CTD (temperature, salinity and fluorescence) from bi-weekly vertical profiles in Resurrection Bay, AK from January to March of 2023

Website: https://www.bco-dmo.org/dataset/954156
Data Type: Other Field Results
Version: 1
Version Date: 2025-02-21

Project
» Collaborative Research: Zooplankton restarts in a high-latitude marine ecosystem: species-specific recruitment and development in early spring (Zooplankton recruitment)

Contributors	Affiliation	Role
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Abstract
The Gulf of Alaska is a highly seasonal environment that is characterized by an order-of-magnitude increase in copepod biomass in the photic zone between winter and spring. The study focused on copepod recruitment to characterize species-specific naupliar production. Concurrent environmental monitoring included approximately bi-weekly vertical profiles of temperature, salinity and fluorescence were recorded at an established station (RES2.5) in Resurrection Bay, AK. Day-trips aboard the R/V Nanuq were conducted approximately bi-weekly in Resurrection Bay, AK during January to March, 2023.

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Coverage

Location: Resurrection Bay, Gulf of Alaska, sub-arctic Pacific
Spatial Extent: **Lat**:60.025 **Lon**:-149.3583
Temporal Extent: 2023-01-05 - 2023-03-24

Methods & Sampling

Samples were collected in Resurrection Bay within the inner basin at RES2.5 (60° 1.5' N, 149° 21.5' W; 298 m deep) at approximately biweekly intervals aboard the R/V Nanuq between January 5th and March 24th, 2023. Collection and sample processing are described in detail in Block (2024). Vertical profiles of water temperature, salinity, and fluorescence were measured from 280 m to the surface using a CTD (SBE25 SeaLogger) and WetLabs chlorophyll α fluorometer mounted on an SBE55 rosette with six 4-L Niskin Bottles. Water was collected at discrete depths (surface, 10, 20, 30, 40, 50, 150, and 280 m) for characterization of the

phytoplankton and microzooplankton community. Two casts were required to collect all water samples.

Data Processing Description

CTD data were processed using the SBEDataProcessing-Win32 program. Data processing included filtering, alignment, thermal mass correction, loop edits, and derivation of depth, salinity, and density variables. Data were then averaged at 1 dbar intervals.

Data processing was completed according to the SBE Advanced Data Processing Module (accessed from https://www.seabird.com/training-materials-download).
Manuals and guides referenced:
* Module 9 Advanced Data Processing.pdf
* Module12_AdvancedDataProcessing.pdf
* Manual_SBEDataProcessing_7.16a.pdf

BCO-DMO Processing Description

* Sheet 1 of submitted file "NaupProj2023_combinedCTDs_BCODMO_v2.csv" was imported into the BCO-DMO data system for this dataset. Table will appear as Data File: 954156_v1_ctd.csv (along with other download format options).
* start timestamp with timezone added in UTC time (ISO 8601 format) from local US/Alaska date and times provided.
* date formats changed to ISO format.

Problem Description

No known problems associated with the CTD dataset

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Data Files

File
954156_v1_ctd.csv (Comma Separated Values (.csv), 286.40 KB) MD5:cf8d8094c2fd89f27908052122f8576c Primary data file for dataset ID 954156, version 1

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Related Publications

Block, L. N. (2024). Evaluating Species-Specific Naupliar Recruitment During the Winter-to-Spring Transition in the Northern Gulf of Alaska Using Molecular Tools (Master's thesis, University of Hawai'i at Manoa). Available from https://hdl.handle.net/10125/108679
Results

Sea-Bird Scientific (n.d.) Training Materials for Download. Accessed from https://www.seabird.com/training-materials-download
Methods

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Related Datasets

IsRelatedTo

Block, L. N., Lenz, P. H. (2025) **Chlorophyll a and flow cytometry data from bi-weekly vertical profiles in Resurrection Bay, AK from January to March of 2023 from bi-weekly vertical profiles in Resurrection Bay, AK from January to March of 2023.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-02-21 doi:10.26008/1912/bco-dmo.954173.1 [view at BCO-DMO]
Relationship Description: Related data collected as part of the same study published in Block, L. N. (2024, https://hdl.handle.net/10125/108679).

