Plankton size spectra compiled from projects CCE LTER, HOT, CRD FluZIE, BLOOFINZ-GoM, and SalpPOOP in the California Current Ecosystem, North Pacific subtropical gyre, Costa Rica Dome, Gulf of Mexico, and Southern Ocean subtropical front from 2004-2018

Website: https://www.bco-dmo.org/dataset/924554
Data Type: Cruise Results
Version: 1
Version Date: 2024-10-17

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

Contributors	Affiliation	Role
Decima, Moira	New Zealand National Institute of Water and Atmospheric Research (NIWA)	Principal Investigator
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Abstract
This dataset includes compiled plankton size spectra from 5 different projects: California Current Ecosystem Long-Term Ecological Research (CCE LTER) process cruises, Hawaii Ocean Time-series (HOT) cruises, Costa Rica Dome Fluxes Zinc and Iron Experiments (CRD FluZIE), Gulf of Mexico Bluefin Larvae in Oligotrophic Ocean Foodwebs, Investigations of Nutrients to Zooplankton (BLOOFINZ-GoM), and Salp Particle expOrt and Ocean Production (SalpPOOP) spanning 2004 to 2018. Biomass was determined using three different methods: flow cytometry for less than 2-micron cells, epifluorescence microscopy for 2 - 200 um cells, and size-fractionated zooplankton net tows for >200-um organisms.

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Coverage

Location: California Current Ecosystem, North Pacific subtropical gyre, Costa Rica Dome, Gulf of Mexico,

and Southern Ocean subtropical front
Spatial Extent: **N**:9.00146 **E**:179.5464167 **S**:-42.67441667 **W**:-120.62
Temporal Extent: 2004-06-16 - 2018-11-17

Dataset Description

The published paper associated with this dataset is: Relationships Between Plankton Size Spectra, Net Primary Production, and the Biological Carbon Pump.

Stukel, M. R., Décima, M., Kelly, T. B., Landry, M. R., Nodder, S. D., Ohman, M. D., Selph, K. E., & Yingling, N. (2024). Relationships Between Plankton Size Spectra, Net Primary Production, and the Biological Carbon Pump. Global Biogeochemical Cycles, 38(4). Portico. https://doi.org/10.1029/2023gb007994

Methods & Sampling

In situ data were compiled from five field programs: CCE LTER, CRD FluZIE, BLOOFINZ-GoM, SalpPOOP, and HOT (Fig.1 illustrates their locations, Stukel et al, 2024). Datasets from the California Current Ecosystem Long-Term Ecological Research (CCE LTER) Program are derived from eight cruises spanning multiple seasons and years (2006-2016) in the southern sector of the California Current System. This region includes a productivity gradient stretching from a coastal upwelling biome to an oligotrophic offshore domain (Ohman et al. 2013). Results from the Costa Rica Dome (CRD) are derived from the CRD FLUxes and ZInc Experiments (FLUZIE) cruise in an open-ocean upwelling region of the Eastern Tropical Pacific in July 2010 (Landry et al. 2016). The Gulf of Mexico (GoM) dataset was collected on two cruises of the Bluefin Larvae in Oligotrophic Ocean Foodwebs, Investigations of Nutrients to Zooplankton (BLOOFINZ-GoM) program in May 2017 and May 2018 that focused on the oligotrophic deepwater spawning grounds of Atlantic Bluefin Tuna (Gerard et al. 2022). The Salp Particle expOrt and Oceanic Production (SalpPOOP) Expedition investigated the Southern Ocean region near the Subtropical Front and sampled waters of frontal, subtropical and subantarctic origin (Décima et al. 2023). All of these programs utilized quasi-Lagrangian sampling schemes with Lagrangian experiments that lasted from ~2.25 to ~7.75 days in duration (typical duration = 4.25 days) allowing repeated sampling of plankton communities from bacteria to microzooplankton within distinct water parcels (Landry 2009). Samples from the North Pacific Subtropical Gyre were collected by the Hawaii Ocean Time-series program, which samples the time-series station ALOHA over ~3 days near Hawai'i with ~monthly frequency (Church et al. 2013; Karl and Church 2014). Brief descriptions of field methods are given below. Additional details are available in original publications as cited.

