

Kelp and urchin mean densities from Aleutian habitat surveys 2008-2010 (Kelp Forest Apex Predator Collapse project)

Website: <https://www.bco-dmo.org/dataset/712940>

Data Type: Other Field Results

Version: 1

Version Date: 2017-07-24

Project

» [Collaborative Research: Kelp forest interaction webs in the Aleutian Archipelago: patterns and mechanism of change following the collapse of an apex predator](#) (Kelp Forest Apex Predator Collapse)

Contributors	Affiliation	Role
Konar, Brenda	University of Alaska Fairbanks (UAF)	Principal Investigator
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Abstract

Kelp and urchin mean densities from Aleutian habitat surveys 2008-2010 (Kelp Forest Apex Predator Collapse project). Data are reported as means. The kelp means come from twenty 0.25m^2 quadrats placed at each site.

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Coverage

Spatial Extent: N:54.167867 E:-167.644102 S:51.406833 W:173.59089

Temporal Extent: 2008-06-02 - 2010-07-10

Dataset Description

Data are reported as means. The kelp means come from twenty 0.25m^2 quadrats placed at each site. The urchin means either come from twenty quadrats or fewer if 200 urchins were counted first (i.e., if 200 urchins were counted in two quadrats, then the mean only comes from these two quadrats).

Methods & Sampling

These data come from dive surveys. Depths are typically around 20 or 40 ft in rocky substrates. We randomly place twenty 0.25m^2 quadrats at each site and count and identify kelp stipes. A second diver does the same for sea urchins. If 200 urchins are counted in fewer than twenty quadrats, then we quantify fewer quadrats.

Data Processing Description

These data were stored in an access database.

BCO-DMO Processing Notes:

Added conventional header with dataset name, PI name, version date.
Modified parameter names to conform with BCO-DMO naming conventions.
Re-formatted date from dd-MON-YY to yyyyymmdd.
Replaced data values of "." (period) with nd (no data).

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Data Files

File
kelp_density.csv (Comma Separated Values (.csv), 29.00 KB) MD5:0f181514116094717e7e44960c6d4492
Primary data file for dataset ID 712940

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Parameters

Parameter	Description	Units
Island	name of the island where observations were taken	unitless
Latitude	Latitude coordinate where the sample was collected; South is negative.	decimal degrees
Longitude	Longitude coordinate where the sample was collected; West is negative.	decimal degrees
Date	date the observations were taken	yyyyymmdd
Site	numerical identifier for the site at each island	unitless
Depth	depth of the water column where the observations were taken	feet
Sea_Urchins	mean density of sea urchins	sea urchins per 0.25 square meters ($\backslash 0.25m^2$)
Eualaria_fistulosa	mean density of eualaria fistulosa	eualaria fistulosa per 0.25 square meters ($\backslash 0.25m^2$)
Laminaria_spp	mean density of Laminaria spp.	Laminaria spp. per 0.25 square meters ($\backslash 0.25m^2$)
Laminaria_yezoensis	mean density of Laminaria yezoensis	Laminaria yezoensis per 0.25 square meters ($\backslash 0.25m^2$)
Laminaria_longipes	mean density of Laminaria longipes	Laminaria longipes per 0.25 square meters ($\backslash 0.25m^2$)
Agarum_spp	mean density of Agarum spp.	Agarum spp. per 0.25 square meters ($\backslash 0.25m^2$)
Thalassiophyllum_sp	mean density of Thalassiophyllum sp.	Thalassiophyllum sp. per 0.25 square meters ($\backslash 0.25m^2$)
Cymatherea_triplicata	mean density of Cymatherea triplicata	Cymatherea triplicata per 0.25 square meters ($\backslash 0.25m^2$)

Instruments

Dataset-specific Instrument Name	scuba diver surveys
Generic Instrument Name	Diving Mask and Snorkel
Dataset-specific Description	These are from scuba diver surveys.
Generic Instrument Description	A diving mask (also half mask, dive mask or scuba mask) is an item of diving equipment that allows underwater divers, including, scuba divers, free-divers, and snorkelers to see clearly underwater. Snorkel: A breathing apparatus for swimmers and surface divers that allows swimming or continuous use of a face mask without lifting the head to breathe, consisting of a tube that curves out of the mouth and extends above the surface of the water.

