Moored pressure observations at the offshore edge of the three kelp forest study sites in the Santa Barbara Channel from 2015 to 2017

Website: https://www.bco-dmo.org/dataset/744676
Version: 1
Version Date: 2018-08-28

Project
» Linking nearshore kelp forest dynamics to sandy beach ecosystems (Linking Kelp to Beaches)

Contributors	Affiliation	Role
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Abstract
Pressure data from Sea-Bird SBE 26plus wave and tide recorders moored roughly 1 km from the shore off the Santa Barbara coast. Burst data are recorded hourly to obtain significant wave height and dominant wave period data.

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Coverage

Temporal Extent: 2015-11-20 - 2017-12-04

Dataset Description

These data have been submitted to BCO-DMO and are in the process of being served.

Methods & Sampling

Sea-Bird SBE 26plus wave/tide recorders were moored at three locations. Instruments were deployed for roughly three months at a time (I.e. battery life) over a two-year period. Deployments occurred at the offshore edge of each of the three kelp forests targeted in the study.

Data Processing Description

Significant wave height and dominant wave period were obtained hourly via two separate methods using the Sea-Bird data processing software.

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Parameters

Parameters for this dataset have not yet been identified

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Instruments

Dataset-specific Instrument Name	SBE-26plus
Generic Instrument Name	Sea-Bird SBE 26 Wave and Tide Recorder
Dataset-specific Description	SBE-26plus wave and tide recorder manufactured by Sea-Bird Electronics (Bellevue, WA).
Generic Instrument Description	The Sea-Bird Electronics SBE 26 SEAGAUGE is a wave level and tide recorder with a pressure sensor, accurate clock, precision thermometer and optional SBE 4M conductivity sensor. Pressure data are integrated to give sea level or are burst recorded at rates up to 4 Hz to characterize waves. The standard pressure sensor is a 20 meter (45 psia) Quartzonix, with a temperature-compensated quartz element. Optionally, the SBE 26 can be configured with a Paroscientific Digiquartz pressure sensor with a temperature-compensated quartz element in 13 ranges, from 1 to 6800 meters (15 to 10,000 psia). more information from Sea-Bird Electronics

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Deployments

SBC_Moorings_2015_to_2017

Website	https://www.bco-dmo.org/deployment/744684
Platform	shoreside Calif_shore
Start Date	2015-11-20
End Date	2017-12-04

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Project Information

Linking nearshore kelp forest dynamics to sandy beach ecosystems (Linking Kelp to Beaches)

Coverage: Santa Barbara Channel, California, USA 34 N, 119 W

This project is affiliated with the Santa Barbara Coastal LTER project.

Description from NSF award abstract:
Primary producers, such as plants and algae, form the basis of most food webs and their productivity and fate fundamentally shape ecosystems. Often, however, food and other resources are delivered to a food web from

an outside source, providing a subsidy to the recipient ecosystem. Understanding these types of trophic connections and exchanges between ecosystems is necessary for predicting how food webs may respond to change, whether environmental or anthropogenic. Despite their potential importance, quantitative evaluations of cross-ecosystem material fluxes, variation of these fluxes in time and space, and ecological responses of recipient communities are lacking, particularly for marine ecosystems. By investigating links between a source ecosystem, kelp forests, and a recipient ecosystem, sandy beaches, this project will expand and transform our understanding of cross-ecosystem fluxes in the coastal ocean. Nearshore kelp forests are highly productive marine ecosystems characterized by large seasonal and interannual variations in net primary production (NPP). More than 90% of kelp forest NPP is exported to adjacent ecosystems including the intertidal zone. Lacking attached plants and algae, sandy beach ecosystems near kelp forests depend heavily on imported drift kelp (wrack) to support complex and diverse food webs. Although sandy beaches are a dominant shoreline type along all U.S. coasts, provide habitat and prey for wildlife, including endangered species, and are highly valued by society as recreational and cultural resources that drive vibrant coastal economies, they receive little ecological study compared to other shoreline types. This lack of knowledge hinders the conservation and management of beaches as ecosystems. Perched on the narrow rim between land and sea, beaches are highly vulnerable to climate change, particularly sea level rise, and will be impacted by changes in climate, as will kelp forests. This project integrates biological and physical approaches to achieve an understanding of the fate and transport of exported kelp, and how variability in this resource subsidy shapes the community structure and function of recipient beach ecosystems. Graduate and undergraduate students will be integral members of the research team, receiving scientific training and mentoring in coastal marine ecology and in public outreach and education. The training and participation of local residents and coastal managers in regular shoreline surveys for beached kelp plants will provide an essential research component of the study and enhance public awareness of scientific research, coastal ecology and the role of links between kelp forest and beach ecosystems. The results of this project will provide new insights into the dynamics of connectivity between coastal marine ecosystems that can be applied to their conservation and management.

The project seeks to understand trophic connectivity between a donor ecosystem, kelp forests, and a recipient ecosystem, sandy beaches, with two primary goals:

1) an evaluation of how variation in kelp wrack input affects patterns and processes in beach ecosystems and

2) a quantitative understanding of trophic connectivity through physical transport and input of drift kelp biomass from kelp forests to sandy beaches.

The project will begin with two years of intensive work at a well-studied kelp forest in the Santa Barbara Channel, Mohawk Reef, and along 10 km of adjacent coastline, where the research team will measure intertidal community structure over time in response to variability in kelp inputs. To assess effects of variation in wrack input on ecosystem function, they will also measure kelp consumption and secondary production rates of intertidal consumers on adjacent beaches. They will directly observe fate and transport of kelp using complimentary approaches: 1) tracking kelp plants tagged at Mohawk Reef using drifters with GPS; and 2) tagging large numbers of kelp plants (2000) with "drift cards" at Mohawk Reef for recovery by the project team and trained volunteer beachcombers. Ending distributions of recovered drift cards and drifter tracks along the shoreline will then be computed. These data will be used to inform and validate a kelp forest-to-beach kelp transport model based on numerical simulations of coastal surface currents from the Regional Oceanic Modeling System (ROMS). Using predicted kelp beaching rates from this model run regionally, the investigators will then sample community structure and wrack biomass at a larger set of beaches spanning 100 km of the southern California shoreline to test the generality of research findings. This combination of fate and transport observations, beach community surveys and process measurements, and modeling will allow the investigators to characterize temporal variability in kelp subsidy inputs and the consequences of this variability for community structure and function of recipient beach ecosystems.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1458845

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