Microbes – Samples for microbial biomass were collected by Niskin bottles at 6 – 8 depths spanning the euphotic zone. Picoplankton abundances (heterotrophic bacteria, *Prochlorococcus*, *Synechococcus*, and picoeukaryotes) were determined by flow cytometry and converted to biomass using carbon cell-1 conversion factors for their respective regions as determined by the original investigators (Selph et al. 2016; Selph et al. 2021). While conversion factors did vary slightly between regions for some groups, they were generally quite similar. Nano- and microplankton biomasses were determined by epifluorescence microscopy with proflavin (protein) and DAPI (nucleic acid) staining (Taylor et al. 2012; Taylor et al. 2016). 50-mL samples were filtered through 0.8-µm filters to quantify ~2- to 12-µm cells (imaged at 60X or 63X magnification) and 450-mL samples were filtered through 8.0-µm filters to quantify >12-µm cells (imaged at 20X magnification). Cells were manually outlined based on proflavin fluorescence and carbon biomass was determined from biovolume using equations in Menden-Deuer and Lessard (2000). We note that while this approach will accurately quantify most nano- and micro-sized protists (autotrophic, heterotrophic, and mixotrophic), some fragile taxa (e.g., some ciliates) may not survive preservation and hence could be undercounted.

Mesozooplankton – Mesozooplankton were collected with either a ring net or a bongo net with 202-µm mesh, equipped with a General Oceanics flow meter and a depth sensor. Double oblique net tows (to a maximum depth between 100 and 210 m) were conducted twice daily (paired day and night tows) during Lagrangian experiments. Typically three day/night pairs of tows were conducted for each occupation of Station ALOHA in the subtropical North Pacific. After recovery, samples were split using a Folsom splitter and sequentially filtered through nested sieves (5 mm, 2 mm, 1 mm, 0.5 mm, 0.2 mm). Sieves were rinsed onto pre-weighed, 47-mm diameter, 0.2-mm mesh filters, rinsed with isotonic ammonium formate, and dried for storage (Décima et al. 2016; Landry and Swalethorp 2021). On land, samples were weighed to determine dry mass. Filters from most projects were then subsampled for C/N analyses by elemental analyzer thus providing carbon values for all 5 size classes. For cruises without direct carbon measurements available, dry weight was converted to carbon using equations in Landry et al. (2001). On the SalpPOOP cruise, >5-mm salps were removed from the >5-mm sample and individually sized (for all other cruises, no organisms were removed from the large size fraction and it was treated identically to other size fractions). We estimated salp biomass using allometric relationships in Iguchi et al. (2004) and included it to the >5-mm sample.

Data Processing Description

Data treatment We compiled flow cytometry, epifluorescence microscopy, and zooplankton net tow data to compute size spectra. Our choice of size bins was dictated by the size bins reported by each field program, which typically followed approximately octave (base 2) scaling. However, we were forced to make some distinct choices: I) Cell size was not reported for flow cytometry data, hence we assumed that the size bin for picoplankton was 0.5 – 2.0 µm. This is likely a reasonable range that encompasses most biomass for populations including heterotrophic bacteria, *Prochlorococcus*, *Synechococcus*, and picoeukaryotes. II) The largest size class of microplankton reported from epifluorescence microscopy data was typically either >20 µm or >40 µm. We assumed that this size class extends to an upper limit of 200-µm cells, because many common protists (e.g., diatoms, dinoflagellates, and ciliates) seen in these samples can reach this size. However, we acknowledge that epifluorescence microscopy likely misses many <200-µm metazoan zooplankton (e.g., appendicularians and copepod nauplii that are likely common in all study regions) as well as fragile rhizarians (that are known to be common and contribute to export in the CCE region, Gutierrez-Rodriguez et al. 2019). Our estimate of the biomass of this size class is thus likely an underestimate. III) The upper limit of the >5-mm mesozooplankton size class is also unknown. We consistently treated this size class as encompassing organisms from 5 – 50 mm because 50 mm was a reasonable estimate for the upper limit of organisms typically collected in this size class. However, functionally this class includes all >5 mm taxa that were present and did not avoid the net. For instance, the “5 – 50 mm” size class often included ~100 mm salps in the SalpPOOP study and 50 – 200 mm pyrosome colonies in the CCE. While it might have been most appropriate to remove all >50 mm organisms from this size class, this was not possible as the proportion of the biomass contained in >50 mm organisms was not included in datasets. Furthermore, since our goal was to estimate the slope of the plankton size spectrum, the exclusion of all large mesozooplankton would bias our results. We thus consider it most appropriate to sum all >5-mm taxa into a single size class and use a typical maximum size (50 mm) as the assumed upper limit of the bin.

