

Sediment trap carbon, nitrogen, and isotope flux from the "SalpPOOP" cruise on R/V Tangaroa during October and November 2018

Website: <https://www.bco-dmo.org/dataset/813759>

Data Type: Cruise Results

Version: 1

Version Date: 2020-07-08

Project

» [Collaborative Research: Quantifying trophic roles and food web ecology of salp blooms of the Chatham Rise](#)
(Salp Food Web Ecology)

| Contributors | Affiliation | Role |
|------------------------------------|---|---------------------------|
| Stukel, Michael R. | Florida State University (FSU) | Principal Investigator |
| Decima, Moira | New Zealand National Institute of Water and Atmospheric Research (NIWA) | Co-Principal Investigator |
| Kelly, Thomas | Florida State University (FSU) | Co-Principal Investigator |
| Nodder, Scott | New Zealand National Institute of Water and Atmospheric Research (NIWA) | Co-Principal Investigator |
| Rauch, Shannon | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager |

Abstract

Sediment trap carbon, nitrogen, and isotope flux from the "SalpPOOP" cruise on R/V Tangaroa during October and November 2018.

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Coverage

Spatial Extent: N:-42.654 E:-179.7765 S:-45.54917 W:174.11167

Temporal Extent: 2018-10-24 - 2018-11-15

Methods & Sampling

Data comes from VERTEX-style, surface-tethered, drifting sediment trap deployments. Particle interceptor tubes were deployed on cross-pieces with 16 tubes attached. Tubes were deployed with a dense formaldehyde brine created by adding NaCl and formaldehyde to filtered seawater. After recovery, overlying seawater was removed from each cruise by gentle suction. Tubes were then gravity filtered through a 200-micron nitex mesh filter, and the 200-micron filters were carefully analyzed under a stereomicroscope and all metazoan

zooplankton "swimmers" were removed from the sample. Material remaining on the 200-micron filters (i.e., sinking material) was then imaged with a macrophotography rig and subsequently rinsed back into the original sample tube (i.e., re-combined with the <200-micron sinking material). Samples were then separated and filtered onto different types of filters for a suite of different analyses including: particulate organic carbon flux, particulate nitrogen flux, carbon and nitrogen isotopes, chlorophyll a and phaeopigment flux, microscopy, genetic analyses, and ²³⁴Th flux.

Samples for particulate organic carbon flux were vacuum filtered through pre-combusted GF/F filters at low pressure. Samples were then frozen at -80C and stored for the duration of the cruise. They were then dried out for shipping. On land they were acidified by fuming with HCl. Samples were then thoroughly dried and packed into pre-combusted tin cups. They were analyzed by isotope ratio mass spectrometer at the UC Davis Stable Isotope Facility for carbon, nitrogen, carbon isotopes, and nitrogen isotopes.

Data Processing Description

BCO-DMO Processing:

- converted latitude values from degrees South to degrees North;
- rounded lat and lon to 5 decimal places;
- added UTC date/time fields in ISO8601 format;
- renamed fields.

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Data Files

| File |
|---|
| C_and_N_isotopes.csv (Comma Separated Values (.csv), 5.11 KB) MD5:e5ca6386df4454f0a3069ba8c3d141ec Primary data file for dataset ID 813759 |

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Parameters

| Parameter | Description | Units |
|---------------------------|---|----------|
| Cruise | Cruise name | unitless |
| Cycle | Lagrangian experiment number | unitless |
| Date_Deployed | Date/time of deployment (New Zealand ST); format: MM/DD/YY hh:mm | unitless |
| Deployed_ISO_DateTime_UTC | Date/time of deployment (UTC) formatted to ISO8601 standard: YYYY-MM-DDThh:mmZ | unitless |
| Date_Recovered | Date/time of recovery (New Zealand ST); format: MM/DD/YY hh:mm | unitless |
| | | |

| | | |
|----------------------------|--|---|
| Recovered_ISO_DateTime_UTC | Date/time of recovery (UTC) formatted to ISO8601 standard: YYYY-MM-DDThh:mmZ | unitless |
| Duration | Duration of deployment | days |
| Deployment_Lat | Latitude of deployment (positive values = North) | degrees North |
| Deployment_Lon | Longitude of deployment (positive values = East) | degrees East |
| Recovery_Lat | Latitude of recovery (positive values = North) | degrees North |
| Recovery_Lon | Longitude of recovery (positive values = East) | degrees East |
| Depth | Depth of deployment | meters (m) |
| Corg | Particulate organic carbon flux | milligrams C per square meter per day (mg C m ⁻² d ⁻¹) |
| Corg_stdev | Standard deviation of organic carbon flux | milligrams C per square meter per day (mg C m ⁻² d ⁻¹) |
| Norg | Particulate nitrogen flux | milligrams N per square meter per day (mg N m ⁻² d ⁻¹) |
| Norg_stdev | Standard deviation of particulate nitrogen flux | milligrams N per square meter per day (mg N m ⁻² d ⁻¹) |
| Chl | Chlorophyll a | micrograms chl a per square meter per day (ug chl a m ⁻² d ⁻¹) |
| Chl_stdev | Standard deviation of chlorophyll a | micrograms chl a per square meter per day (ug chl a m ⁻² d ⁻¹) |
| Phaeo | Phaeo | micrograms chl a per square meter per day (ug chl a m ⁻² d ⁻¹) |
| Phaeo_stdev | Standard deviation of phaeo | micrograms chl a per square meter per day (ug chl a m ⁻² d ⁻¹) |
| d13C | d13C of sinking particles | per mil |
| d13C_stdev | Standard deviation of d13C | per mil |

