Whelk counts from 4 sites relative to tidal elevation from coastal Oregon, 2014-2015

Website: https://www.bco-dmo.org/dataset/653942
Data Type: Other Field Results
Version:
Version Date: 2016-08-12

Project
» Testing the rocky intertidal community consequences of the decimation of purple sea star populations along the Oregon coast by sea star wasting disease (Sea star wasting)

Program
» Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)

Contributors	Affiliation	Role
Menge, Bruce A.	Oregon State University (OSU)	Principal Investigator
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Dataset Description

Data are counts of Nucella canaliculata and N. ostrina from surveys in July 2014 and 2015 of whelk size distributions. Whelks were counted at 4 sites in haphazard quadrats.

Related Reference:

Elizabeth B. Cerny-Chipman, Jenna M. Sullivan, and Bruce A. Menge. Whelk predators exhibit limited population responses and community effects following disease-driven declines of the keystone sea star *Pisaster ochraceus.* In Revision: MEPS.

Related Datasets:
Predator removals
Prey percent covers
Whelk size distributions: individuals
Whelk surveys

Methods & Sampling

Study system:

Our study included 4 sites along the Oregon coast: Strawberry Hill (44.250°N-124.115°W) and Yachats Beach (44.319°N-124.109°W), located on Cape Perpetua, and Fogarty Creek (44.837°N-124.0587°W) and Boiler Bay (44.832°N-124.061°W) located on Cape Foulweather (Fig.1). Cape Perpetua is a rocky headland adjacent to a wide continental shelf offshore that promotes retention of propagules such as larvae and phytoplankton (Menge et al. 2015). As a result, Cape Perpetua intertidal sites are characterized by high phytoplankton productivity and high recruitment of invertebrates (Menge et al. 1997, 2004, 2015). Cape Foulweather, in contrast, is characterized by a narrower offshore continental shelf, which leads to reduced retentiveness, lower invertebrate abundance, and high macrophyte abundance. Prior to the onset of SSWD, densities of P. ochraceus could be as high as 8 individuals m-2 at Cape Perpetua and 4 individuals m-2 at Cape Foulweather sites (Menge et al. 2016).

Whelk size distributions
With P. ochraceus at low densities, whelks presumably were relieved from both competitive and consumptive pressure. Thus, we predicted that whelks would become both more abundant and larger in size as a result of greater food resources and less predation. We measured whelk size distributions at the same four sites used in our vertical abundance surveys. We haphazardly placed 0.0625 m2 quadrats in the intertidal and extracted all whelks in the quadrat taking care to include small individuals. Whelks were sorted by species and measured with calipers to the nearest millimeter. This sampling was done in a semi-stratified pattern vertically along the shore within areas of intermediate wave exposure until we had at least 200 individuals of each species at each site. Size distribution surveys were conducted in July in 2014 and 2015. When possible, all counts were conducted in a single day at each site in order to minimize the chance of repeatedly counting the same individuals.

Data Processing Description

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- reformatted date from m/d/yyyy to yyyymmdd
- replaced . in specific_cover_type column with nd (no data)

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Data Files

File
whelk_sizedist_cnt.csv (Comma Separated Values (.csv), 4.87 KB) MD5:d74bd7b67460775a55b46ca9e43dda9c Primary data file for dataset ID 653942

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Parameters

Parameter	Description	Units
date	Date of monitoring in format YYYYMMDD	year-month-day
site	One of four sites: BB=Boiler Bay; FC=Fogarty Creek; SH=Strawberry Hill; YB=Yachats Beach	unitless
zone	Ecological zone: ua=upper algal zone; lm=lower edge of mussel bed; mm=middle of mussel bed; um=upper edge of mussel bed; hi=high zone; mt=bed of M. trossulus in low zone	unitless
exposure	Wave exposure. e=exposed; me=mid-exposed	unitless
quadrat	Quadrat number per site per survey day	unitless
N_can	Number of N. canaliculata in plot	individuals
N_ost	Number of N. ostrina in plot	individuals
specific_cover_type	Note if cover was different than that which typified the zone: mt=Mytilus trossulus bed; scar=Semibalanus cariosus	unitless

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Deployments

Menge_2014

Website	https://www.bco-dmo.org/deployment/653801
Platform	OSU
Start Date	2014-04-16
End Date	2015-07-17
Description	Benthic ecology before and after Seastar Wasting Disease infection.

