

Sea urchin frequency and diameters as surveyed in Sitka Sound and Torch Bay, Alaska

Website: <https://www.bco-dmo.org/dataset/842621>

Data Type: Other Field Results

Version: 1

Version Date: 2021-02-26

Project

» [CAREER: Energy fluxes and community stability in a dynamic, high-latitude kelp ecosystem](#) (High latitude kelp dynamics)

Contributors	Affiliation	Role
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Abstract

This dataset is part of a suite of studies conducted in Southeast Alaska to determine how benthic communities respond to variable environmental conditions. In an effort to determine how temperature and carbonate chemistry combine to affect primary consumer bioenergetics and research the indirect effects of ocean acidification and warming on primary consumers, the sea urchin population was investigated. The frequency of occurrence and test diameter was recorded for sea urchins at Sitka Sound and Torch Bay, Alaska from 1988 to 2019.

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Related Datasets](#)
- [Parameters](#)
- [Instruments](#)
- [Project Information](#)
- [Funding](#)

Coverage

Spatial Extent: N:58.9729 E:-135.293 S:58.3279 W:-136.817

Temporal Extent: 1988-07-25 - 2019-08-07

Methods & Sampling

The frequency of occurrence and size (test diameter) was recorded for sea urchins at 19 sites in Sitka Sound and Torch Bay, Alaska from 1988 to 2019. At each site, twenty quadrats were placed at random locations along a transect line. Sea urchins were measured in either all 20 quadrats or when 200 sea urchins had been sized, whichever came first.

Sampling and analytical procedures: Sizing the sea urchin was done by measuring the test diameter with calipers. Data represents combined observations and measurements collected from multiple groups using the same approach in the field.

GPS coordinates are only relevant for data collected after 1988

Data Processing Description

BCO-DMO processing description:

- Converted dates to ISO date format (yyyy-mm-dd)
- Replaced 'not recorded' with 'nd' (BCO-DMO's default missing data identifier)
- Adjusted field/parameter names to comply with database requirements
- Added a conventional header with dataset name, PI names, version date
- Corrected columns with inadvertently shifted data

[[table of contents](#) | [back to top](#)]

Data Files

File
urchin_diameter_frequency_data.csv (Comma Separated Values (.csv), 70.97 KB) MD5:4bcc85fa20c485afe1a9029c894e29f9
Primary data file for dataset ID 842621

[[table of contents](#) | [back to top](#)]

Related Datasets

IsSupplementedBy

Kroeker, K., Estes, J. A., Raimondi, P. T. (2021) **GPS coordinates for survey sites in Sitka Sound and Torch Bay, Alaska from 2003 to 2019 (High latitude kelp dynamics project)**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-06-01 doi:10.26008/1912/bco-dmo.852763.1 [[view at BCO-DMO](#)]

IsRelatedTo

Kroeker, K., Raimondi, P. T., Estes, J. A. (2021) **Benthic community cover and counts in Sitka Sound and Torch Bay, Alaska from 1988 to 2019**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-02-27 doi:10.26008/1912/bco-dmo.842632.1 [[view at BCO-DMO](#)]

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
ISO_Date	Date of survey (yyyy-mm-dd)	unitless
Area	Location in Southeast Alaska	unitless
Site	Site of survey	unitless
Latitude	Latitude	decimal degrees
Longitude	Longitude	decimal degrees
Depth	Depth surveyed (in feet)	feet
Species	Species of Sea Urchin surveyed	unitless
Test_Diameter	Diameter of sea urchin test	millimeters (mm)
Frequency	Number of individuals of size in quadrat	individuals
Quadrat_Area	Area of quadrat	meters squared (m ²)

[[table of contents](#) | [back to top](#)]

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	calipers
Generic Instrument Description	A caliper (or "pair of calipers") is a device used to measure the distance between two opposite sides of an object. Many types of calipers permit reading out a measurement on a ruled scale, a dial, or a digital display.

Dataset-specific Instrument Name	hand-held GPS
Generic Instrument Name	Global Positioning System Receiver
Dataset-specific Description	GPS coordinates were take using a handheld GPS unit (2018 data with Garmin Legend, other years unspecified)
Generic Instrument Description	The Global Positioning System (GPS) is a U.S. space-based radionavigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis. The U.S. Air Force develops, maintains, and operates the space and control segments of the NAVSTAR GPS transmitter system. Ships use a variety of receivers (e.g. Trimble and Ashtech) to interpret the GPS signal and determine accurate latitude and longitude.

[[table of contents](#) | [back to top](#)]

Project Information

CAREER: Energy fluxes and community stability in a dynamic, high-latitude kelp ecosystem (High latitude kelp dynamics)

Coverage: SE Alaskan coastal waters

NSF Award Abstract:

High latitude kelp forests support a wealth of ecologically and economically important species, buffer coastlines from high-energy storms, and play a critical role in the marine carbon cycle by sequestering and storing large amounts of carbon. Understanding how energy fluxes and consumer-resource interactions vary in these kelp communities is critical for defining robust management strategies that help maintain these valuable ecosystem services. In this integrated research and education program, the project team will investigate how consumer populations respond to variability in temperature, carbonate chemistry and resource quality to influence the food webs and ecosystem stability of kelp forests. A comprehensive suite of studies conducted at the northern range limit for giant kelp (*Macrocystis pyrifera*) in SE Alaska will examine how kelp communities respond to variable environmental conditions arising from seasonal variability and changing ocean temperature and acidification conditions. As part of this project, undergraduate and high school students will receive comprehensive training through (1) an immersive field-based class in Sitka Sound, Alaska, (2) intensive, mentored research internships, and (3) experiential training in science communication and public outreach that will include a variety of opportunities to disseminate research findings through podcasts, public lectures and radio broadcasts.

Consumer-resource interactions structure food webs and govern ecosystem stability, yet our understanding of how these important interactions may change under future climatic conditions is hampered by the complexity of direct and indirect effects of multiple stressors within and between trophic levels. For example, environmentally mediated changes in nutritional quality and chemical deterrence of primary producers have the potential to alter herbivory rates and energy fluxes between primary producers and consumers, with implications for ecosystem stability. Moreover, the effects of global change on primary producers are likely to depend on other limiting resources, such as light and nutrients, which vary seasonally in dynamic, temperate and high latitude ecosystems. In marine ecosystems at high latitude, climate models predict that ocean acidification will be most pronounced during the winter months, when primary production is limited by light. This project is built around the hypothesis that there could be a mismatch in the energetic demands of primary consumers caused by warming and ocean acidification and resource availability and quality during winter months, with cascading effects on trophic structure and ecosystem stability in the future. Through complementary lab and field experiments, the project team will determine 1) how temperature and carbonate chemistry combine to affect primary consumer bioenergetics across a diversity of species and 2) the indirect effects of ocean acidification and warming on primary consumers via environmentally mediated changes in the availability, nutritional quality and palatability of primary producers across seasons. Using the data from the laboratory and field experiments, the project team will 3) construct a model of the emergent effects of warming and ocean acidification on trophic structure and ecosystem stability in seasonally dynamic, high latitude environments.

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.

[[table of contents](#) | [back to top](#)]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1752600
David and Lucile Packard Foundation (Packard)	Packard - Kelp Ecosystem Dynamics
Alfred P. Sloan Foundation (Sloan)	Sloan - Kelp Ecosystem Dynamics

[[table of contents](#) | [back to top](#)]