Environmental data collected in marine lakes in Palau in 2010 from small boats

Website: https://www.bco-dmo.org/dataset/683072
Data Type: Other Field Results
Version: 1
Version Date: 2017-02-24

Project
» Do Parallel Patterns Arise from Parallel Processes? (PaPaPro)

Program
» Dimensions of Biodiversity (Dimensions of Biodiversity)

Contributors	Affiliation	Role
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Abstract
Environmental data collected in marine lakes in Palau in 2010 from small boats. Reported parameters include depth, temperature, conductivity, salinity, oxygen, pH, light, chlorophyll, phosphate, nitrite, ammonium, and nitrate.

Table of Contents

Coverage

Spatial Extent: **N**:7.32285 **E**:134.50855 **S**:7.1165 **W**:134.269367
Temporal Extent: 2010-08-21 - 2010-09-03

Dataset Description

Environmental data collected in marine lakes in Palau in 2010.

Methods & Sampling

Refer to the following paper for complete methodology:
Meyerhof, M. et al. 2016. Microbial community diversity, structure and assembly across oxygen gradients in meromictic marine lakes, Palau. Environmental Microbiology. doi:10.1111/1462-2920.13416

In summary (extracted from above paper):
We studied five meromictic lakes in Palau: Spooky Lake (SLM), Goby Lake (GLK), Ongeim'l Tketau Lake (OTM, known colloquially as Jellyfish Lake), Clear Lake (CLM) and Ngermeuangel Lake (NLK). One holomictic lake (Mekeald Lake; MLN) and an ocean site at the German Channel on the southwestern side of the islands (OS-GC) were also sampled for comparison. We vertically profiled dissolved oxygen (DO), temperature, pH, chlorophyll fluorescence and salinity/conductivity using a HydroLab DS5 (Hach Company, Loveland, CO, USA) and sampled three depth layers within each meromictic lake: the mixolimnion (0–5 m depth), the monimolimnion (5–20 m depth) and intermediate depths near the chemocline; these intermediate depths ranged from 1 to 15 m, depending on the depth of the chemocline within the individual lakes. We sampled comparable depths at MLN (5–20 m) and OS-GC (5–30 m). For QPCR analysis of functional genes (dsrA, amoA and nirS) and specific functional groups, as well as analysis dissolved nutrient concentrations, we collected additional samples above and below the chemocline to capture abrupt transitions in biogeochemical conditions across this interface.

Samples were collected from small boats using a horizontal, 2.5 L GoFlo bottle (General Oceanics, Miami, FL, USA), transferred to 1 L polycarbonate bottles, and stored in the dark during transit to the Coral Reef Research Foundation laboratory in Koror, Palau. Water samples were filtered using a peristaltic pump and 0.22 um Durapore PVDF hydrophilic filters (Millipore, Billerica, MA, USA). Filters were immediately frozen in 800 uL Sucrose-Tris-EDTA (STE) lysis buffer (750 mM sucrose, 20 mM EDTA, 400 mM NaCl and 50 mM Tris) in 2 mL Lysing Matrix E tubes (MP Biomedicals, Solon, OH, USA), and stored at -20 C until transport to the United States, where they were stored at -80 C until extraction (Dry ice and liquid nitrogen are not readily available in Palau.)

During sample filtration, 50 mL of filtrate was collected in high density polyethylene bottles for subsequent nutrient analysis at the University of California, Santa Barbara (UCSB) Marine Analytical Laboratory. Samples were analyzed for ammonium (UCSB MAL analytical method for ammonium, see below; Diamond and Huberty, 1996), nitrite (Environmental Protection Agency (EPA) Method 353.2; Schroeder, 1997), nitrite+nitrate (EPA Method 353.2; Diamond, 1997) and phosphate (EPA Method 365.1; Huberty and Diamond, 1998), on a Lachat QuikChem 8000 Flow Injection Analyzer (Hach Company, Loveland, CO, USA). A handful of samples containing large concentrations of sulfide were not analyzed for nitrate, as sulfide damages the cadmium reduction column. For ammonium analysis, each sample was injected into a flowing carrier stream through an injection valve, and then merged with an alkaline solution stream; the produced ammonia was diffused through a hydrophobic, gas-permeable membrane into a recipient stream containing a pH indicator. Colour change occurs in the indicator solution due to an increase in pH, and the concentration of ammonia was determined spectrophotometrically based on absorption at 570 nm. For all analyses, a mid-range check standard bracketed every 20 samples to verify the accuracy of the measurements, and samples that were detected outside of the standards' range were diluted 1:10 and reanalyzed. Detection limits were 0.10 uM for phosphate, 0.10 uM for nitrite, 0.20 uM for nitrite+nitrate and 0.10 uM for ammonium.

Data Processing Description

BCO-DMO Processing:
-modified parameter names to conform with BCO-DMO naming conventions;
-formatted date to yyyy-mm-dd.

