Percent cover of sessile invertebrates and algae along the coast of Monterey and Carmel starting in 1999 (Kelp Forest Resilience project)

Website: https://www.bco-dmo.org/dataset/661151
Data Type: Other Field Results
Version: 1
Version Date: 2017-11-20

Project
» Kelp forest community resilience in action: adaptive responses of predators to a disease-driven food web perturbation (Kelp_Forest_Resilience)

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Abstract
Percent cover of sessile invertebrates and algae along the coast of Monterey and Carmel starting in 1999 (Kelp Forest Resilience project)

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Coverage

Spatial Extent: **N**:36.640454 **E**:-121.894574 **S**:36.397717 **W**:-121.982468
Temporal Extent: 1996 - 2016

Dataset Description

This metadata record documents the kelp forest community survey component of our project. Data generated by these surveys consists of the following recorded on "transects" (described in Methodology section below): (i) percent cover of conspicuous colonial sessile invertebrates and particular species of macroalgae (e.g., foliose red algae), and (ii) percent cover of substratum type (sand, cobble, boulder, bedrock), and category of vertical relief.

Methods & Sampling

Sampling consists of visual surveys of the percent cover of conspicuous colonial sessile invertebrates and individually indistinguishable macroalgae by SCUBA divers. Surveys are conducted at sites distributed throughout the study region (Carmel Bay and southern Monterey Bay). Each sample site is divided into three "zones" (by depth - 20m, 12.5m, 5m - or from offshore to inshore at sites with little depth variation) to assure that samples are distributed across the face of a reef from inshore to offshore. Where possible, taxa (or

taxonomic categories) are enumerated on six transects stratified across the three depth strata (two per stratum) per site (typically a 100m length of coastline, extending from onshore to the 20m isobath). Each "transect" is a 2m x 30m swath haphazardly located within one of the three depth strata. Transects within a stratum are separated end-to-end by approximately 5m. Sampling of each transect is conducted by three divers simultaneously. One diver records the number of individual invertebrates and macroalgae within each of three 10m-long segments of the 60m2 swath. A second diver records the organism and substratum type beneath each of 30 points uniformly distributed along the 30m length of the transect (i.e. 1.0m increments) and the vertical relief (highest to lowest height of the reef surface) within a 0.5m long by 1m wide area centered on each uniform point. A third diver records the number and size of sea urchins and abalone within each of the 10m long segments of the 60m2 swath. Surveys are designed to measure year-to-year site-wide variability in species density or percent cover, from which community structure and interannual dynamics are derived.

Data Processing Description

Data recorded on underwater paper by divers are entered into Excel spreadsheets by hand and double checked for accuracy. Each dataset is checked for valid entries and completeness.

BCO-DMO Data Processing Notes:

-Month and day combined with year to create date column.
-All column names reformatted to comply with BCO-DMO standards
-nd was entered into all blank cells
-Commas were removed from the descriptions in notes column
-lat/lon columns created based on information found in the site keys submitted with the data

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Data Files

File
communityDynamics_percentCover.csv(Comma Separated Values (.csv), 2.74 MB) MD5:2c209e7f32692d93dbc1da87abbd6d97
Primary data file for dataset ID 661151