We determined the average euphotic zone biomass in each size bin. For microbial populations, we vertically-integrated the biomass profiles from 6 – 8 depths through the euphotic zone. We then divided by the depth of the deepest sample (which was always near the base of the euphotic zone) to determine an average volumetric carbon biomass (mmol C m-3). Multiple profiles per Lagrangian experiment were averaged. For mesozooplankton size classes, volumetric carbon biomass was determined by dividing the net-tow biomass by the volume filtered (determined using a flow meter attached to the net frame). For each Lagrangian experiment, we computed daytime and nighttime average biomasses and then took the average of these two values to get a day-night mean estimate of volumetric carbon biomass. Individual microbial size classes thus typically incorporated ~24 distinct measurements (6 depths × 4 days for one Lagrangian experiment), while zooplankton size classes typically incorporated 8 distinct measurements (~2 day-night tows per day × 4 days). We believe this results in very robust estimates of the NBSS for these programs. For the station ALOHA samples, results are typically derived from a single profile of microbial measurements (Pasulka et al. 2013) and three day-night pairs of zooplankton net tows and hence should be assumed to have greater uncertainty.

BCO-DMO Processing Description

Loaded the submitted Excel spreadsheet Supp Table 1_BCO-DMO.xlsx into the BCO-DMO data processor Laminar.

The original Date column contains a mixed format of data and time where some entries don’t have a time and some entries have an abbreviated month rather than a number.

Split the date and time values into 2 new columns to reformat. Not all entries have a time value and the submitter requested the Time column be removed and only the Date values be kept.

Inside the new Date column, converted 3 letter month abbreviations in the dates to numeric values.

The year is a two digit year with a known century of 2000, so the two digit year was prefixed with ‘20’ to create a 4 digit year.

Reformatted new dates into the ISO format of %Y-%m-%d.

Removed the original date column.

Renamed the column ‘Cruise / Cycle ID’ to ‘Cruise_ID_or_Cycle_ID’.

Renamed the fields using the BCO-DMO naming convention of no spaces or punctuation marks and with no numbers at the front of a parameter name. Spaces were replaced with underscores.

Saved the final table to 924554_v1_plankton_biomass.csv.

Checked the bacteria names in the submitted text matched the World Register of Marine Species (WoRMS) website.

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Data Files

File
924554_v1_plankton_size_spectra.csv (Comma Separated Values (.csv), 76.46 KB) MD5:9d02f597dd94ca2589f6dbd25bca9acc Primary data file for dataset ID 924554, version 1

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Related Publications

Church, M. J., Lomas, M. W., & Muller-Karger, F. (2013). Sea change: Charting the course for biogeochemical ocean time-series research in a new millennium. Deep Sea Research Part II: Topical Studies in Oceanography, 93, 2–15. https://doi.org/10.1016/j.dsr2.2013.01.035
Methods

