Tidepool attributes by date and ecological survey data from seasonal surveys conducted at tidepools along the California coast from 2017 to 2018

Website: https://www.bco-dmo.org/dataset/861571
Data Type: Other Field Results
Version: 1
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Project
» Collaborative Research: Context-dependency of top-down vs. bottom-up effects of herbivores on marine primary producers (CalCoast Grazer TDBU)

Contributors	Affiliation	Role
Bracken, Matthew	University of California-Irvine (UC Irvine)	Principal Investigator, Contact
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Abstract
This dataset includes information on tidepool attributes by date as well as ecological survey data for each seasonal survey. Data include cover and counts of algae and mobile invertebrates. Sampling took place in 2017 and 2018 at tide pools located in three regions along the California (USA) coast: (1) Bodega Head, Sonoma County (38.31°N, 123.07°W); (2) Kenneth Norris Rancho Marino Reserve and Hazards Canyon Reef, San Luis Obispo County (35.54°N, 121.09°W and 35.29°N, 128.88°W, respectively); and (3) Corona del Mar State Beach, Orange County (33.59°N, 117.87°W). In the fall of 2017, initial surveys and measurements were conducted quantifying physical attributes, including surface area, volume, and height on the shore. Surveys were repeated every three months until immediately prior to the establishment of grazing experiments at each site in the summer of 2018. During the quarterly surveys, consumer abundances, nutrient fluxes, oxygen fluxes, and photosynthetic biomass in each tide pool were quantified.

Table of Contents

Coverage

Spatial Extent: **N**:38.3195 **E**:-117.866 **S**:33.5867 **W**:-123.075
Temporal Extent: 2017-09-21 - 2018-04-26

Dataset Description

Users of these data are requested to contact Matthew Bracken (m.bracken@uci.edu) prior to use.

Methods & Sampling

Methodology:
High-intertidal pools are common in all three regions, allowing us to work at two spatially separated sites in each region. At each site, we identified 18 tide pools, marking each pool and quantifying physical attributes, including surface area, volume, and height on the shore. We also anchored TidbiT temperature datalogger (Onset; Bourne, Massachusetts, USA) in most pools. In the fall of 2017, we identified tide pools and conducted initial surveys and measurements. We repeated surveys every three months until immediately prior to the establishment of grazing experiments at each site in the summer of 2018. These surveys provided insights into the natural temporal variability in community and ecosystem metrics and provided baseline information on relationships between grazer abundances and producer biomass.

Sampling and analytical procedures:
During the quarterly surveys, we quantified consumer abundances, nutrient fluxes, oxygen fluxes, and photosynthetic biomass in each tide pool. Organism abundances were measured by pumping the water from each pool into a bucket, spreading a flexible mesh quadrat over the bottom of the pool, and censusing the algae and invertebrates present in each pool. Nutrient and oxygen fluxes were measured during whole-pool incubations in the dark and in the light.

Seasonal survey data:
Surveys include information on pool attributes by date as well as ecological survey data for each seasonal survey. Abundances of algae and mobile invertebrates were measured by delineating the perimeter of each pool with a transect tape then pumping the water from each pool into a bucket. A flexible mesh quadrat (Bracken and Nielsen 2004) was spread over the bottom of each pool. The mesh was composed of 10 centimeter x 10 centimeter squares, and total square counts (also used to estimate pool percent cover) and squares per species (to the nearest ¼ square) were used to estimate cover of seaweeds and sessile invertebrates. All mobile invertebrates in each pool were counted and identified to the lowest possible taxonomic unit, usually species. Values for other pool attributes (e.g., volume, depth, perimeter) were often measured during seasonal surveys, and those were recorded in the Survey dataset as well as in Pool Characteristics (see related dataset "Tide Pool Characteristics").

This work was conducted at sites located in three regions along the California (USA) coast: (1) Bodega Head, Sonoma County (38.31°N, 123.07°W); (2) Kenneth Norris Rancho Marino Reserve and Hazards Canyon Reef, San Luis Obispo County (35.54°N, 121.09°W and 35.29°N, 128.88°W, respectively); and (3) Corona del Mar State Beach, Orange County (33.59°N, 117.87°W).