Dataset-specific Instrument Name	scuba
Generic Instrument Name	Self-Contained Underwater Breathing Apparatus
Dataset-specific Description	These data come from dive surveys.
Generic Instrument Description	The self-contained underwater breathing apparatus or scuba diving system is the result of technological developments and innovations that began almost 300 years ago. Scuba diving is the most extensively used system for breathing underwater by recreational divers throughout the world and in various forms is also widely used to perform underwater work for military, scientific, and commercial purposes. Reference: http://oceanexplorer.noaa.gov/technology/diving/diving.html

Deployments

Aleutian_kelp_forest_surveys_2008-2010

Website	https://www.bco-dmo.org/deployment/712948
Platform	Aleutian Islands
Start Date	2008-06-02
End Date	2010-07-10
Description	Dive surveys in the Aleutian Islands, Alaska.

Website	https://www.bco-dmo.org/deployment/713030
Platform	R/V Thomas G. Thompson
Start Date	2008-05-18
End Date	2008-06-24

PS0914

Website	https://www.bco-dmo.org/deployment/713034
Platform	R/V Point Sur
Start Date	2009-06-16
End Date	2009-07-03
Description	Project: Kelp Forest Interaction Webs in the Aleutian Archipelago

PS1011

Website	https://www.bco-dmo.org/deployment/713035
Platform	R/V Point Sur
Start Date	2010-06-24
End Date	2010-07-17
Description	Project: Kelp Forest Interaction Webs in the Aleutian Archipelago

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Project Information

Collaborative Research: Kelp forest interaction webs in the Aleutian Archipelago: patterns and mechanism of change following the collapse of an apex predator (Kelp Forest Apex Predator Collapse)

Coverage: Pacific coast (Alaska to Baja California). Aleutian Archipelago

NSF abstract:

Research on sea otters and kelp forest ecosystems conducted over the past 35 years provides one of the better known examples of top-down forcing by a large vertebrate predator. These studies have shown that 1) sea otters indirectly maintain kelp forests by limiting herbivorous sea urchins, and 2) this trophic cascade has strong indirect effects on a number of other species and ecosystem processes. These insights were obtained largely through the comparison of islands in the Aleutian archipelago with and without sea otters, an opportunity created by the spatially asynchronous population recovery of sea otters following their decimation by the Pacific maritime fur trade.

In the course of more than 35 years of studies, these researchers have obtained an extensive amount of data on sea otter populations, kelp forest communities, and an array of associated marine wildlife from numerous Aleutian Islands with and without sea otters. Sea otter populations have since collapsed and the species is now ecologically extinct across the entire region. In this study, Drs. Konar, Edwards and Estes will combine the multi-decadal database with this extinction event to chronicle the patterns and mechanisms of spatial and temporal change in distributions and abundances of sea urchins and fleshy macroalgae (kelps and other species). They will do this by revisiting 20 islands for which they have long-term data and re-censusing the historical kelp forest monitoring sites for the abundance and population structure of sea urchins, and for the abundance and species composition of kelps and other fleshy macroalgae. In combination, these data will

provide an account of the degree to which the otter-urchin kelp trophic cascade has changed with the collapse of sea otters across the Aleutian archipelago.

The available information indicates that kelp forests collapsed very rapidly following the sea otter decline, and that this rapid shift was facilitated by the upward migration of sea urchins from deep water as opposed to in situ recruitment and growth. This group of marine scientists will test this idea by measuring various temperature- and nutrient sensitive isotopic patterns along the growth increment of sea urchin spines of animals collected from shallow and deep water. Similar to a depth refuge for urchins, studies from other areas have suggested that macroalgae may have a spatial refuge from urchin grazing in shallow waters or amongst very dense algal stands. They will explore macroalgal spatial refuges by using data collected during the re-censusing of the kelp forest monitoring sites and by extending our surveys to shallower waters and isolated kelp beds.

This research is an opportunity to rigorously explore and document the influences of a large vertebrate predator on the interaction web dynamics of its associated ecosystem. The intellectual merit of this project emphasizes the special character of oceanic islands and the Arctic for the study of near-shore ecosystem structure and processes.

Broader impacts of this project include benefits to society, teaching, and training. The project will be very newsworthy because it will describe the current status of a rapidly declining marine mammal and will document changes that have occurred due to fluctuations in the abundance of this species over the last 20+ years. Training and educational opportunities will be offered to graduate students from three different universities. The project will involve the University of Alaska Fairbanks, University of California Santa Cruz, and San Diego State University.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0647635

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