Size fractionated zooplankton C:N, d13C, and d15N from the EXPORTS cruise on R/V Roger Revelle (RR1813) during August and September 2018

Website: https://www.bco-dmo.org/dataset/772776
Data Type: Cruise Results
Version: 1
Version Date: 2019-07-11

Project
» Collaborative Research: Isotopic Indicators for Mechanisms of Organic Matter Degradation in the Northeast Pacific (EXPORTS) (EXPORTS Isotopes)

Program
» EXport Processes in the Ocean from Remote Sensing (EXPORTS)

Contributors	Affiliation	Role
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Abstract
Size fractionated zooplankton C:N, d13C, and d15N from the EXPORTS cruise on R/V Roger Revelle (RR1813) during August and September 2018. Zooplankton were collected using a multiple opening-closing net and environmental sensing system (MOCNESS).

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Coverage

Spatial Extent: **N**:50.509713 **E**:-144.626667 **S**:50.316924 **W**:-145.09737
Temporal Extent: 2018-08-21 - 2018-09-07

Methods & Sampling

Zooplankton were collected using a multiple opening-closing net and environmental sensing system (MOCNESS). Onboard, zooplankton were wet-sieved in filter seawater using 0.2, 0.5, 1.0, 2.0, and 5.0 mm mesh sieves into different size fractions and frozen at -20 degrees Celsius. Zooplankton were dried and each fraction ground using a mortar and pestle. Samples were weighed into tin capsules and isotope ratios were determined using a Costech elemental combustion system coupled to an isotope ratio mass spectrometer

through a Conflo-IV interface. For details please see Hannides et al. (2013).

Data Processing Description

BCO-DMO Processing:
- modified parameter names (replaced hyphens with underscores, replaced delta symbol with "d", changed "C:N" to "C_to_N");
- replaced blanks with "nd" (no data);
- added date-time field in ISO8601 format using original Date and Time columns.

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Data Files

File
zoop_C_and_N.csv (Comma Separated Values (.csv), 42.19 KB) MD5:ba6fa69356eccac56a52ee02dafb7a57 Primary data file for dataset ID 772776

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Related Publications

Hannides, C. C. S., Popp, B. N., Choy, C. A., & Drazen, J. C. (2013). Midwater zooplankton and suspended particle dynamics in the North Pacific Subtropical Gyre: A stable isotope perspective. Limnology and Oceanography, 58(6), 1931–1946. doi:10.4319/lo.2013.58.6.1931
Methods

Wiebe, P. H., K.H. Burt, S. H. Boyd, A. W. Morton (1976). A multiple opening/closing net and environment sensing system for sampling zooplankton. J. Mar. Res., 34, 313-326.
Methods

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Parameters

Parameter	Description	Units
Cruise	Cruise designation	unitless
R2R_Event	R2R event number	unitless
Latitude	Latitude in degrees and decimal minutes N	degrees
Longitude	Longitude in degrees and decimal minutes W	degrees
Date	Sampling date: YYYYMMDD (UTC)	unitless

Time	Sampling time: deployment of net HH:MM:SS (UTC)	unitless
ISO_DateTime_UTC	Date and time formatted to ISO8601 standard. Format: yyyy-mm-ddTHH:MM:SS.ss	unitless
MOCNESS_Tow	Shipboard MOCNESS tow designation	unitless
DayNight	Indicates day or night tow	unitless
MOCNESS_Net	MOCNESS net number (of 10 nets)	unitless
DepthInterval_max	maximum depth of sample	meters
DepthInterval_min	minimum depth of sample	meters
VolFilt	volume of water filtered	cubic meters
SizeFraction_min	minimum wet sieved size fraction	micrometers (um)
SizeFraction_max	maximum wet sieved size fraction	micrometers (um)
SampleWeight	weight of sample analyzed	milligrams (mg)
N	nitrogen content of sample	micrograms (ug)
d15N	nitrogen isotopic composition of sample	permil (‰) vs AIR
C	organic carbon content of sample	micrograms (ug)
d13C	carbon isotopic compostion of sample	per mil (‰) vs VPDB
C_to_N	C:N: carbon:nitrogen molar ratio	mol/mol

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Instruments

Dataset-specific Instrument Name	Costech Model 4010
Generic Instrument Name	Elemental Analyzer
Dataset-specific Description	Costech Model 4010 elemental combustion system
Generic Instrument Description	Instruments that quantify carbon, nitrogen and sometimes other elements by combusting the sample at very high temperature and assaying the resulting gaseous oxides. Usually used for samples including organic material.

Dataset-specific Instrument Name	Thermo-Finnigan Delta Plus XP
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Thermo-Finnigan Delta Plus XP isotope ratio mass spectrometer with Conflo IV interface.
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

Dataset-specific Instrument Name	MOCNESS
Generic Instrument Name	MOCNESS1
Dataset-specific Description	Multiple opening-closing net and environmental sensing system (MOCNESS) net with 1 m2 opening using 0.2 mm mesh plankton nets (see Wiebe et al., 1976).
Generic Instrument Description	The Multiple Opening/Closing Net and Environmental Sensing System or MOCNESS is a family of net systems based on the Tucker Trawl principle. The MOCNESS-1 carries nine 1-m2 nets usually of 335 micrometer mesh and is intended for use with the macrozooplankton. All nets are black to reduce contrast with the background. A motor/toggle release assembly is mounted on the top portion of the frame and stainless steel cables with swaged fittings are used to attach the net bar to the toggle release. A stepping motor in a pressure compensated case filled with oil turns the escapement crankshaft of the toggle release which sequentially releases the nets to an open then closed position on command from the surface. -- from the MOCNESS Operations Manual (1999 + 2003).