Known Problems/Issues:
Some environmentally-related (e.g., tides, darkness) issues caused gaps in the data. These are indicated by "nd".

Data Processing Description

Data Processing:
Data reported here were recorded in the field, transcribed into a database, then collated using R.

BCO-DMO Processing:
- Converted dates to format: yyyy-mm-dd
- Adjusted field/parameter names to comply with BCO-DMO naming conventions
- Replaced commas with semi-colons in the "Weather" column
- Added a conventional header with dataset name, PI names, version date
- Rounded Latitude and Longitude columns to 6 decimal places

[table of contents | back to top]

Data Files

File
seasonal_surveys.csv (Comma Separated Values (.csv), 71.96 KB) MD5:49586269826ea27cbcba8b96781d3954 Primary data file for dataset ID 861571

[table of contents | back to top]

Related Publications

Bracken, M. E. S., & Nielsen, K. J. (2004). DIVERSITY OF INTERTIDAL MACROALGAE INCREASES WITH NITROGEN LOADING BY INVERTEBRATES. Ecology, 85(10), 2828–2836. doi:10.1890/03-0651
Methods

[table of contents | back to top]

Related Datasets

IsRelatedTo

Bracken, M., Martiny, A., Miller, L. P. (2021) **Characteristics of tidepools from seasonal surveys conducted at tidepools along the California coast from 2017 to 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-12-16 doi:10.26008/1912/bco-dmo.862207.1 [view at BCO-DMO]

Bracken, M., Martiny, A., Miller, L. P. (2021) **Seasonal data on productivity, characteristics, and community composition of tidepools on the California coast from 2017 to 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-12-16 doi:10.26008/1912/bco-dmo.860440.1 [view at BCO-DMO]

[table of contents | back to top]

Parameters

Parameter	Description	Units
Site	Site of measurements (BMR = Bodega Marine Reserve; RMR = Rancho Marino Reserve / Hazards Canyon Reef; CDM = Corona del Mar)	unitless
Survey_Date	Date of survey in format: YYYY-mm-dd	unitless
Weather	Weather recorded by surveyors	unitless
Pool	Pool number and station (A or B), including adjacent Ocean	unitless
Latitude	Latitude in decimal degrees North	Decimal Degrees
Longitude	Longitude in decimal degrees East (West is negative)	Decimal Degrees

Tide_Height	Height of pool in meters above Mean Lower low Water (MLLW)	meters
Max_Depth	Maximum depth of pool in centimeters	centimeters
Perimeter	Perimeter of pool in meters	meters
Surface_Area_Squares	Overall surface area of pool in count of squares (0.1m^2)	Number of squares
Surface_Area_m2	Surface area of pool in square meters	square meters
Dye_Volume	Volume of pool in L estimated using dye method	Liters
Pump_Volume	Volume of pool in L estimated using pump method	Liters
Tide_Height2	Height of pool in m above MLLW	Meters
Number_Squares	Date-specific surface area of pool in count of squares (0.1square meter)	Number of squares
Cover_Bare_Rock	Cover of bare rock in count of squares (0.1square meter)	Number of squares
Cover_Prionitis	Cover of Prionitis sternbergii in count of squares (0.1square meter)	Number of squares
Cover_Mastocarpus	Cover of Mastocarpus papillatus in count of squares (0.1square meter)	Number of squares
Cover_Polysiphonia	Cover of Polysiphonia spp. in count of squares (0.1square meter)	Number of squares
Cover_Hildenbrandia	Cover of Hildenbrandia spp. in count of squares (0.1square meter)	Number of squares
Cover_Odonthalia	Cover of Odonthalia spp. in count of squares (0.1square meter)	Number of squares
Cover_Mytilus	Cover of Mytilus spp. in count of squares (0.1square meter)	Number of squares

