Oxygen measurements from kelp forests and urchin barrens on the Aleutian Islands, Alaska from R/V Oceanus cruises OC1606A and OC1707A during 2016-2017

Website: https://www.bco-dmo.org/dataset/755658
Data Type: Cruise Results, Other Field Results
Version: 1
Version Date: 2019-02-12

Project
» Collaborative Research: Changes in ecosystem production and benthic biodiversity following the widespread loss of an ecosystem engineer (Kelp Forest Ecosystem Engineer Loss)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **N**:53.38962 **E**:-179.30663 **S**:51.41008 **W**:177.60144
Temporal Extent: 2016-06-17 - 2017-07-22

Dataset Description

Estimates of benthic primary production and respiration in kelp forests and urchin barrens in the Aleutian Archipelago, Alaska (Attu, Nizki, Kiska, Atka, Adak, Chuginadak, Tanaga, Amchitka, Yunaska, Unmak, and Unalaska).

Methods & Sampling

We deployed 3-5 benthic chambers in each of three habitats (kelp forests, urchin barrens, and transition zones) at each of 10 islands in the Aleutian Archipelago. Each chamber was equipped with a data logger for dissolved oxygen (PME Minidot) and light (Odyssey PAR) and were left on the benthos for 36 hours.

Data were collected each minute while deployed. Data are given for each chamber in each habitat at each island.

Refer to list below for the habitat type each sensor was place in on each island.

Attu:
Kelp forest: S1, S2, S3, S10.

Urchin Barren: S4, S5, S6.
Transition: S7, S8, S9, S11.

Nizki:
Kelp forest: S1, S2, S3, S11.
Urchin Barren: S4, S5, S6, S13.
Transition: S7, S8, S9, S10.

Kiska:
Kelp forest: S1, S2, S3, S11.
Urchin Barren: S4, S5, S6, S13.
Transition: S7, S8, S9, S10.

Amchitka:
Kelp forest: S1, S2, S3, S11.
Urchin Barren: S4, S5, S6.
Transition: S7, S8, S9, S10.

Tanaga:
Kelp forest: S5, S6, S7, S8.
Urchin Barren: S9, S10, S11, S12.
Transition: S1, S2, S3, S4.

Adak:
Kelp forest: S9, S10, S11, S12.
Urchin Barren: S1, S2, S3, S4.
Transition: S5, S6, S7, S8.

Atka:
Kelp forest: S1, S2, S3, S11.
Urchin Barren: S7, S8, S9, S13.
Transition: S4, S5, S6, S10.

Yunaska:
Kelp forest: S1, S2, S3.
Urchin Barren: S4, S5, S6, S11.
Transition: S7, S9, S10.

Chuginadak:
Kelp forest: S9, S10, S11, S12.
Urchin Barren: S1, S2, S3, S4, S13, S14.
Transition: S5, S6, S7, S8.

Umnak:
Kelp forest: S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S13, S15.

Unalaska:
Kelp forest: S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15.

Data Processing Description

We used MS Excel and R-Studio to summarize and QA the data.

BCO-DMO Processing:
- modified parameter names (replaced spaces with underscores);
- re-formatted date to yyyy-mm-dd;
- re-formatted time to HH:MM;
- filled empty cells with nd;
- inserted latitude and longitude for each site.

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Data Files

File
O2.csv (Comma Separated Values (.csv), 3.52 MB) MD5:d3b2bbc0b93fc8180753cac6c1300107 Primary data file for dataset ID 755658

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Parameters

Parameter	Description	Units
Site	Island name	unitless
lat	Latitude of measurement; positive values = North	decimal degrees
lon	Longitude of measurement; positive values = East	decimal degrees
Date	Date of measurement; format: yyyy-mm-dd	unitless
Alaska_Standard_Time	Time of deployment (Alaskan standard time); 24-hr clock; format: HH:MM	unitless
S1	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S2	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S3	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S4	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S5	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S6	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S7	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S8	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S9	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S10	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S11	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S12	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S13	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S14	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
S15	Oxygen measurement (DO); refer to metadata for habitat type at each deployment	milligrams per liter (mg/L)
Time_24_hr	Chuginadak only; format: HH:MM	unitless
Alaska_Standard_Time_S1_S3	The sensors' internal clocks for the S1, S2, and S3 sensors. Recorded at Umnak only; format: HH:MM.	unitless
Alaska_Standard_Time_S4_S15	The sensors' internal clocks for the S4-S15 sensors. Recorded at Umnak only; format: HH:MM.	unitless

