Year-round variation in relative light intensity reaching the benthos on four coraline rocky reed sites in Sitka Sound, AK from 2017 to 2020

Website: https://www.bco-dmo.org/dataset/856598
Data Type: Other Field Results
Version: 1
Version Date: 2021-07-27

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

Contributors	Affiliation	Role
Kroeker, Kristy J.	University of California-Santa Cruz (UCSC)	Principal Investigator
Bell, Lauren E.	University of California-Santa Cruz (UCSC)	Contact
Newman, Sawyer	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Year-round variation in relative light intensity reaching the benthos on four coralline rocky reef sites in Sitka Sound, Alaska. These four sites are Harris Island, Breast Island, Samsing Pinnacle, and Sandy Cove from 2017 to 2020.

Table of Contents

Coverage

Spatial Extent: **Lat**:57.032 **Lon**:-135.277
Temporal Extent: 2017-08-26 - 2020-10-18

Dataset Description

Year-round variation in relative light intensity reaching the benthos on four coralline rocky reef sites in Sitka Sound, AK.

Methods & Sampling

Methodology:

Sampling and analytical procedures:

Year-round variation in relative light intensity reaching the benthos on coralline algal reefs in Sitka Sound, AK was measured using submersible pendant light loggers (Onset HOBO). From 2017-2020, we intermittently

deployed two light loggers at ~7m depth (MLLW) at each of four rocky reef sites with high coralline algal cover and varied kelp canopy cover (Harris Is.: 57.032N, 135.277W; Breast Is.: 57.039N, 135.333W; Samsing Pinnacle: 56.988N, 135.357W; Sandy Cove: 56.986N, 135.321W; Fig. A.1). At each site, both loggers were placed within 1m of each other, oriented to face the water surface, and programmed to record light intensity (lux; lumen m-2) every 30 min. The light loggers were cleaned every 1-3mo, although overall fouling was low.

Problem report:

Gaps in sampling data occur when loggers were retrieved for cleaning and data download. Otherwise should be continuous, with data logged every 30min.

Data Processing Description

Processing notes from researcher:

Data downloaded from loggers using HOBOware software (Onset Computer Corporation, v3.7.22

BCO-DMO processing notes:

- Added UTC datetime

- Converted local time to YYYY-MM-DD format, changed the column name to timestamp_local_akst, and removed the original timestamp column

- Rounded temp_F column to 4 digits past decimal point

[table of contents | back to top]

Data Files

File	
benthic_lightexposure-1.csv	(Comma Separated Values (.csv), 12.76 MB) MD5:80bf8070d6e1ee3d44d5dc2540de9496
Primary data file for dataset ID 856598	

[table of contents | back to top]

Related Publications

Bell, L., Gómez, J., Donham, E., Steller, D., Gabrielson, P., & Kroeker, K. (2022). High-latitude calcified coralline algae exhibit seasonal vulnerability to acidification despite physical proximity to a non-calcified alga. Climate Change Ecology, 3, 100049. https://doi.org/10.1016/j.ecochg.2022.100049
Results

[table of contents | back to top]

Parameters

Parameter	Description	Units
site	Site name	unitless
ISO_DateTime_UTC	Date and time of logged data (UTC); format: YYYY-MM-DDTH:MZ	unitless
timestamp_local_akst	Date and time of logged data (AKST); format: YYYY-MM-DD H:M	unitless
logger	Numerical ID of logger (1 or 2) at each site	unitless
temp_F	Temperature	degrees F
I_lumft2	Instantaneous light intensity	lumens per square foot

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Onset HOBO pendant light loggers
Generic Instrument Name	Onset HOBO Pendant Temperature/Light Data Logger
Dataset-specific Description	Researchers during this data collection, intermittently deployed two light loggers at ~7 meter depth at each of four rocky reef sites with high coralline algal cover and varied kelp canopy cover. At each site, both loggers were placed within 1 meter of each other, oriented to face the water surface, and programmed to record light intensity every 30 minutes. The light loggers were cleaned every 1 to 3 months, although overall fouling was low.
Generic Instrument Description	The Onset HOBO (model numbers UA-002-64 or UA-001-64) is an in-situ instrument for wet or underwater applications. It supports light intensity, soil temperature, temperature, and water temperature. A two-channel logger with 10-bit resolution can record up to approximately 28,000 combined temperature and light measurements with 64K bytes memory. It has a polypropylene housing case. Uses an optical USB to transmit data. A solar radiation shield is used for measurement in sunlight. Temperature measurement range: -20 deg C to 70 deg C (temperature). Light measurement range: 0 to 320,000 lux. Temperature accuracy: +/- 0.53 deg C from 0 deg C to 50 deg C. Light accuracy: Designed for measurement of relative light levels. Water depth rating: 30 m.

[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

[table of contents | back to top]