Cover_Calliarthron	Cover of Calliarthron spp. in count of squares (0.1square meter)	Number of squares
Cover_Anthopleura_spp	Cover of Anthopleura spp. in count of squares (0.1square meter)	Number of squares
Cover_Anthopleura_elegantissima	Cover of Anthopleura elegantissima in count of squares (0.1square meter)	Number of squares
Cover_Anthopleura_xanthogrammica	Cover of Anthopleura xanthogrammica in count of squares (0.1square meter)	Number of squares
Cover_Corralina	Cover of Corralina spp. in count of squares (0.1square meter)	Number of squares
Cover_Enteromorpha	Cover of Ulva sp. (Enteromorpha form) in count of squares (0.1square meter)	Number of squares
Cover_Ralfsia	Cover of Ralfsia spp. in count of squares (0.1square meter)	Number of squares
Cover_Mazzaella	Cover of Mazzaella spp. in count of squares (0.1square meter)	Number of squares
Cover_Caulacanthus	Cover of Caulacanthus spp. in count of squares (0.1square meter)	Number of squares
Cover_Corralina_spp	Cover of Corralina spp. in count of squares (0.1square meter)	Number of squares
Cover_Articulated_Coralline	Cover of Articulated coralline in count of squares (0.1square meter)	Number of squares
Cover_Encrusting_Coralline	Cover of Encrusting coralline in count of squares (0.1square meter)	Number of squares
Cover_Barnacles	Cover of Barnacles in count of squares (0.1square meter)	Number of squares
Cover_Endocladia	Cover of Endocladia muricata in count of squares (0.1square meter)	Number of squares
Cover_Ulva	Cover of Ulva spp. in count of squares (0.1square meter)	Number of squares

Cover_Cladophora	Cover of Cladophora columbiana in count of squares (0.1square meter)	Number of squares
Cover_Gelidium	Cover of Gelidium coulteri in count of squares (0.1square meter)	Number of squares
Cover_Petalonia	Cover of Petalonia sp. in count of squares (0.1square meter)	Number of squares
Cover_Scytosiphon	Cover of Scytosiphon sp. in count of squares (0.1square meter)	Number of squares
Cover_Petrocelis	Cover of Petrocelis form of Mastocarpus in count of squares (0.1square meter)	Number of squares
Cover_Anthopleura_sola	Cover of Anthopleura sola in count of squares (0.1square meter)	Number of squares
Cover_Phragmatapoma	Cover of Phragmatopoma sp. in count of squares (0.1square meter)	Number of squares
Cover_Pterocladiella	Cover of Pterocladiella sp. in count of squares (0.1square meter)	Number of squares
Cover_Non_Coralline_Crust	Cover of non-coralline algal cruse in count of squares (0.1square meter)	Number of squares
Cover_Dictyota	Cover of Dictyota sp. in count of squares (0.1square meter)	Number of squares
Cover_Ceramium	Cover of Ceramium sp. in count of squares (0.1square meter)	Number of squares
Cover_Chondracanthus	Cover of Chondracanthus sp. in count of squares (0.1square meter)	Number of squares
Cover_Sargassum	Cover of Sargassum sp. in count of squares (0.1square meter)	Number of squares
Cover_Gastroclonium	Cover of Gastroclonium sp. in count of squares (0.1square meter)	Number of squares