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Parameters

Parameter	Description	Units
year	The year that the survey was done. This date is expressed in YYYY format. Dates reflect measurements taken in Local Time.	unitless
date	The date that the survey was done. This date is expressed in YYYYmmdd format. Dates reflect measurements taken in Local Time.	unitless
site	The unique site code where the survey was performed. This site code refers to a specific GPS location defined by a bounding box and is likely associated with a placename (i.e there may be multiple sitecodes at the 'Jalama Beach' placename).	unitless
lat	Latitude; north is positive.	decimal degrees
lon	Longitude; east is positive.	decimal degrees
side	A division of the site into two or three areas referred to as sides. Sides may be East (E); West (W); South (S); North (N) or CEN (central)	unitless
zone	A division of the side into 2 or 4 categories representing onshore-offshore stratification or targeted bottom depths for transects. Zones may be INNER; INMID; OUTMID; OUTER.	unitless
transect	A number representing one of the parallel transects through the sitearea along which are located the sampling segments.	unitless
category	Type of percent cover observation. Values include: SUBSTRATE (size of rock or sand over which the observation is taken); RELIEF (vertical relief within a 1m x 0.5m box around the sampled point); COVER (type of biotic subtrate associated cover present the uppermost layer at the observation point); SUPERLAYER (organisms which are super-numerous but not attached to the bottom and would not therefore otherwise be captured by the density or percent cover samping methods.)	unitless
classcode	The unique taxonomic or functional classification code that is being counted as defined in the PISCO classification table. This refers to a code that defines the Genus and Species. See "Species Key" dataset for definitions.	unitless
count	The count of the species or class indicated by the class code. The count is the number of points which fall on the identified classcode at 1m intervals along the transect tape.	count
pct_cov	Percent cover of the identified classcode calculated by dividing the count by the total number of points sampled along the transect.	centimeters (cm)
depth	Average depth of the transect estimated by the diver. Each level is measured.	meters (m)
notes	notes	dimensionless

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Deployments

Carr_1999

Website	https://www.bco-dmo.org/deployment/661099
Platform	Long Marine Lab UCSC
Start Date	1999-09-22
End Date	2015-07-24
Description	Sites of Kelp Forest Resilience project. Nearshore waters of southern Monterey Bay and Carmel Bay, California. 36 N, 121 W.

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Project Information

Kelp forest community resilience in action: adaptive responses of predators to a disease-driven food web perturbation (Kelp_Forest_Resilience)

Coverage: Monterey Bay and Carmel Bay, California; 36 N, 121 W

A key goal of ecology is to understand how species interactions -- competition, predation, mutualism -- influence the structure (e.g., biodiversity) and functions (e.g., productivity) of ecological communities and contribute to the stability and resilience of ecosystems. Kelp forests along the West Coast of North America have been a model ecosystem in which marine ecologists have explored these questions. That work has provided evidence that predators, including sea otters, sea stars, and fishes, can be important in controlling sea urchins that otherwise overgraze forests and create alternative "barrens" states, devoid of kelp. However, other examples suggest that disease and disturbance, not predators, suppress urchin overgrazing. Here we employ experiments and surveys to determine whether and how sea otters and sea stars act separately and in combination to control the rapid growth of sea urchin populations that is occurring in concert with a sea star "wasting" epidemic along the West Coast of North America. The results of this work will (i) advance our understanding of how multiple predators interact to influence community structure, stability and resilience, and (ii) shed light on how species interactions contribute to the stability of these forests that are the foundation of productive commercial and recreational fisheries. The project will involve citizen scientists contributing to surveys of sea otter abundance, foraging behavior and diet, and underrepresented (largely Latino) undergraduates and results will be disseminated in several public outreach facilities and K-12 educational programs.

This project will advance our understanding of the combined roles of species diversity and predators in contributing to the stability and resilience of community structure. Though both predators and diversity have been the focus of numerous studies, fewer have explored how predator diversity does or does not enhance the resilience of marine ecosystems. The investigators will determine the relative contributions of southern sea otters (Enyhda lutris lutris) and two species of sea stars (Pycnopodia helianthoides and Pisaster giganteus) in controlling the density and size structure of two prey species, the purple sea urchin (Strongylocentrotus purpuratus) and a snail (Promartynia pulligo), and the cascading effects on survival and density of giant kelp (Macrocystis pyrifera). Orthogonal manipulations of predator access in large field enclosures/exclosures will be used to assess the relative roles of redundancy, complementarity and "sampling effect" (i.e. particular importance of either species) among the two predators on both direct mortality and indirect (trait-mediated) foraging behavior of their prey. The PIs will evaluate whether results from the experiments "scale up" to explain geographic variation in the relative densities of predators (otters and stars), prey (urchins) and the major primary producer (giant kelp) and the ability of sea otters to compensate for declines in sea stars to control the rapid growth in purple sea urchin populations that can otherwise cause phase shifts (forests to barrens) of these ecosystems.

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1538582