Sample log recorded during cruise LMG1801 on R/V Laurence M. Gould from January to February 2018

Website: https://www.bco-dmo.org/dataset/839985
Data Type: Cruise Results
Version: 1
Version Date: 2021-04-08

Project
» Collaborative Research: Chemoautotrophy in Antarctic Bacterioplankton Communities Supported by the Oxidation of Urea-derived Nitrogen (Oxidation of Urea N)

Contributors	Affiliation	Role
Hollibaugh, James T.	University of Georgia (UGA)	Principal Investigator, Contact
Popp, Brian N.	University of Hawai'i at Mānoa (SOEST)	Co-Principal Investigator
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Abstract
Sample log recorded during cruise LMG1801 on R/V Laurence M. Gould. 30 Dec 2017 to 12 Feb 2018, port to port; sampling from 5 Jan 2018 to 4 Feb 2018.

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Coverage

Spatial Extent: **N**:-64.03196 **E**:-64.03196 **S**:-69.25615 **W**:-78.20207
Temporal Extent: 2018-01-05 - 2018-02-04

Methods & Sampling

Sample Collection. Samples were collected on the Antarctic continental shelf and slope west of the Antarctic Peninsula within the PAL-LTER sampling domain (http://pal.lternet.edu/) during summer (cruise dates 30 Dec 2017 through 12 Feb 2018; sampling dates 5 Jan to 4 Feb 2018) from the ARSV Laurence M Gould (LMG 1801, PAL-LTER cruise 26, DOI: 10.7284/907858). Sampling focused on three or 4 depths at each station chosen to represent the Antarctic Surface Water (ASW, 0 -34 m depth), the Winter Water (WW, the water column temperature minimum, generally between 35 and 174 m) the Circumpolar Deep Water (CDW, 175-1000 m) and slope water (SLOPE, >1000 m, generally ~10 m above the bottom at deep stations on the slope, 2500-3048m). Water samples were collected from Niskin bottles (General Oceanics Inc., Miami, FL, USA) into opaque 2 L HDPE plastic bottles or into aged, acid-washed, sample-rinsed 250 ml polycarbonate bottles (Nalge) completely filled (~270 mL) directly from Niskin bottles as soon as possible after the rosette was secured on deck. Subsequent processing took place in an adjacent laboratory.

Samples for DNA analysis were taken from the 2 L opaque HDPE bottles and were filtered under pressure through 0.22 um pore size Sterivex GVWP filters (EMD Millipore, Billerica, MA, USA) using a peristaltic pump. Residual seawater was expelled from the filter using a syringe filled with air, then ~1.8 ml of lysis buffer (0.75 M sucrose, 40 mM EDTA, 50 mM Tris, pH 8.3) was added to the filter capsule, which was capped and placed in a -20 °C freezer. The frozen samples were aggregated into Ziploc Freezer Bags and transferred to a -80 °C freezer for the remainder of the cruise and for shipping to the laboratory.

Two samples of the Sterivex filtrate (40 mL each into new 50 mL disposable centrifuge tubes, VWR, rinsed 3x with sample) were frozen immediately at -20 °C, then aggregated into Ziploc Freezer Bags and transferred to a -80 ° freezer for the remainder of the cruise and for shipping to the laboratory. These were used for subsequent determination of 1) urea concentration and 2) the natural abundance of 15N in the nitrite plus nitrate pools ($15NO_x$ hereinafter). An additional sample of the Sterivex filtrate was stored in a polycarbonate bottle at 4 °C for subsequent onboard determination of ammonia concentration by the Holmes et al (1999) o-phthaldialdehyde method and nitrite concentration by the diazo-coupling method (Strickland and Parsons 1972). Technical difficulties encountered during onboard analysis resulted in the loss of ammonium and nitrite data for some samples.

Samples for DNA and chemical analyses were shipped on dry ice from Punta Arenas, Chile to the Hollibaugh laboratory at the University of Georgia. Upon arrival they were stored in a -80 °C freezer until analyzed. Samples for 15N analysis were shipped on dry ice from Punta Arenas, Chile to the Popp laboratory at the University of Hawaii. Upon arrival they were stored in a -40 °C freezer until analyzed.

Data Processing Description

BCO-DMO Processing:
- replaced 'NAN' with 'nd' as missing data identifier;
- renamed fields to comply with BCO-DMO naming conventions;
- corrected dates where month and day were reversed;
- converted cast start date/time field to ISO8601 format;
- replaced commas with semi-colons in the Other_Notes column;
- 2021-03-02: revised/updated the Acquisition Description section of the metadata;
- 2021-04-08: replaced data file with copy received on 2021-03-18.

