Salps & Hyperiid Amphipods CSIA-AA

Website: https://www.bco-dmo.org/dataset/908493
Version: 1
Version Date: 2023-09-15

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

Contributors	Affiliation	Role
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Abstract
This dataset presents compound specific isotopic analysis (15N) of the amino acids of salps and hyperiid amphipods collected near the Chatham Rise on the SalpPOOP (TAN1810) cruise. The cruise focus was on studying the impact of salp blooms and marine biogeochemistry and food webs. Stable isotopes were measured to investigate trophic positions of salps and hyperiid amphipods. Samples were collected by bongo tows and individual organisms were picked from the samples and frozen. On land their guts were dissected out. Bodies were run for stable isotope analyses and (in some cases) guts were also analyzed separately. Samples were analyzed for CSIA-AA at the UC Davis stable isotope facility.

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Related Publications

Décima, M., Stukel, M. R., Nodder, S. D., Gutiérrez-Rodríguez, A., Selph, K. E., dos Santos, A. L., Safi, K., Kelly, T. B., Deans, F., Morales, S. E., Baltar, F., Latasa, M., Gorbunov, M. Y., & Pinkerton, M. (2023). Salp blooms drive strong increases in passive carbon export in the Southern Ocean. Nature Communications, 14(1). https://doi.org/10.1038/s41467-022-35204-6
Methods

Fender, C. K., Décima, M., Gutiérrez-Rodríguez, A., Selph, K. E., Yingling, N., & Stukel, M. R. (2023). Prey size spectra and predator to prey size ratios of southern ocean salps. Marine Biology, 170(4). https://doi.org/10.1007/s00227-023-04187-3
Results

Stukel, M. R., Décima, M., & Landry, M. R. (2022). Quantifying biological carbon pump pathways with a data-constrained mechanistic model ensemble approach. Biogeosciences, 19(15), 3595–3624. https://doi.org/10.5194/bg-19-3595-2022
Results

Stukel, M.R., Décima, M., Selph, K.E. and Gutiérrez-Rodríguez, A. (2021), Size-specific grazing and competitive interactions between large salps and protistan grazers. Limnol Oceanogr, 66: 2521-2534. https://doi.org/10.1002/lno.11770
Results

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Related Datasets

IsRelatedTo

Stukel, M., Decima, M. (2023) **Bulk stable isotopes (d13C, d15N) of size-fractionated zooplankton collected near the Chatham Rise on the R/V Tangaroa SalpPOOP (TAN1810) cruise in Oct. and Nov. of 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-09-15 http://lod.bco-dmo.org/id/dataset/908460 [view at BCO-DMO]
Relationship Description: Data from analyses performed on the same bongo tow samples.

Stukel, M., Decima, M. (2023) **Compound specific isotopic analysis (15N) of the amino acids of size-fractionated zooplankton collected near the Chatham Rise on the R/V Tangaroa SalpPOOP (TAN1810) cruise in Oct. and Nov. of 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-09-15 http://lod.bco-dmo.org/id/dataset/908476 [view at BCO-DMO]
Relationship Description: Data from analyses performed on the same bongo tow samples.

Stukel, M., Decima, M. (2023) **Salp & Hyperiid Amphipod bulk isotopes.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-09-15 http://lod.bco-dmo.org/id/dataset/908486 [view at BCO-DMO]
Relationship Description: Data from analyses performed on the same bongo tow samples.

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Parameters

Parameters for this dataset have not yet been identified

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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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