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Project Information

Testing the rocky intertidal community consequences of the decimation of purple sea star populations along the Oregon coast by sea star wasting disease (Sea star wasting)

Website: http://www.eeb.ucsc.edu/pacificrockyintertidal/data-products/sea-star-wasting/

Coverage: Oregon coast

This study will investigate the ecological consequences of the decimation of sea star populations by wasting disease along the Oregon coast. Hallmarks of wasting disease are the formation of sores on the sea star that progress to cause loss of arms, and ultimately death of the animal. Wasting disease was reported in sea star populations including those of the purple sea star, Pisaster ochraceus, in British Columbia, Washington, and California as early as April 2013. In Oregon, wasting was first observed in April 2014, and by June 2014 rates of infection ranged up to 80%, and sea star abundance had declined. At that rate, many populations may disappear by the end of summer 2014. Prior research has shown that in the absence of the purple sea star, mid-shore mussel populations increase, and ultimately overgrow the sea weeds and invertebrates that occur low on the shore, reducing biodiversity. However, because disease events of this magnitude have never occurred along the entire coastline, it is unclear if the small-scale expansion of mussels observed previously will be a general result of this event. One possibility is that predators unaffected by wasting, such as whelks and crabs, will increase their predation effects and blunt the expected invasion of mussels to the low shore. The research in this project will evaluate this possibility by testing the role of these alternative predators. Broader Impacts include the training of undergraduate and graduate students, the involvement of coastal residents and the production of microdocumentaries and video to document the changing context of this ecosystem.

The research project is designed to test three hypotheses. First, that in the absence of Pisaster ochraceus, predation by whelks will increase in strength through increases in whelk abundance and in whelk size, and at least partially compensate for the absence of Pisaster. Second, the small sea star Leptasterias spp. will also expand its role as a predator through increased size and abundance, and expansion of its habitat beyond mussel beds. Although individuals of this sea star have been observed to suffer from wasting as well, the frequency so far appears low, and it seems likely this species may persist. Third, the crab Cancer productus, normally mostly a subtidal species, will expand its range into the intertidal and help to compensate for the loss of Pisaster. Tests of these hypotheses will include manual removal experiments (whelk removal, Leptasterias removal, removal of both and of neither), cage exclusion experiments (whelk exclusions), cage inclusion-exclusion experiments (Leptasterias inclusion, Leptasterias exclusion). Experiments will be replicated with appropriate controls, and done at multiple sites on the central Oregon coast that vary naturally in population abundances, rates of prey and predator recruitment, and oceanographic conditions. Results obtained under this unprecedented set of circumstances will deepen and expand our empirical understanding of the dynamics of an iconic ecosystem, and will help parameterize community models.

Additional Project Information: Sea Star Wasting Map

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Program Information

Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)

Website: http://www.piscoweb.org/

Coverage: West coast of North America from Mexico to Alaska

The Partnership for Interdisciplinary Studies of Coastal Oceans is a long-term ecosystem research and monitoring program established with the goals of:

- understanding dynamics of the coastal ocean ecosystem along the U.S. west coast
- sharing that knowledge so ocean managers and policy makers can make science based decisions regarding coastal and marine stewardship
- producing a new generation of scientists trained in interdisciplinary collaborative approaches

Over the last 10 years, PISCO has successfully built a unique research program that combines complementary disciplines to answer critical environmental questions and inform management and policy. Activities are conducted at the latitudinal scale of the California Current Large Marine Ecosystem along the west coast of North America, but anchored around the dynamics of coastal, hardbottom habitats and the oceanography of the nearshore ocean – among the most productive and diverse components of this ecosystem. The program integrates studies of changes in the ocean environment through ecological monitoring and experiments. Scientists examine the causes and consequences of ecosystem changes over spatial scales that are the most relevant to marine species and management, but largely unstudied elsewhere.

Findings are linked to solutions through a growing portfolio of tools for policy and management decisions. The time from scientific discovery to policy change is greatly reduced by coordinated, efficient links between scientists and key decision makers.

Core elements of PISCO are:

- Interdisciplinary ecosystem science
- Data archiving and sharing
- Outreach to public and decision-making user groups
- Interdisciplinary training
- Coordination of distributed research team

Established in 1999 with funding from The David and Lucile Packard Foundation, PISCO is led by scientists from core campuses Oregon State University (OSU); Stanford University's Hopkins Marine Station; University of California, Santa Cruz (UCSC); and University of California, Santa Barbara (UCSB). Collaborators from other institutions also contribute to leadership and development of PISCO programs. As of 2005, core PISCO activities are funded by collaborative grants from The David and Lucile Packard Foundation and the Gordon and Betty Moore Foundation. Core support, along with additional funding from diverse public and private sources, make this unique partnership possible.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1448913

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