

CTD data collected on a R/V Sarmiento de Gamboa cruise in the Subtropical North Atlantic Ocean between January and March 2011 (Microbial associations in zooplankton project)

Website: <https://www.bco-dmo.org/dataset/681423>

Data Type: Cruise Results

Version: 1

Version Date: 2017-02-02

Project

» [Microbial associations in zooplankton: significance for the marine nitrogen cycle](#) (Microbial associations in zooplankton)

Contributors	Affiliation	Role
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Abstract

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Coverage

Spatial Extent: N:27.8 E:-13.3 S:24.5 W:-65.7

Temporal Extent: 2011 - 2011

Dataset Description

Conductivity-Temperature-Depth data

Methods & Sampling

A profile was conducted using a Seabird sonde.

Data Processing Description

Basic post processing was conducted.

BCO-DMO Data Processing Notes:

-Reformatted column names to comply with BCO-DMO standards

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Data Files

File
CTD.csv (Comma Separated Values (.csv), 41.18 KB) MD5:feb0826317f0123edf765e776e776e34cd02
Primary data file for dataset ID 681423

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Parameters

Parameter	Description	Units
depth	Depth at which sample was taken	meters
salinity	Salinity at depth	practical salinity units
temperature	Temperature at depth	Celsius
fluorescence	Fluorescence at depth	volts
PAR	Photosynthetically Active Radiation	$\mu\text{E}/\text{m}^2/\text{sec}$

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Instruments

Dataset-specific Instrument Name	CTD
Generic Instrument Name	CTD Sea-Bird
Dataset-specific Description	CTD used to sample
Generic Instrument Description	Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics, no specific unit identified. This instrument designation is used when specific make and model are not known. See also other SeaBird instruments listed under CTD. More information from Sea-Bird Electronics.

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Deployments

Malaspina_2011

Website	https://www.bco-dmo.org/deployment/680974
Platform	R/V Sarmiento de Gamboa
Start Date	2011-01-28
End Date	2011-03-09

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Project Information

Microbial associations in zooplankton: significance for the marine nitrogen cycle (Microbial associations in zooplankton)

Coverage: Sargasso Sea, Eastern and Western North Atlantic.

Description from NSF award abstract:

Nitrogen (N₂) fixation is a key biogeochemical process providing new N for the marine ecosystem. Current estimates of the global rates suggest that the inputs and outputs of N are not in balance, leaving an apparent deficiency in N₂ fixation in the oceanic N budget. Based on recovery of N₂ fixation gene fragments, however, numerous potential N₂-fixing microbes are present in the euphotic layer and below, yet evidence for their contribution to N₂-fixation is lacking. The goal of this study is to identify and determine the importance of potentially diazotrophic, heterotrophic prokaryotes occupying a previously unstudied niche in the upper ocean.

This project PIs hypothesize that N₂ fixation in zooplankton-associated microbial communities is an important source of new N in the open ocean contributing to the oceanic N budget. In oligotrophic, N-limited open ocean waters, zooplankton are faced with the same low N availability in their diets that limits growth of primary producers and heterotrophic microbes in the open ocean. Zooplankton guts would be a particularly suitable environment for heterotrophic N₂-fixers as the nitrogenase enzyme is inhibited by oxygen. In many terrestrial insects, N₂ fixation by gut microbes serves as a source of N. The aim of this study is to investigate whether similar associations occur in marine zooplankton that live on N-limited phytoplankton. The PIs will investigate specific associations between copepods from N-limited and non-N limited oceanic waters with microorganisms that are potentially or actively fixing N. They will also investigate the fate of this N to study whether the new N is incorporated into the zooplankton host. The main research objectives are to determine whether:

1. diazotrophic microflora exist in copepods and what is their seasonal and spatial variability,
2. microbial communities associated with copepods are actively fixing N₂,
3. diazotroph communities contribute to the N nutrition of their zooplankton hosts.

Monthly samples will be collected in the oligotrophic Sargasso Sea, in association with BATS sampling cruises. In addition, experiments and field studies will be conducted in Bermuda during the summer. For comparison to a site that is not severely N limited, and for methods development, additional studies will be carried out in coastal Gulf of Maine waters. Selected copepod species and their fecal pellets will be analyzed for the presence of nifH genes and their expression using cloning and sequencing and Reverse Transcriptase-PCR. Quantitative PCR will be employed to investigate the seasonal distributions of dominant phylotypes. Anaerobic cultivation will be used for the enrichment of the gut microflora. Zooplankton will be incubated with ¹⁵N₂ to quantify microbial N₂ fixation activity and its fate of N through zooplankton overall ¹⁵N content and nanoSIMS determination of ¹⁵N localization. Products of this study will include novel microbial isolates or consortia, evidence regarding taxa-specific expression of N₂ fixation in these microhabitats, and a first estimate for the importance of this process for the oceanic N budget.

This project addresses fundamental issues regarding the sources of oceanic nitrogen and will test hypotheses regarding previously overlooked diazotrophic niches. As open ocean productivity is frequently N limited, characterization of new sources of N will have global impacts.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1130495

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