Cover_Leathesia_Colpomenia	Cover_Leathesia of Colpomenia sp. in count of squares (0.1square meter)	Number of squares
Cover_Chaetomorpha	Cover of Chaetomorpha sp. in count of squares (0.1square meter)	Number of squares
Count_Limpets	Count of Limpets in count of of individuals per pool	Number of individuals
Count_Chlorostoma_spp	Count of Tegula (Chlorostoma) spp. in count of of individuals per pool	Number of individuals
Count_Littorina_spp	Count of Littorina spp. in count of of individuals per pool	Number of individuals
Count_Chitons	Count of Chitons in count of of individuals per pool	Number of individuals
Count_Pagurus_spp	Count of Pagurus spp. in count of of individuals per pool	Number of individuals
Count_Anthopleura_sola	Count of Anthopleura sola in count of of individuals per pool	Number of individuals
Count_Shore_crab	Count of shore crabs in count of of individuals per pool	Number of individuals
Count_Mytilus	Count of Mytilus spp. in count of of individuals per pool	Number of individuals
Count_Nucella	Count of Nucella spp. in count of of individuals per pool	Number of individuals
Count_Anthopleura_elegantissima	Count of Anthopleura elegantissima in count of of individuals per pool	Number of individuals
Count_Anthopleura_xanthogrammica	Count of Anthopleura xanthogrammica in count of of individuals per pool	Number of individuals
Count_Sculpin	Count of sculpins in count of of individuals per pool	Number of individuals
Count_Strongylocentrotus_purpuratus	Count of Strongylocentrotus purpuratus in count of of individuals per pool	Number of individuals
Count_Phragmatapoma	Count of Phragmatopoma sp. in count of individuals per pool	Number of individuals

Count_Acanthonucella	Count of Acanthonucella sp. in count of individuals per pool	Number of individuals
Count_Brachidontes	Count of Brachidontes sp. in count of individuals per pool	Number of individuals
Count_Nudibranch	Count of nudibranchs in count of individuals per pool	Number of individuals
Count_Mussels	Count of mussels in count of individuals per pool	Number of individuals

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Garmin eTrex handheld GPS
Generic Instrument Name	Global Positioning System Receiver
Generic Instrument Description	The Global Positioning System (GPS) is a U.S. space-based radionavigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis. The U.S. Air Force develops, maintains, and operates the space and control segments of the NAVSTAR GPS transmitter system. Ships use a variety of receivers (e.g. Trimble and Ashtech) to interpret the GPS signal and determine accurate latitude and longitude.

Dataset-specific Instrument Name	Self-leveling rotary laser kit, CST/berger
Generic Instrument Name	Laser
Generic Instrument Description	A device that generates an intense beam of coherent monochromatic light (or other electromagnetic radiation) by stimulated emission of photons from excited atoms or molecules.

Dataset-specific Instrument Name	TidbiT temperature datalogger (Onset; Bourne, Massachusetts, USA)
Generic Instrument Name	Temperature Logger
Generic Instrument Description	Records temperature data over a period of time.

[table of contents | back to top]

Project Information

Collaborative Research: Context-dependency of top-down vs. bottom-up effects of herbivores on marine primary producers (CalCoast Grazer TDBU)

Coverage: Coast of California, USA

Humans are modifying marine food webs both from the top-down, by reducing consumer abundances, and from the bottom-up, by adding nutrients to coastal habitats. Predicting these impacts is complicated because herbivores affect primary producers both from the top-down, by eating them, and from the bottom-up, by recycling nutrients and facilitating the recruitment of algae into local marine ecosystems. This project uses experimental manipulations along a natural gradient in nutrient availability on the California coast to evaluate the complex interactions between top-down and bottom-up processes in marine communities. This project includes experiments and outreach in a location with substantial exposure to the public, and the investigators will work with community and university outreach personnel to communicate this research to broader audiences. Specifically, the project includes mechanisms for curriculum development and outreach and will train undergraduate and graduate students in marine science.

The investigators are implementing a suite of innovative approaches to understand the multiple roles that herbivores play in marine systems. Traditional experimental methods for herbivore removal result in the loss of both the consumptive and facilitative effects of herbivores. In contrast, the investigators' experimental design allows them to partition the different effects of herbivores on marine primary producers. These methods, including observations, experiments, and modeling approaches, allow researchers to (i) calculate the relative importance of herbivores' consumptive and facilitative effects on algal diversity and abundance; (ii) determine the effects of temperature, nutrients, and herbivores on the microbial community; and (iii) evaluate the relative importance of internal processes and spatial subsidies.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1736891
NSF Division of Ocean Sciences (NSF OCE)	OCE-1737065
NSF Division of Ocean Sciences (NSF OCE)	OCE-1904184

[table of contents | back to top]