Décima, M., Landry, M. R., Stukel, M. R., Lopez-Lopez, L., & Krause, J. W. (2015). Mesozooplankton biomass and grazing in the Costa Rica Dome: amplifying variability through the plankton food web. Journal of Plankton Research, 38(2), 317–330. https://doi.org/10.1093/plankt/fbv091
Methods

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

Gerard, T., Lamkin, J. T., Kelly, T. B., Knapp, A. N., Laiz-Carrión, R., Malca, E., Selph, K. E., Shiroza, A., Shropshire, T. A., Stukel, M. R., Swalethorp, R., Yingling, N., & Landry, M. R. (2022). Bluefin Larvae in Oligotrophic Ocean Foodwebs, investigations of nutrients to zooplankton: overview of the BLOOFINZ-Gulf of Mexico program. Journal of Plankton Research, 44(5), 600–617. https://doi.org/10.1093/plankt/fbac038
Methods

Gutierrez-Rodriguez, A., Stukel, M. R., Lopes dos Santos, A., Biard, T., Scharek, R., Vaulot, D., Landry, M. R., & Not, F. (2018). High contribution of Rhizaria (Radiolaria) to vertical export in the California Current Ecosystem revealed by DNA metabarcoding. The ISME Journal, 13(4), 964–976. https://doi.org/10.1038/s41396-018-0322-7
Methods

Iguchi, N. (2004). Metabolism and elemental composition of aggregate and solitary forms of Salpa thompsoni (Tunicata: Thaliacea) in waters off the Antarctic Peninsula during austral summer 1999. Journal of Plankton Research, 26(9), 1025–1037. https://doi.org/10.1093/plankt/fbh093
Methods

Karl, D. M., & Church, M. J. (2014). Microbial oceanography and the Hawaii Ocean Time-series programme.

Nature Reviews Microbiology, 12(10), 699–713. https://doi.org/10.1038/nrmicro3333
Methods

Landry, M. R. (2009). Grazing processes and secondary production in the Arabian Sea: A simple food web synthesis with measurement constraints. Geophysical Monograph Series, 133–146. https://doi.org/10.1029/2008gm000781 https://doi.org/10.1029/2008GM000781
Methods

Landry, M. R., & Swalethorp, R. (2021). Mesozooplankton biomass, grazing and trophic structure in the bluefin tuna spawning area of the oceanic Gulf of Mexico. Journal of Plankton Research, 44(5), 677–691. https://doi.org/10.1093/plankt/fbab008
Methods

Landry, M. R., Al-Mutairi, H., Selph, K. E., Christensen, S., & Nunnery, S. (2001). Seasonal patterns of mesozooplankton abundance and biomass at Station ALOHA. Deep Sea Research Part II: Topical Studies in Oceanography, 48(8–9), 2037–2061. https://doi.org/10.1016/s0967-0645(00)00172-7 https://doi.org/10.1016/S0967-0645(00)00172-7
Methods

Landry, M. R., De Verneil, A., Goes, J. I., & Moffett, J. W. (2015). Plankton dynamics and biogeochemical fluxes in the Costa Rica Dome: introduction to the CRD Flux and Zinc Experiments. Journal of Plankton Research, 38(2), 167–182. https://doi.org/10.1093/plankt/fbv103
Methods

Menden-Deuer, S., & Lessard, E. J. (2000). Carbon to volume relationships for dinoflagellates, diatoms, and other protist plankton. Limnology and Oceanography, 45(3), 569–579. doi:10.4319/lo.2000.45.3.0569
Methods

Ohman, M., Barbeau, K., Franks, P., Goericke, R., Landry, M., & Miller, A. (2013). Ecological Transitions in a Coastal Upwelling Ecosystem. Oceanography, 26(3), 210–219. https://doi.org/10.5670/oceanog.2013.65
Methods

Pasulka, A. L., Landry, M. R., Taniguchi, D. A. A., Taylor, A. G., & Church, M. J. (2013). Temporal dynamics of phytoplankton and heterotrophic protists at station ALOHA. Deep Sea Research Part II: Topical Studies in Oceanography, 93, 44–57. https://doi.org/10.1016/j.dsr2.2013.01.007
Methods