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Instruments

Dataset-specific Instrument Name	PME Minidot Oxygen loggers
Generic Instrument Name	Oxygen Sensor
Generic Instrument Description	An electronic device that measures the proportion of oxygen (O2) in the gas or liquid being analyzed

Dataset-specific Instrument Name	Odyssey PAR Logger
Generic Instrument Name	Photosynthetically Available Radiation Sensor
Generic Instrument Description	A PAR sensor measures photosynthetically available (or active) radiation. The sensor measures photon flux density (photons per second per square meter) within the visible wavelength range (typically 400 to 700 nanometers). PAR gives an indication of the total energy available to plants for photosynthesis. This instrument name is used when specific type, make and model are not known.

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Deployments

OC1606A

Website	https://www.bco-dmo.org/deployment/727190
Platform	R/V Oceanus
Start Date	2016-06-17
End Date	2016-07-02
Description	Project: Changes in Ecosystem Production and Benthic Biodiversity

OC1707A

Website	https://www.bco-dmo.org/deployment/729428
Platform	R/V Oceanus
Start Date	2017-07-18
End Date	2017-07-25
Description	Project: Changes in Ecosystem Production and Benthic Biodiversity

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Project Information

Collaborative Research: Changes in ecosystem production and benthic biodiversity following the widespread loss of an ecosystem engineer (Kelp Forest Ecosystem Engineer Loss)

Website: http://sdsukelp.weebly.com/blog

Coverage: Aleutian Islands Alaska (Attu Island to Unalaska)

NSF abstract:

In many ecosystems the presence of a single dominant species can modify the physical conditions of the environment and alter patterns of biodiversity, nutrient cycling, and primary production. Losses of these "ecosystem engineers" can have profound impacts to how ecosystems function. Coastal kelps provide excellent examples of organisms whose structure modifies the physical characteristics of their habitats (light, nutrients, water motion) and supports enhanced biodiversity. The kelp forests in the coastal waters of the Aleutian Archipelago have suffered large-scale declines over the past several decades. This project will examine how these losses impact patterns of ecosystem production and biodiversity using a combination of techniques ranging from in situ benthic chambers and shipboard incubations to remote sensing using satellite imagery. The results will provide an understanding of how such events may impact this and other ecosystems. This project will support graduate students and will introduce the public to the Aleutian ecosystems in a series of videos. The investigators will also work with a San Diego high school teacher to integrate project findings into classroom activities, and they expect to involve a teacher in their field program.

The investigators will ask two highly integrated questions: 1) How do the widespread losses of kelp forests impact benthic productivity across the Aleutian Archipelago? 2) How do the widespread losses of kelp forests impact benthic biodiversity and community structure across the archipelago? To address these, the investigators will estimate changes to productivity at ten islands where they have historic data on seaweed community composition and estimates of kelp canopy cover. They will use in situ benthic chambers placed in both kelp forests and urchin barrens to measure plot-scale patterns of net ecosystem productivity (NEP), and shipboard incubations to examine net primary productivity (NPP) for the dominant macroalgae. Data for individual species rates of NPP will be scaled by their biomass and combined with in situ plot-scale benthic chamber experiments of whole communities to estimate NEP at the islands visited. These estimates will be scaled up to calculate NEP across the entire archipelago by first extrapolating results from the study sites to entire islands, and then across the archipelago. They will also estimate broad-scale patterns in production by characterizing water column irradiances across the archipelago and modeling NPP using species-level relationships between irradiance and photosynthesis. Coupling these with estimates of water column irradiance and community respiration will allow modeling of NEP across this region. Benthic biodiversity will be assessed using diver surveys and shipboard benthic trawls. Following these activities, satellite remote sensing of the kelp canopies dating back to the 1980s and the investigators' own historical data on benthic macroalgal abundances at these and other islands will be used to estimate the temporal and spatial patterns of change across the archipelago.

For more information see:

Project blog: http://sdsukelp.weebly.com/blog
Project website: http://www.uaf.edu/cfos/research/projects/collaborative-research--/

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1435194

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