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Data Files

File	
LMG1801_Sample_Log.csv	(Comma Separated Values (.csv), 22.79 KB) MD5:f2ac7721cc2b042e4974c2e6f93d0e3a
Primary data file for dataset ID 839985	

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Related Publications

Holmes, R. M., Aminot, A., Kérouel, R., Hooker, B. A., & Peterson, B. J. (1999). A simple and precise method for measuring ammonium in marine and freshwater ecosystems. Canadian Journal of Fisheries and Aquatic Sciences, 56(10), 1801–1808. doi:10.1139/f99-128
Methods

Strickland, J. D. H. and Parsons, T. R. (1972). A Practical Hand Book of Seawater Analysis. Fisheries Research Board of Canada Bulletin 157, 2nd Edition, 310 p.
Methods

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Parameters

Parameter	Description	Units
Event_Log_Number	Sequential numbers keyed to the bridge log of activities	unitless
Cast_Start_ISO_DateTime_UTC	Date and time of day for beginning CTD cast = sample collection; 24-hour clock; formatted to ISO8601 standard (UTC/GMT): YYYY-MM-DDThh:mmZ	unitless
Latitude	Latitude in decimal degrees (negative values = South)	degrees North
Longitude	Longitude in decimal degrees (negative values = West)	degrees East
Station_Description	PAL-LTER category for the station	unitless
LTER_Grid_Station	Station location on the PAL-LTER sampling grid (http://pal.lternet.edu)	unitless
Sample_Depth	Depth sampled in meters	meters (m)
Niskin_Bottle_Number	The number of the Niskin bottle from which the sample was taken	unitless
Sample_Temp	Water temperature from the CTD in Centigrade degrees from CTD data	degrees Celsius
Sample_Salinity	Salinity calculated from water temperature and conductivity from the ship's CTD, practical salinity units	PSU
Vol_Filtered_for_DNA	The amount of water filtered under pressure from a peristaltic pump through a Millipore Sterivex GV filter capsule (0.22 micron pore size)	liters (L)
Ammonium_oxidation_incubation_Start_Time_GMT	Time when 15N NH4 was added to subsamples to initiate the ammonia oxidation rate measurements: MMDDYY hh:mm format, 24-hour clock, Greenwich Mean Time	unitless

Ammonium_oxidation_incubation_End_Time_GMT	Time when ammonia oxidation rate measurements were terminated by freezing a 45 mL susample: MMDDYY hh:mm format, 24-hour clock, Greenwich Mean Time	unitless
Nitrite_oxidation_incubation_Start_Time_GMT	Time when 15N nitrite was added to subsamples to initiate thenitrite oxidation rate measurements: MMDDYY hh:mm format, 24-hour clock, Greenwich Mean Time	unitless
Nitrite_oxidation_incubation_End_Time_GMT	Time when nitrite oxidation rate measurements were terminated by freezing a 45 mL susample: MMDDYY hh:mm format, 24-hour clock, Greenwich Mean Time	unitless
Urea_oxidation_incubation_Start_Time_GMT	Time when 15N urea was added to subsamples to initiate the urea N oxidation rate measurements: MMDDYY hh:mm format, 24-hour clock, Greenwich Mean Time	unitless
Urea_oxidation_incubation_End_Time_GMT	Time when urea-N oxidation rate measurements were terminated by freezing a 45 mL susample: MMDDYY hh:mm format, 24-hour clock, Greenwich Mean Time	unitless
Putrescine_oxidation_incubation_Start_Time_GMT	Time when 15N NH4 was added to subsamples to initiate the ammonia oxidation rate measurements: MMDDYY hh:mm format, 24-hour clock, Greenwich Mean Time	unitless
Putrescine_oxidation_incubation_End_Time_GMT	Time when putrescine-N oxidation rate measurements were terminated by freezing a 45 mL susample: MMDDYY hh:mm format, 24-hour clock, Greenwich Mean Time	unitless
C14_Incubation_Start_Time_GMT	Time when 14C NaHCO3 was added to subsamples to initiate the chemoautotrophy measurements: MMDDYY hh:mm format, 24-hour clock, Greenwich Mean Time	unitless
C14_Incubation_End_Time_GMT	Time when chemoautotrophy samples were vacuum filtered through Millipore GS (0.22 micron pore size) filters: MMDDYY hh:mm format, 24-hour clock, Greenwich Mean Time	unitless
Other_Notes	Notes relevant to the activities performed at this station or with this sample	unitless