Selph, K. E., Landry, M. R., Taylor, A. G., Gutiérrez-Rodríguez, A., Stukel, M. R., Wokuluk, J., & Pasulka, A. (2015). Phytoplankton production and taxon-specific growth rates in the Costa Rica Dome. Journal of Plankton Research, 38(2), 199–215. https://doi.org/10.1093/plankt/fbv063
Methods

Selph, K.E., Swalethorp, R., Stukel, M.R., Kelly, T.B., Knapp, A.N., Fleming, K., Hernandez, T., & Landry, M.R. (2021). Phytoplankton community composition and biomass in the oligotrophic Gulf of Mexico. Journal of Plankton Research. doi:10.1093/plankt/fbab006
Methods

Stukel, M. R., Décima, M., Kelly, T. B., Landry, M. R., Nodder, S. D., Ohman, M. D., Selph, K. E., & Yingling, N. (2024). Relationships Between Plankton Size Spectra, Net Primary Production, and the Biological Carbon Pump. Global Biogeochemical Cycles, 38(4). Portico. https://doi.org/10.1029/2023gb007994 https://doi.org/10.1029/2023GB007994
Results

Taylor, A. G., Goericke, R., Landry, M. R., Selph, K. E., Wick, D. A., & Roadman, M. J. (2012). Sharp gradients in phytoplankton community structure across a frontal zone in the California Current Ecosystem. Journal of Plankton Research, 34(9), 778–789. https://doi.org/10.1093/plankt/fbs036
Methods

Taylor, A. G., Landry, M. R., Freibott, A., Selph, K. E., & Gutiérrez-Rodríguez, A. (2015). Patterns of microbial community biomass, composition and HPLC diagnostic pigments in the Costa Rica upwelling dome. Journal of Plankton Research, 38(2), 183–198. doi:10.1093/plankt/fbv086
Methods

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Parameters

Parameter	Description	Units
Project	Name of the project from which data was collected	unitless
Deployment	Deployment	unitless
Cruise_ID_or_Cycle_ID	Identifier for Lagrangian experiment (or HOT cruise) from which data was collected	unitless
Lat	Sampling location latitude, south is negative	decimal degrees
Lon	Sampling location longitude, west is negative	decimal degrees
Date	Midpoint date of the Lagrangian experiment on which the collections were made	unitless
Size_Bin_Lower_Limit	Lower limit of the size bin	microns (um)
Size_Bin_Upper_Limit	Upper limit of the size bin	microns (um)
Biomass	Carbon biomass in the size bin	milligrams of carbon per meter cubed (mg/m^3)

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Instruments

Dataset-specific Instrument Name	Bongo Net
Generic Instrument Name	Bongo Net
Dataset-specific Description	Bongo net with 202-µm mesh
Generic Instrument Description	A Bongo Net consists of paired plankton nets, typically with a 60 cm diameter mouth opening and varying mesh sizes, 10 to 1000 micron. The Bongo Frame was designed by the National Marine Fisheries Service for use in the MARMAP program. It consists of two cylindrical collars connected with a yoke so that replicate samples are collected at the same time. Variations in models are designed for either vertical hauls (OI-2500 = NMFS Pairovet-Style, MARMAP Bongo, CalVET) or both oblique and vertical hauls (Aquatic Research). The OI-1200 has an opening and closing mechanism that allows discrete "known-depth" sampling. This model is large enough to filter water at the rate of 47.5 m3/minute when towing at a speed of two knots. More information: Ocean Instruments, Aquatic Research, Sea-Gear