| | | |
|------------------|--|---|
| d15N | d15N of sinking particles | per mil |
| d15N_stdev | Standard deviation of d15N | per mil |
| Salp_Pellet_Mass | Salp pellet mass | milligrams C per square meter per day (mgC m-2 d-1) |
| Mass_stdev | Standard deviation of salp pellet mass | milligrams C per square meter per day (mgC m-2 d-1) |

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Instruments

| | |
|---|--|
| Dataset-specific Instrument Name | macrophotography rig |
| Generic Instrument Name | Camera |
| Generic Instrument Description | All types of photographic equipment including stills, video, film and digital systems. |

| | |
|---|--|
| Dataset-specific Instrument Name | isotope ratio mass spectrometer |
| Generic Instrument Name | Isotope-ratio Mass Spectrometer |
| 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 | stereomicroscope |
| Generic Instrument Name | Microscope - Optical |
| Generic Instrument Description | Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope". |

| | |
|---|--|
| Dataset-specific Instrument Name | VERTEX-style, surface-tethered, drifting sediment trap |
| Generic Instrument Name | Sediment Trap |
| Generic Instrument Description | Sediment traps are specially designed containers deployed in the water column for periods of time to collect particles from the water column falling toward the sea floor. In general a sediment trap has a jar at the bottom to collect the sample and a broad funnel-shaped opening at the top with baffles to keep out very large objects and help prevent the funnel from clogging. This designation is used when the specific type of sediment trap was not specified by the contributing investigator. |

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Deployments

TAN1810

| | |
|-------------------|---|
| Website | https://www.bco-dmo.org/deployment/757070 |
| Platform | R/V Tangaroa |
| Start Date | 2018-10-23 |
| End Date | 2018-11-21 |

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Project Information

Collaborative Research: Quantifying trophic roles and food web ecology of salp blooms of the Chatham Rise (Salp Food Web Ecology)

Coverage: East of New Zealand, Chatham Rise area

NSF Award Abstract:

Salps are unique open-ocean animals that range in size from a few millimeters to greater than twenty centimeters, have a gelatinous (jelly-like) body, and can form long chains of many connected individuals. These oceanic organisms act as oceanic vacuum cleaners, having incredibly high feeding rates on phytoplankton and, unusual for consumers of their size, smaller bacteria-sized prey. This rapid feeding and the salps' tendency to form dense blooms, allows them move substantial amounts of prey carbon from the surface into the deep ocean, leading to carbon dioxide removal from the atmosphere. However, salps are often considered a trophic dead-end, rather than a link, in the food web due to the assumption that they themselves are not consumed, since their gelatinous bodies are less nutritious than co-occurring crustacean prey. Along with this, salp populations are hypothesized to be increasing due to climate change. This proposal addresses these questions: 1) Do salps compete primarily with crustaceans (as in the prevailing paradigm) or are they competitors of single-celled protists, which are the dominant grazers of small phytoplankton? 2) Do salp blooms increase the efficiency of food-web pathways from tiny phytoplankton to fisheries production in nutrient-poor ocean regions?

This project will support the interdisciplinary education of a graduate student who will learn modeling and laboratory techniques in the fields of biological and chemical oceanography and stimulate international collaborations between scientists in the United States and New Zealand. Additionally, several Education and Outreach initiatives are planned, including development of a week-long immersive high school class in biological oceanography, and education modules that will serve the "scientists-in-the schools" program in Tallahassee, FL.

It is commonly assumed that salps are a trophic sink. However, this idea was developed before the discovery that protists (rather than crustaceans) are the dominant grazers in the open ocean and was biased by the difficulty of recognizing gelatinous salps in fish guts. More recent studies show that salps are found in guts of a diverse group of fish and seabirds and are a readily available prey source when crustacean abundance is low. This proposal seeks to quantify food web flows through contrasting salp-dominated and salp-absent water parcels near the Chatham Rise off western New Zealand where salp blooms are a predictable phenomenon. The proposal will leverage previously obtained data on salp abundance, bulk grazing impact, and biogeochemical significance during Lagrangian experiments conducted by New Zealand-based collaborators. The proposal will determine 1) taxon- and size-specific phytoplankton growth rate measurements, 2) taxon- and size-specific protozoan and salp grazing rate measurements, 3) compound specific isotopic analysis of the amino acids of mesozooplankton to quantify the trophic position of salps, hyperiid amphipods, and other crustaceans, 4) sediment traps to quantify zooplankton carcass sinking rates, and 5) linear inverse ecosystem modeling syntheses. Secondary production and trophic flows from this well-constrained ecosystem model will be compared to crustacean-dominated and microbial loop-dominated ecosystems in similarly characterized regions (California Current, Costa Rica Dome, and Gulf of Mexico).

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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Funding

| Funding Source | Award |
|--|-----------------------------|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1756465 |
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1756610 |

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