

Residence times of consumers in subtidal areas on Isla Baltra, Galápagos during 2012 (GMR Trophic Cascades project)

Website: <https://www.bco-dmo.org/dataset/630458>

Data Type: Other Field Results

Version: 1

Version Date: 2016-01-05

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

Residence times of consumer species during a trophic cascade experiment conducted at 8- 10 m depth at Isla Baltra, Galápagos Islands from July 13 to July 19, 2012. Data represent counts of consumer species photographed with GoPro cameras at 1 second intervals during daylight hours in two adjacent areas of the bottom, named Baltra crest and Baltra gully. The consumers were photographed in the vicinity of treatments where sea urchins *Lytechinus semituberculatus* were enclosed in fences on substrates of consumable benthic algae. Data represent raw data of entrance and exit times from image analysis and the calculated difference.

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Coverage

Spatial Extent: Lat:-0.411 Lon:-90.27525

Temporal Extent: 2012-07-13 - 2012-07-19

Processing Description

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date, reference information
- renamed parameters to BCO-DMO standard
- changed question mark to nd

- added species name, lat and lon columns

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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](https://doi.org/10.1890/14-2265.1)
Methods

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Parameters

Parameter	Description	Units
site	study areas	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
date_local	local date	yyyy-mm-dd
time_enter	local time when consumer entered area	HH:MM
predator_grp	predator group name	unitless
species_code	species code	unitless
species	taxonomic species name	unitless
image_enter	image number when consumer entered area	unitless
image_exit	image number when consumer exited area	unitless
time_elapsed	residence times of consumer species	seconds

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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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