Dataset-specific Instrument Name	Flow Cytometer
Generic Instrument Name	Flow Cytometer
Dataset-specific Description	There were multiple different flow cytometers used. Typically a seagoing flow cytometer was used for picoeukaryotes and a higher resolution flow cytometer was used for bacteria. The flow cytometers varied between studies. Data users can go to the cited publications (or original flow cytometry datasets) to find out more.
Generic Instrument Description	Flow cytometers (FC or FCM) are automated instruments that quantitate properties of single cells, one cell at a time. They can measure cell size, cell granularity, the amounts of cell components such as total DNA, newly synthesized DNA, gene expression as the amount messenger RNA for a particular gene, amounts of specific surface receptors, amounts of intracellular proteins, or transient signalling events in living cells. (from: http://www.bio.umass.edu/micro/immunology/facs542/facswhat.htm)

Dataset-specific Instrument Name	Flow Meter
Generic Instrument Name	Flow Meter
Dataset-specific Description	General Oceanics flow meter
Generic Instrument Description	General term for a sensor that quantifies the rate at which fluids (e.g. water or air) pass through sensor packages, instruments, or sampling devices. A flow meter may be mechanical, optical, electromagnetic, etc.

Dataset-specific Instrument Name	Fluorescence Microscope
Generic Instrument Name	Fluorescence Microscope
Dataset-specific Description	A ZeissAxioVert200M microscope was used for most of the microscopy, and an Olympus BX51 microscope was used for samples from the SalpPOOP cruise (TAN1810).
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of fluorescence and phosphorescence instead of, or in addition to, reflection and absorption of visible light. Includes conventional and inverted instruments.

Dataset-specific Instrument Name	Folsom splitter
Generic Instrument Name	Folsom Plankton Splitter
Generic Instrument Description	A device for sub-sampling of plankton and ichthyoplankton samples by splitting, developed by Dr. Folsom of the Scripps Institute of Oceanography. Ideally suited for splitting plankton samples with minimal debris. A measured volume of plankton sample is placed in the undivided section of the drum. This is rotated 120 degrees to divide the stirred sample with a separating blade. Standard Methods suggests splitting until a subsample of 200-500 individuals is obtained.

Dataset-specific Instrument Name	Niskin bottle
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.

Dataset-specific Instrument Name	Depth sensor
Generic Instrument Name	Pressure Sensor
Dataset-specific Description	Different depth sensors were used on different cruises
Generic Instrument Description	A pressure sensor is a device used to measure absolute, differential, or gauge pressures. It is used only when detailed instrument documentation is not available.

Dataset-specific Instrument Name	Ring net
Generic Instrument Name	Ring Net
Dataset-specific Description	Ring net with 202-µm mesh
Generic Instrument Description	A Ring Net is a generic plankton net, made by attaching a net of any mesh size to a metal ring of any diameter. There are 1 meter, .75 meter, .25 meter and .5 meter nets that are used regularly. The most common zooplankton ring net is 1 meter in diameter and of mesh size .333mm, also known as a 'meter net' (see Meter Net).

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Deployments

HOT_cruises

Website	https://www.bco-dmo.org/deployment/58879
Platform	Multiple Vessels
Report	http://hahana.soest.hawaii.edu/hot/
Start Date	1988-10-31
Description	Since October 1988, the Hawaii Ocean Time-series (HOT) program has investigated temporal dynamics in biology, physics, and chemistry at Stn. ALOHA (22°45' N, 158°W), a deep ocean field site in the oligotrophic North Pacific Subtropical Gyre (NPSG). HOT conducts near monthly ship-based sampling and makes continuous observations from moored instruments to document and study NPSG climate and ecosystem variability over semi-diurnal to decadal time scales.