Block, L. N., Lenz, P. H. (2025) **Microplankton microscopy and biovolume analysis from Lugol's samples collected in Resurrection Bay, AK from January to March of 2023.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-02-21 doi:10.26008/1912/bco-dmo.954189.1 [view at BCO-DMO]
Relationship Description: Related data collected as part of the same study published in Block, L. N. (2024, https://hdl.handle.net/10125/108679).

Block, L. N., Lenz, P. H. (2025) **Molecular identification of genetic variants of Neocalanus flemingeri in the Gulf of Alaska from samples collected from 2015 to 2023.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-02-21 doi:10.26008/1912/bco-dmo.954181.1 [view at BCO-DMO]
Relationship Description: Related data collected as part of the same study published in Block, L. N. (2024, https://hdl.handle.net/10125/108679).

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Parameters

Parameter	Description	Units
cruise	Cruise ID	unitless
station	Station ID	unitless
date_local	Date (Local time, Alaska Standard Time) in ISO 8601 format yyyy-mm-dd	unitless
start_time_local	Time (Local time, Alaska Standard Time) formatted as hh:mm and 24-hour clock	unitless
start_DateTime_UTC	Start DateTime with timezone (in UTC, ISO 8601 format)	unitless
julianday	Intiger Day of Year (1=Jan 1st)	unitless
lat	Station latitude, north is positive	decimal degrees
lon	Station latitude, west is negative	decimal degrees
binned_pressure	Pressure (dbar) binned at 1 dbar intervals	Decibars (dbar)

temperature	Water column temperature	Celsius (C)
conductivity	Water column conductivity	Siemens per meter (S/m)
turbidity	Water column turbidity	Nephelometric Turbidity Unit (NTU)
fluorescence	Water column chlorophyll-a fluorescence	Milligrams per cubic meter (mg/m^3)
time_elapsed	Time elapsed from instrument initialization	Seconds (s)
scan	Scan count	unitless
depth	Depth of CTD in water column.	Meters (m)
salinity	Water column salinity	Practical Salinity Units (PSU)
sigmaT	Water column density	Kilograms per cubic meter (kg/m^3)
descent_rate	Descent rate of instrument package	Meters per second (m/s)
nbin	Number of scans averaged over 1 db bins.	unitless

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Instruments

Dataset-specific Instrument Name	WetLabs chlorophyll α fluorometer
Generic Instrument Name	Fluorometer
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

Dataset-specific Instrument Name	
Generic Instrument Name	Niskin bottle
Dataset-specific Description	SBE55 rosette with 6 4-L Niskin Bottles
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	
Generic Instrument Name	Sea-Bird SBE 25 Sealogger CTD
Generic Instrument Description	The Sea-Bird SBE 25 SEALOGGER CTD is battery powered and is typically used to record data in memory, eliminating the need for a large vessel, electrical sea cable, and on-board computer. All SBE 25s can also operate in real-time, transmitting data via an opto-isolated RS-232 serial port. Temperature and conductivity are measured by the SBE 3F Temperature sensor and SBE 4 Conductivity sensor (same as those used on the premium SBE 9plus CTD). The SBE 25 also includes the SBE 5P (plastic) or 5T (titanium) Submersible Pump and TC Duct. The pump-controlled, TC-ducted flow configuration significantly reduces salinity spiking caused by ship heave, and in calm waters allows slower descent rates for improved resolution of water column features. Pressure is measured by the modular SBE 29 Temperature Compensated Strain-Gauge Pressure sensor (available in eight depth ranges to suit the operating depth requirement). The SBE 25's modular design makes it easy to configure in the field for a wide range of auxiliary sensors, including optional dissolved oxygen (SBE 43), pH (SBE 18 or SBE 27), fluorescence, transmissivity, PAR, and optical backscatter sensors. More information from Sea-Bird Electronics: http:www.seabird.com.