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Deployments

RR1813

Website	https://www.bco-dmo.org/deployment/772777
Platform	R/V Roger Revelle
Report	https://datadocs.bco-dmo.org/docs/EXPORTS/data_docs/RR1813_Cruise_Report.pdf
Start Date	2018-08-10
End Date	2018-09-12
Description	Additional cruise information is available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/RR1813

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Project Information

Collaborative Research: Isotopic Indicators for Mechanisms of Organic Matter Degradation in the Northeast Pacific (EXPORTS) (EXPORTS Isotopes)

Website: http://oceanexports.org/projects/project_id_0000_close.html

Coverage: Station Papa, Northeast Pacific

NSF Award Abstract:
The biological pump is largely responsible for the vertical transport of organic carbon from the surface to the ocean interior. However, only a small fraction of organic material produced in surface waters is sequestered in the deep ocean. The rest is consumed, or respired, by bacteria and larger organisms. The overarching goal of the proposed work is to characterize the relative influences of bacteria versus larger organisms on the degradation of organic material with depth. Guided by recent results from the subtropical Pacific, the investigators will use measurements of stable isotopes of nitrogen in different amino acids (compound-specific isotopic analysis of amino acids, known as AA-CSIA), along with measurements of the abundances of different forms of amino acids, and other parameters derived from these analyses to identify how the partitioning and flux of large and small particles are affected by different degradation processes. By improving the interpretive power of the AA-CSIA technique the investigators propose to determine: 1) the relative importance of microbial and zooplankton consumption on the efficiency of the biological carbon pump in the subarctic northeast Pacific, and 2) how much microbially-altered small particles fuel the metabolisms of mid-water zooplankton. This work capitalizes on an existing, comprehensive field program (NASA EXPORTS) specifically focused on building a predictive framework relating surface ocean properties to the vertical flux of organic carbon. The tremendous amount of data to be collected on all aspects of the biological pump as part of the EXPORTS program will aid the development and interpretation of the investigators' amino acid isotopic tool. Results will be broadly communicated via production and distribution of several episodes of Voice of the Sea, a local television program that will air in Hawaii and across many Pacific islands. Episodes also will be posted online and publicized through social media to the south Florida community. This project will support a Ph.D. student and an undergraduate student at University of Miami, which serves a 25% Hispanic population, and an M.S. student and an undergraduate student at University of Hawaii, which is a designated minority-serving institution.

The proposed work introduces a new geochemical framework to distinguish microbial versus zooplankton alteration of marine organic matter. Piloted on samples from the subtropical Pacific, this approach interrogates unamended sinking material directly, using amino acid compound-specific isotopic analysis (AA-CSIA) to determine the progressive, cumulative impact of microbial and zooplankton degradative pathways. The proposed work (1) will extend this interpretive framework to explicitly define end-member signatures such as fecal pellets and will apply this refined method to a study site in the subarctic northeast Pacific to (2) determine the vertical progression of degradative mechanisms in an oceanographic location with contrasting productivity and vertical length scales of flux attenuation and (3) determine whether microbially- degraded biomass is important for fueling midwater metazoans under contrasting carbon flux conditions. The proposed work will be conducted in collaboration with the NASA EXPORTS program at the Ocean Station Papa time-series site. Teaming with this program presents a unique opportunity to refine AA-CSIA interpretation in parallel with intensive data collection defining productivity, particle size distribution and flux, and numerous biological parameters. In comparing subtropical and subarctic Pacific locations, the proposed work will test how

differences in productivity and plankton community structure influence vertical patterns of consumption and alteration of phytodetritus by microbes and zooplankton, from surface to mesopelagic depths.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Program Information

EXport Processes in the Ocean from Remote Sensing (EXPORTS)

Website: http://oceanexports.org/

EXport Processes in the Ocean from Remote Sensing (EXPORTS) is a large-scale NASA-led field campaign that will provide critical information for quantifying the export and fate of upper ocean net primary production (NPP) using satellite observations and state of the art ocean technologies.

Ocean ecosystems play a critical role in the Earth’s carbon cycle and the quantification of their impacts for both present conditions and for predictions into the future remains one of the greatest challenges in oceanography. The goal of the EXport Processes in the Ocean from Remote Sensing (EXPORTS) Science Plan is to develop a predictive understanding of the export and fate of global ocean net primary production (NPP) and its implications for present and future climates. The achievement of this goal requires a quantification of the mechanisms that control the export of carbon from the euphotic zone as well as its fate in the underlying "twilight zone" where some fraction of exported carbon will be sequestered in the ocean’s interior on time scales of months to millennia. In particular, EXPORTS will advance satellite diagnostic and numerical prognostic models by comparing relationships among the ecological, biogeochemical and physical oceanographic processes that control carbon cycling across a range of ecosystem and carbon cycling states. EXPORTS will achieve this through a combination of ship and robotic field sampling, satellite remote sensing and numerical modeling. Through a coordinated, process-oriented approach, EXPORTS will foster new insights on ocean carbon cycling that maximizes its societal relevance through the achievement of U.S. and International research agency goals and will be a key step towards our understanding of the Earth as an integrated system.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1830016
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829425

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