L., Kemp, K. M., Griffin, D. W., & Lipp, E. K. (2016). Saharan dust nutrients promoteVibriobloom formation in marine surface waters. Proceedings of the National Academy of Sciences, 113(21), 5964–5969. doi:10.1073/pnas.1518080113
Results

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Parameters

Parameter	Description	Units
sample	sample identifier	unitless
date	sampling date formatted as yyyy-mm-dd	year-month-day
time_start_local	local start time formatted as HH:MM	hours:minutes

depth	depth	feet
location	sample collection location	unitless
station_notes	comments pertaining to the station	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
temp	temperature	degrees Celsius
sal	salinity	Practical Salinity Units (PSU)
pH	pH: The measure of the acidity or basicity of an aqueous solution	unitless; pH scale
Vibrio	Vibrio colony concentration. CFU/ml determined by spread on TCBS agar in triplicate for each experimental replicate and counting green and yellow colonies after 18 - 24 incubation at 30 C. limit of detection was 3.3 CFU/ml (determined using 100 ul spread volume in triplicate); 0.0 = below detection limit.	colony forming units/milliliter (CFU/ml)
Chl_a	Chlorophyll-a concentration determined by acetone freeze thaw using EPA method 445.0 (non-acidification); bdl for below detection limit.	micrograms/liter (ug/ml)
DOC	Dissolved organic carbon concentration: determined using oxidative high temperature combustion-infrared analysis. MDL is 11.16 micromol/L.	micromoles/liter (ug/ml)
TDN	Total dissolved nitrogen concentration determined using oxidative high temperature combustion-infrared analysis.	micromoles/liter (ug/ml)
DON	Dissolved organic nitrogen concentration; MDL is 5.38 micromol/L (determined using 9 samples on two different runs and correct student-T value). bdl = below detection limit.	micromoles/liter (ug/ml)
NH4	Ammonium concentration determined by the automated phenate method 4500-NH3G. (20th Edition Std. Meth.); MDL is 0.3 micro gram/L (determined using 9 samples on two different runs and correct student-T value). bdl = below detection limit.	micromoles/liter (ug/ml)
NO3	Nitrate concentration determined by the automated cadmium reduction method 4500-NO3- F (20th Edition Std. Meth.); MDL is 0.3 micro gram/L (determined using 9 samples on two different runs and correct student-T value). bdl = below detection limit.	micromoles/liter (ug/ml)
NO2	Nitrite concentration determined as with Nitrate without running the sample through a cadmium column (20th Edition Std. Meth.); MDL is 0.1 micro gram/L (determined using 9 samples on two different runs and correct student-T value). bdl = below detection limit.	micromoles/liter (ug/ml)
Orthophosphate	Orthophosphate concentration determined by the automated ascorbic acid reduction method 4500-P F. (20th Edition Std. Meth.); MDL is 0.2 micro gram/L (determined using 9 samples on two different runs and correct student-T value). bdl = below detection limit.	micromoles/liter (ug/ml)
SiO4	Silicate concentration determined by the automated molybdate-reactive silica method 4500-SiO2 E. (20th Edition Std. Meth.); MDL is 0.3 micro gram/L (determined using 9 samples on two different runs and correct student-T value). bdl = below detection limit.	micromoles/liter (ug/ml)
dFe	dissolved iron concentration determined in the 0.2 um filtered fraction using ICP-MSas described in Milne et al. 2010. Analytica Chimera Acta 665: 200-207	nanomoles/liter (ug/ml)

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Instruments

Dataset-specific Instrument Name	chemoluminescence gas analyzer
Generic Instrument Name	Gas Analyzer
Dataset-specific Description	To measure dissolved organic nitrogen
Generic Instrument Description	Gas Analyzers - Instruments for determining the qualitative and quantitative composition of gas mixtures.

Dataset-specific Instrument Name	
Generic Instrument Name	plate reader
Dataset-specific Description	To measure colony counts
Generic Instrument Description	Plate readers (also known as microplate readers) are laboratory instruments designed to detect biological, chemical or physical events of samples in microtiter plates. They are widely used in research, drug discovery, bioassay validation, quality control and manufacturing processes in the pharmaceutical and biotechnological industry and academic organizations. Sample reactions can be assayed in 6-1536 well format microtiter plates. The most common microplate format used in academic research laboratories or clinical diagnostic laboratories is 96-well (8 by 12 matrix) with a typical reaction volume between 100 and 200 uL per well. Higher density microplates (384- or 1536-well microplates) are typically used for screening applications, when throughput (number of samples per day processed) and assay cost per sample become critical parameters, with a typical assay volume between 5 and 50 µL per well. Common detection modes for microplate assays are absorbance, fluorescence intensity, luminescence, time-resolved fluorescence, and fluorescence polarization. From: http://en.wikipedia.org/wiki/Plate_reader, 2014-09-0-23.

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Deployments

Lipp_2014-16

Website	https://www.bco-dmo.org/deployment/663738
Platform	Florida Keys National Marine Sanctuary
Start Date	2014-07-22
End Date	2015-05-09
Description	Microbial studies

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Project Information

Vibrio as a model microbe for opportunistic heterotrophic response to Saharan dust deposition events in marine waters (Vibrio-dust deposition)

Coverage: Florida Keys, FL, USA

Description from NSF award abstract:
Dust and mineral aerosols are a significant source of micro and macronutrients to oligotrophic ocean surface waters. Evidence is growing that heterotrophic microbes may play key roles in processing deposited minerals and nutrients. Yet it is not known which components of dust stimulate the heterotrophic bacteria, which cellular mechanisms are responsible for the utilization of those components and how the activity of these bacteria affect the availability and utilization of dust-derived minerals and nutrients by marine autotrophs. Knowledge of these factors is key to understanding how dust deposition impacts carbon cycles and for predicting the response of tropical oceans to future changes in the frequency and intensity of dust deposition events. The objective of this project is to examine the specific effects of aeolian dust on heterotrophic microbes in a tropical marine system under controlled conditions. The central hypothesis is that in oligotrophic tropical systems numerically minor opportunistic bacteria are the first responders to influx of dust constituents and respond primarily by rapidly accessing soluble trace metals and limiting nutrients that are deposited with Saharan dust. The project will focus on two specific aims: 1) Quantify changes in community structure, composition and transcriptional activity among marine microbial populations upon exposure to dust, and 2) Identify key components in Saharan dust aerosols that stimulate or repress growth and/or activity in Vibrio, a model opportunistic marine heterotrophic group. The study will use a series of controlled experiments designed to identify and quantify heterotrophic microbial response to dust deposition events using both natural communities and model bacteria (Vibrio) through metagenomics, transcriptomics and atmospheric and marine biogeochemical techniques. This innovative approach will identify the most critical (reactive) components leached from dust aerosols on the microbial community as well as elucidate potential mechanisms of response.

There is great interest in the biological response to dust aerosols given its potentially large influence on biogeochemical cycling, but there has been relatively little work that has addressed the mechanisms of response (especially among the heterotrophic microbial fraction) or identified the relative importance of specific constituents of dust aerosols. A detailed framework for microbial response (focusing on opportunistic heterotrophs) will facilitate efforts to link autotrophic and heterotrophic processing. This contribution is significant because it will provide one of the first end-to-end (chemistry to physiology to ecology) mechanistic pathways for marine biological response to desert dust aerosols.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1357423

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