Dataset-specific Instrument Name	Sea-Bird ECO-NTU Turbidity Sensor
Generic Instrument Name	Turbidity Meter
Generic Instrument Description	A turbidity meter measures the clarity of a water sample. A beam of light is shown through a water sample. The turbidity, or its converse clarity, is read on a numerical scale. Turbidity determined by this technique is referred to as the nephelometric method from the root meaning "cloudiness". This word is used to form the name of the unit of turbidity, the NTU (Nephelometric Turbidity Unit). The meter reading cannot be used to compare the turbidity of different water samples unless the instrument is calibrated. Description from: http://www.gvsu.edu/wri/education/instructor-s-manual-turbidity-10.htm (One example is the Orion AQ4500 Turbidimeter)

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Project Information

Collaborative Research: Zooplankton restarts in a high-latitude marine ecosystem: species-specific recruitment and development in early spring (Zooplankton recruitment)

Coverage: Sub-arctic marine ecosystem, Gulf of Alaska

NSF Award Abstract
Global climate change and associated extreme weather events are increasingly impacting marine communities at all trophic levels and leading to shifts in the timing of life history events. This project is investigating the annual restart of the spring zooplankton community in the Gulf of Alaska in order to determine the timing of species-specific recruitment and growth. Zooplankton are small pelagic animals that are a critical link between microalgae and protozoans and higher levels in the food web including economically important fishes, birds and marine mammals. While their abundances and species composition have been documented over part of the annual cycle between late spring and fall, this project focuses on winter and early spring. The project integrates traditional methods with modern molecular approaches to characterize the diversity, development, feeding and physiology of zooplankton, especially the early developmental stages of copepods (small crustaceans). The goal is to determine which species are there, how many are present and where they are in the water column, and to reveal indicators of their health. Broader impacts include research training for three graduate students and at least four undergraduates in biological oceanography and physiological ecology. Outreach activities are focusing on broadening the public's understanding of plankton ecology. An illustrated zooplankton guide for the Gulf of Alaska and plankton module for school teachers and students is being produced in collaboration with the Center for Alaskan Coastal Studies. Other plans include sponsorship of nature-drawing workshops on zooplankton and the production of an Art & Science traveling exhibit.

This project is tracking zooplankton population abundances, species composition and developmental stages through the spring restart in a high-latitude fjord in the northern Gulf of Alaska. While the entire zooplankton community is being characterized, the main focus is on the difficult-to-assess early developmental stages of copepods, which dominate the late spring biomass in the region. Three central hypotheses guide the research: 1) high abundances of copepod nauplii are present before any measurable increases in food in surface waters; 2) species diversity increases between winter and spring, with nauplii from large lipid-rich capital-breeding species appearing first, followed by those from income- and hybrid-strategy species and finally nauplii that emerge from dormant eggs; 3) prior to the appearance of food resources, nauplii from capital-breeding species conserve resources by delaying development and entering a state of dormancy in the second and third naupliar stages. The project entails intensive depth-stratified field sampling to characterize the wild community, in combination with laboratory experiments on nauplii to determine their responsiveness to food. The prey are being characterized by measuring chlorophyll a, dietary and prey community DNA sequencing and flow cytometry to establish diversity and abundances. Size-fractionated zooplankton samples are being analyzed using microscopy and community DNA sequencing to ascertain species diversity, developmental stage distribution and abundances. Feeding activity is being measured using dietary DNA sequencing of nauplii followed by comparisons with the prey field. Dormancy in nauplii is being determined by differential gene expression of target genes (RT-qPCR) and high-throughput sequencing of mRNA of individuals (transcriptomics) and community samples (meta-transcriptomics). Short-term and long-term effects of food availability on dormancy, development and growth are being quantified in laboratory experiments. Broader impacts are focused on training of students in interdisciplinary research and state-of-art techniques, and public outreach to introduce plankton ecology to broader audiences.

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Funding

Funding Source	Award
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OCE-2222376
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OCE-2222592
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OCE-2222558

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