

Benthic community cover and counts in Sitka Sound and Torch Bay, Alaska from 1988 to 2019

Website: <https://www.bco-dmo.org/dataset/842632>

Data Type: Other Field Results

Version: 1

Version Date: 2021-02-27

Project

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

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Abstract

This dataset is part of a suite of studies conducted in Southeast Alaska to determine how kelp communities respond to variable environmental conditions arising from seasonal variability as well as changing ocean temperature and acidification conditions. The benthic communities in Sitka Sound and Torch Bay, Alaska were investigated at 19 sites from 1988 through 2019. Twenty quadrats were placed at random locations along a transect line, then benthic species were counted or the percent cover of the species was estimated in each quadrat.

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Coverage

Spatial Extent: N:58.3279 E:-135.293 S:56.9638 W:-136.817

Temporal Extent: 1988-05-08 - 2019-08-07

Acquisition Description

Observations were made during May through September during six years ranging from 1988 through

2019. At each site twenty quadrats were placed at random locations along a transect line. Benthic species were either counted or the cover of the species was estimated in each quadrat. The species recorded were algae and kelps including giant kelp, bull kelp, sieve kelp, ribbon kelp, acid kelp, ribbed kelp, suction-cup kelp, and others.

In 2019, only *Agarum fimbriatum* was counted, but prior to that year, the sieve kelp that was counted included all *Agarum* species.

Small kelp is defined as kelp too small to distinguish the genus, typically less than ten centimeters (<10cm)

GPS coordinates are only relevant for data collected after 1988

Processing Description

BCO-DMO processing description:

- Converted dates to ISO data format (yyyy-mm-dd)
- Adjusted field/parameter names to comply with database requirements
- Missing data identifier of 'nd' used (BCO-DMO's default)
- Added a conventional header with dataset name, PI names, version date

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Related Datasets

IsRelatedTo

Kroeker, K., Raimondi, P. T., Estes, J. A. (2021) **Sea urchin frequency and diameters as surveyed in Sitka Sound and Torch Bay, Alaska**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-02-26 <http://lod.bco-dmo.org/id/dataset/842621> [[view at BCO-DMO](#)]

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](#)]

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Parameters

Parameter	Description	Units
ISO_Date	Date of survey (yyyy-mm-dd)	unitless
Area	Location of survey	unitless
Site	Site surveyed at each location	unitless
Latitude	Latitude	decimal degrees
Longitude	Longitude (west is negative)	decimal degrees
Depth	Depth of survey in feet	feet
Replicate	Replicate quadrat	unitless
Encrusting_Coralline	Percent cover of encrusting coralline algae	percent (%)
Cymathaere	Percent cover of Cymathaere triplicata	percent (%)
Codium	Percent cover of Codium green algae species	percent (%)
Desmarestia	Percent cover of Desmarestia brown algae species	percent (%)
Alaria_marginata	Count of ribbon kelp Alaria Marginata species	count
Alaria_spp	Count of Alaria species	count
Laminaria_cover	Percent cover of Laminaria species	percent (%)
Laminaria_spp	Count of Laminaria species	count
Laminaria_yezoensis	Count of Laminaria yezoensis	count
Pleurophycus	Count of Pleurophycus species	count
Nereocystis_luetkeana	Count of bull kelp Nereocystis luetkeana	count
Macrocystis_integrifolia_pyr	Count of Macrocystis integrifolia (aka Macrocystis pyrifera)	count
Costaria	Count of Costaria costata	count
Agarum	Count of Agarum species (except 2019)	count
Agarum_fi_2019	Count of Agarum fimbriatum in the year 2019	count
Small_kelp	Count of small kelp (typically less than 10cm)	count
Fleshy_red	Percent cover of fleshy red algae	percent (%)
Suspension_feeder	Percent cover of suspension feeding invertebrates	percent (%)
Total_kelp	Count of total kelp	count

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Instruments

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.

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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.

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Funding

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

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