MV1008

Website	https://www.bco-dmo.org/deployment/58834
Platform	R/V Melville
Report	http://dmoserv3.whoi.edu/data_docs/CRD_FLUZiE/CRUISE_REPORT_Melville1008.pdf
Start Date	2010-06-22
End Date	2010-07-25
Description	Research on the cruise was aimed at acquiring a better understanding of plankton dynamics, carbon and nutrient fluxes, and potential trace element limitation in the Costa Rica Dome region of the eastern tropical Pacific. The specific science objectives were: 1) to assess grazing and trace metal/nutrient controls on primary production and phytoplankton standing stocks; 2) to quantify carbon and elemental fluxes and export rates from the euphotic zone; and 3) to measure microbial population, processes, stable isotope abundances associated with the OMZ and nitrite maxima. Operations included: 4-day sediment trap deployments, daily process experiments conducted on satellite-tracked drifters, CTD and trace-metal rosette sampling, shipboard grow-out experiments, net sampling for zooplankton biomass and grazing assessments, and MOCNESS stratified tows to 1000 m. BCO-DMO Note: March 2013 (CLC): The original CTD profile data (85 casts) have been submitted by R2R to NODC. Jim Moffett (USC) was a participant on this cruise and is interested in getting a copy of the full set of CTD cast data (deep and shallow casts). He plans to contact SIO ODF group or Mike Landry (Chief Scientist). Original cruise data are available from the NSF R2R data catalog.

NF1704

Website	https://www.bco-dmo.org/deployment/834975
Platform	R/V Nancy Foster
Report	https://datadocs.bco-dmo.org/docs/302/BLOOFINZ_IO/data_docs/cruise_reports/NF1704_CRUISE_REPORT.pdf
Start Date	2017-05-07
End Date	2017-06-02
Description	R/V Nancy Foster cruise in May 2017 as part of a NOAA RESTORE project (aka: BLOOFINZ-GoM).

NF1802

Website	https://www.bco-dmo.org/deployment/834976
Platform	R/V Nancy Foster
Report	https://datadocs.bco-dmo.org/docs/302/BLOOFINZ_IO/data_docs/cruise_reports/NF1802_CRUISE_REPORT.pdf
Start Date	2018-04-27
End Date	2018-05-20
Description	R/V Nancy Foster cruise in May 2018 as part of a NOAA RESTORE project (aka: BLOOFINZ-GoM).

TAN1810

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

KN182-14

Website	https://www.bco-dmo.org/deployment/933936
Platform	R/V Knorr
Start Date	2006-05-08
End Date	2006-06-07
Description	CCE-P0605, Process Cruise #1 Project: Long-Term Ecological Research (LTER): Nonlinear Transitions in the California Current Coastal Pelagic Ecosystem Coordinates for this deployment can be found in R2R: https://www.rvdata.us/search/cruise/KN182-14

TN204

Website	https://www.bco-dmo.org/deployment/933938
Platform	R/V Thomas G. Thompson
Start Date	2007-04-02
End Date	2007-04-21
Description	CCE-P0704, Process Cruise #2 Project: Long-Term Ecological Research (LTER): Nonlinear Transitions in the California Current Coastal Pelagic Ecosystem Coordinates for this deployment can be found in R2R: https://www.rvdata.us/search/cruise/TN204

BOLT01MV

Website	https://www.bco-dmo.org/deployment/933940
Platform	R/V Melville
Start Date	2008-09-30
End Date	2008-10-29
Description	CCE-P0810, Process Cruise #3 Project: BOLT Expedition, Leg 1/Long-Term Ecological Research (LTER): Nonlinear Transitions in the California Current Coastal Pelagic Ecosystem See more information from R2R: https://www.rvdata.us/search/cruise/BOLT01MV

MV1210

Website	https://www.bco-dmo.org/deployment/933942
Platform	R/V Melville
Start Date	2012-07-28
End Date	2012-08-26
Description	CCE-P1208, Process Cruise #5 Project: Ecological Transitions in the California Current Ecosystem: CCE-LTER Phase II See more information from R2R: https://www.rvdata.us/search/cruise/MV1210

SKQ201605S

Website	https://www.bco-dmo.org/deployment/733308
Platform	R/V Sikuliaq
Start Date	2017-04-17
End Date	2016-05-12
Description	CCE-P1604, Process Cruise #7 Project: RAPID: Responses of the California Current Ecosystem to El Nino 2015-16 Coordinates for this deployment can be found in R2R: http://www.rvdata.us/catalog/SKQ201605S

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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).

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Funding

Funding Source	Award
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