[table of contents | back to top]

Data Files

File
Palau_2010_enviro.csv (Comma Separated Values (.csv), 2.29 KB) MD5:536c30d784f0a0900b9407881fdffb66 Primary data file for dataset ID 683072

[table of contents | back to top]

Related Publications

Meyerhof, M. S., Wilson, J. M., Dawson, M. N., & Michael Beman, J. (2016). Microbial community diversity, structure and assembly across oxygen gradients in meromictic marine lakes, Palau. Environmental Microbiology, 18(12), 4907–4919. doi:10.1111/1462-2920.13416
Methods

[table of contents | back to top]

Parameters

Parameter	Description	Units
sample	Sample identifier	unitless
lake	Lake name	unitless
date	Date sampled, formatted as yyyy-mm-dd	unitless
lat	Latitude	decimal degrees
lon	Longitude	decimal degrees
depth	Depth	meters (m)
temp	Temperature	degrees Celsius
cond	Conductivity	milliSiemens per centimeter (mS/cm)
sal	Salinity	ppt
O2_diss	Dissolved oxygen	micromolar (uM)
pH	pH	unitless
chl	Chlorophyll	micrograms per liter (ug/L)
phosphate	Phosphate	micromolar (uM)
nitrite	Nitrite	micromolar (uM)
ammonium	Ammonium	micromolar (uM)
nitrate	Nitrate	micromolar (uM)

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Lachat QuikChem 8000 Flow Injection Analyzer
Generic Instrument Name	Flow Injection Analyzer
Dataset-specific Description	Samples were analyzed for ammonium, nitrite, nitrite+nitrate, and phosphate on a Lachat QuikChem 8000 Flow Injection Analyzer (Hach Company, Loveland, CO, USA).
Generic Instrument Description	An instrument that performs flow injection analysis. Flow injection analysis (FIA) is an approach to chemical analysis that is accomplished by injecting a plug of sample into a flowing carrier stream. FIA is an automated method in which a sample is injected into a continuous flow of a carrier solution that mixes with other continuously flowing solutions before reaching a detector. Precision is dramatically increased when FIA is used instead of manual injections and as a result very specific FIA systems have been developed for a wide array of analytical techniques.

Dataset-specific Instrument Name	GoFlo bottle
Generic Instrument Name	GO-FLO Bottle
Dataset-specific Description	Samples were collected from small boats using a horizontal, 2.5 L GoFlo bottle (General Oceanics, Miami, FL, USA).
Generic Instrument Description	GO-FLO bottle cast used to collect water samples for pigment, nutrient, plankton, etc. The GO-FLO sampling bottle is specially designed to avoid sample contamination at the surface, internal spring contamination, loss of sample on deck (internal seals), and exchange of water from different depths.

Dataset-specific Instrument Name	HydroLab DS5
Generic Instrument Name	Hydrolab Series 5 probes
Dataset-specific Description	Dissolved oxygen (DO), temperature, pH, chlorophyll fluorescence and salinity/conductivity were measured using a HydroLab DS5 Multiparameter Data Sonde (Hach Company, Loveland, CO, USA).
Generic Instrument Description	Multi-parameter probes that can measure from 12 (MS5) to 16 (DS5 and DS5X) parameters simultaneously. Measurements include temperature, depth, conductivity, salinity, specific conductance, TDS, pH, ORP, dissolved oxygen, turbidity, chlorophyll a, blue-green algae, Rhodamine WT, ammonium, nitrate, chloride, PAR and total dissolved gases. These probes can be deployed at depths up to 200 m and can be used in continuous monitoring programs.

[table of contents | back to top]

Deployments

Palau_lakes

Website	https://www.bco-dmo.org/deployment/542180
Platform	Small boats - CRRF
Start Date	2010-08-21
End Date	2016-06-14
Description	Palau marine lakes

[table of contents | back to top]

Project Information

Do Parallel Patterns Arise from Parallel Processes? (PaPaPro)

Website: http://marinelakes.ucmerced.edu/

Coverage: Western Pacific; Palau; Indonesia (West Papua)

This project will survey the taxonomic, genetic, and functional diversity of the organisms found in marine lakes, and investigate the processes that cause gains and losses in this biodiversity. Marine lakes formed as melting ice sheets raised sea level after the last glacial maximum and flooded hundreds of inland valleys around the world. Inoculated with marine life from the surrounding sea and then isolated to varying degrees for the next 6,000 to 15,000 years, these marine lakes provide multiple, independent examples of how environments and interactions between species can drive extinction and speciation. Researchers will survey the microbes, algae, invertebrates, and fishes present in 40 marine lakes in Palau and Papua, and study how diversity has changed over time by retrieving the remains of organisms preserved in sediments on the lake bottoms. The project will test whether the number of species, the diversity of functional roles played by organisms, and the genetic diversity within species increase and decrease in parallel; whether certain species can greatly curtail diversity by changing the environment; whether the size of a lake determines its biodiversity; and whether the processes that control diversity in marine organisms are similar to those that operate on land.

Because biodiversity underlies the ecosystem services on which society depends, society has a great interest in understanding the processes that generate and retain biodiversity in nature. This project will also help conserve areas of economic importance. Marine lakes in the study region are important for tourism, and researchers will work closely with governmental and non-governmental conservation and education groups and with diving and tourism businesses to raise awareness of the value and threats to marine lakes in Indonesia and Palau.

[table of contents | back to top]

Program Information

Dimensions of Biodiversity (Dimensions of Biodiversity)

Website: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503446

Coverage: global

(adapted from the NSF Synopsis of Program)
Dimensions of Biodiversity is a program solicitation from the NSF Directorate for Biological Sciences. FY 2010 was year one of the program. [MORE from NSF]

The NSF Dimensions of Biodiversity program seeks to characterize biodiversity on Earth by using integrative, innovative approaches to fill rapidly the most substantial gaps in our understanding. The program will take a broad view of biodiversity, and in its initial phase will focus on the integration of genetic, taxonomic, and functional dimensions of biodiversity. Project investigators are encouraged to integrate these three dimensions to understand the interactions and feedbacks among them. While this focus complements several core NSF programs, it differs by requiring that multiple dimensions of biodiversity be addressed simultaneously, to understand the roles of biodiversity in critical ecological and evolutionary processes.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1241255

[table of contents | back to top]