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Instruments

Dataset-specific Instrument Name	CTD rosette
Generic Instrument Name	CTD - profiler
Generic Instrument Description	The Conductivity, Temperature, Depth (CTD) unit is an integrated instrument package designed to measure the conductivity, temperature, and pressure (depth) of the water column. The instrument is lowered via cable through the water column. It permits scientists to observe the physical properties in real-time via a conducting cable, which is typically connected to a CTD to a deck unit and computer on a ship. The CTD is often configured with additional optional sensors including fluorometers, transmissometers and/or radiometers. It is often combined with a Rosette of water sampling bottles (e.g. Niskin, GO-FLO) for collecting discrete water samples during the cast. This term applies to profiling CTDs. For fixed CTDs, see https://www.bco-dmo.org/instrument/869934.

Dataset-specific Instrument Name	Niskin bottles (General Oceanics Inc., Miami, FL, USA)
Generic Instrument Name	Niskin bottle
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

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Deployments

LMG1801

Website	https://www.bco-dmo.org/deployment/839984
Platform	ARSV Laurence M. Gould
Start Date	2017-12-30
End Date	2018-02-12
Description	Additional cruise information is available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/LMG1801 Cruise DOI: 10.7284/907858

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Project Information

Collaborative Research: Chemoautotrophy in Antarctic Bacterioplankton Communities Supported by the Oxidation of Urea-derived Nitrogen (Oxidation of Urea N)

Coverage: Coastal, shelf and slope waters off the West Antarctic Peninsula, PAL-LTER sampling grid,

Lawrence M Gould cruise 18-01

NSF Award Abstract:
Part 1: The project addresses fundamental questions regarding the role of nitrification (the conversion of ammonium to nitrate by a two-step process involving two different guilds of microorganisms: ammonia- and nitrite-oxidizers) in the Antarctic marine ecosystem. Specifically, the project seeks to evaluate the contribution of primary production supported by the energy in nitrogen compounds to the overall supply of organic carbon to the food web of the Southern Ocean. Previous measurements indicate that nitrification could contribute about 9% to primary production supporting the Antarctic food web on an annual basis, but those measurements did not include the additional production associated with nitrite oxidation. Additionally, the project will aim to determine the significance of the contribution of other sources of nitrogen, (specifically organic nitrogen and urea released by other organisms) to nitrification because these contributions may not be assessed by standard protocols. Such work will aid in better understanding the basis of the energy for the Antarctic marine ecosystems on an annual basis as well as better aid in understanding the energetics of the ecosystem in times and places where primary production based on light energy is limited (i.e. during the polar night or under sea ice cover).

This project will result in training a postdoctoral researcher and provide undergraduate students opportunities to gain hand-on experience with research on microbial geochemistry. The Palmer Long Term Ecological Research (LTER) activities have focused largely on the interaction between ocean climate and the marine food web affecting top predators. Relatively little effort has been devoted to studying processes related to the microbial geochemistry of nitrogen cycling, yet these are a major themes at other LTER sites. This work will contribute substantially to understanding an important aspect of nitrogen cycling and bacterioplankton production in the study area. The team will be working synergistically and be participating fully in the education and outreach efforts of the Palmer LTER, including making highlights of the findings available for posting to their project web site and participating in any special efforts they have in the area of outreach.

Part 2: The proposed work will quantify oxidation rates of 15N supplied as ammonium, urea and nitrite, allowing the estimation of the contribution of urea-derived N and complete nitrification (ammonia to nitrate) to chemoautotrophy and bacterioplankton production in Antarctic coastal waters. The project will compare these estimates to direct measurements of the incorporation of 14C into organic matter in the dark for an independent estimate of chemoautotrophy. The team aims to collect samples spanning the water column: from surface water (~10 m), winter water (50-100 m) and circumpolar deep water (>150 m); on a cruise surveying the continental shelf and slope west of the Antarctic Peninsula in the austral summer of 2018. Other samples will be taken to measure the concentrations of nitrate, nitrite, ammonia and urea, for qPCR analysis of the abundance of relevant microorganisms, and for studies of related processes. The project will rely on collaboration with the existing Palmer LTER to ensure that ancillary data (bacterioplankton abundance and production, chlorophyll, physical and chemical variables) will be available. The synergistic activities of this project along with the LTER activities will provide a unique opportunity to assess chemoautotrophy in context of the overall ecosystem's dynamics- including both primary and secondary production processes.

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Funding

Funding Source	Award
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1643466
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1643345

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