Experimental results describing urchin survivorship in tethering experiments on rocky subtidal sites in the Galapagos Islands during 2007-2008 (GMR Trophic Cascades project)

Website: https://www.bco-dmo.org/dataset/632769
Data Type: experimental
Version: 1
Version Date: 2016-01-15

Project
» Effects of Predator Diversity on the Strength of Trophic Cascades in an Oceanic Benthic Ecosystem (GMR Trophic Cascades)

Contributors	Affiliation	Role
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Abstract
Experimental results describing urchin survivorship in tethering experiments on rocky subtidal sites in the Galapagos Islands during 2007-2008.

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Coverage

Spatial Extent: **N**:-0.41155 **E**:-90.14065 **S**:-1.23683 **W**:-90.38498
Temporal Extent: 2007-05-18 - 2008-07-03

Dataset Description

Related Reference:

Witman, J.D., R.W. Lamb and J.E.K. Byrnes (2015). Towards an integration of scale and complexity in marine ecology 2015. Ecological Monographs 85: 475-504.

Methods & Sampling

Data from sea urchin tethering experiments at rocky subtidal sites (10-12 m depth) in the Galapagos Islands during 2007 - 2008. *Eucidaris galapagensis* was used as prey in all trials. Data recorded by time lapse

photography at 1 min intervals in Trials 1-5 and 8, and at 2 minute intervals in Trials 6 - 7.

Data Processing Description

Data are raw, with no processing.

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date, reference information
- renamed parameters to BCO-DMO standard
- reformatted data to a flat file
- added yearday_local and ISO_DateTime_Local for plotting purposes
- added to add lat/lon
- changed format of date to yyyy-mm-dd from m/d/yyyy
- changed format of time from H:M:S AM/PM to HHMM

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Data Files

File
urchin_suvivorship.csv (Comma Separated Values (.csv), 379.84 KB) MD5:04d93ad8b6fa11bff5c8c13f2d84c252 Primary data file for dataset ID 632769

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Related Publications

Witman, J. D., Lamb, R. W., & Byrnes, J. E. K. (2015). Towards an integration of scale and complexity in marine ecology. Ecological Monographs, 85(4), 475–504. doi:10.1890/14-2265.1
Methods

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Parameters

Parameter	Description	Units
trial	trial identification number	unitless
date_local	date; local time	yyyy-mm-dd
year	year	yyyy
mon_local	month; local time	mm
day_local	day; local time	dd
site	site name	unitless
lat	latitude; north is positive	decimal degrees
lon	lonitude; east is positive	decimal degrees
time_local	local time	HHMM
yrday_local	local day and decimal time. eg. 326.5 = 326th day of the year or November 22 at 1200 hours (noon)	unitless
ISO_DateTime_Local	Date/Time (Local) ISO formatted	YYYY-MM-DDTHH:MM:SS
survivors	number of live urchins remaining	urchins

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Camera
Dataset-specific Description	GoPro digital video camera
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

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Deployments

Witman 2012

Website	https://www.bco-dmo.org/deployment/632747
Platform	Unknown Platform
Start Date	2012-01-01
End Date	2012-12-31
Description	Nearshore biological experiments

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Project Information

Effects of Predator Diversity on the Strength of Trophic Cascades in an Oceanic Benthic Ecosystem (GMR Trophic Cascades)

Website: http://www.witmanlab.com/predator-diversity-and-the-strength-of-trophic-cascades-gmr.html

Coverage: Galapagos Islands, Ecuador 00 33.953 S; 90 08.493 W

Description from NSF award abstract:
Predator diversity has decreased dramatically in the world's oceans due to overfishing, anthropogenic habitat destruction and possibly climate change. Yet, still unknown for most ecosystems is the importance of predator diversity and abundance for ecosystem functioning. One of the most pervasive community-wide consequences of top predators is the Trophic Cascade (TC), where herbivores are suppressed, which releases plants from consumption, thus increasing plant productivity. Recent studies have shown that the diversity of predators may reduce, increase, or have no effect on the strength of trophic cascades. The small number, to date, of experimental tests of predator diversity effects on cascade strength precludes broad generalizations vital to the development of predictive theory. Such research is limited by the lack of experimental realism due to the small number of predator species that can be manipulated in simplified mesocosms. Without more realistic species numbers, it is impossible to extrapolate results to natural ecosystems that experience losses of predator diversity.

To meet these challenges, and to better understand the consequences of present and changing levels of predator diversity in marine ecosystems, a series of experimental manipulations will be conducted on natural levels of predator diversity and their herbivorous sea urchin prey. The hypotheses test the ultimate effects on benthic algae, as a measure of cascade strength in oceanic benthic ecosystems of the Galapagos Marine Reserve (GMR). Because of years of protection from industrial fishing as a UNESCO World Heritage Site, and of local conservation protection as the GMR, there are diverse guilds of higher trophic level predators, such as large fish and sharks. Likewise, there is high diversity of intermediate-level fish and invertebrates that prey on sea urchins, creating an unusual opportunity for testing and developing predator diversity and Biodiversity Ecosystem Functioning theory. The overarching questions addressed in this project are: How do naturally occurring large ranges of oceanic predator diversity influence the strength of trophic cascades? and How does environmental variation and conservation protection influence these processes? The first question will be addressed in experiments manipulating both horizontal (within trophic level; urchin herbivores) and vertical (across trophic level; predators) consumer diversity and in another experiment manipulating the diversity of predatory fish and invertebrates guilds. The experiments employ open fenced treatments containing urchins but allowing access by fish and invertebrate predators of the urchins. To record natural levels of fish and invertebrate predator richness encountering the treatments, consuming the urchins and interacting with each other, the entire experimental layout will be video-recorded for up to several weeks at a time. The time-lapse cameras/lighting system is capable of day and night imaging without affecting predator behavior. A simplified manipulation to measure the influence of predator diversity on cascade strength will be replicated and video-recorded at 16 sites -- representing different levels of upwelling and conservation protection -- to place the mechanistic understanding gleaned from detailed experiments at local sites into a broader (mesoscale) context.

Relevant References:

Witman, J.D and F. Smith. 2003. Rapid community change at a tropical upwelling site in the Galapagos Marine

Reserve. Biodiversity and Conservation 12: 25-45

Witman, J.D., M. Brandt and F. Smith 2010. Coupling between subtidal prey and consumers along a mesoscale upwelling gradient in the Galapagos Islands. Ecological Monographs 80: 153-177.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061475

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