Respiration chamber images and R-code for analysis of size measurements and derived respiration rates from experiments conducted at Hopkins Marine Station in 2013 (Experiments in a Model Ecosystem project)

Website: https://www.bco-dmo.org/dataset/630140
Data Type: experimental
Version: 2015-12-23

Project
» Environmental Variability, Functional Redundancy, and the Maintenance of Ecological Processes: Experiments in a Model Ecosystem (Experiments in a Model Ecosystem)

Contributors	Affiliation	Role
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Dataset Description

This dataset provides links to images of the respiration chamber used in the other datasets for this project and also an example of the R-code used to analyze the limpet mass and body volume data.

Growth data for animals on experimental plates in the field during 2013 was collected monthly via digital photographs and measured using ImageJ software. Respiration of limpets collected from the field during summer 2013 was measured in air or seawater at a range of temperatures for one hour or two hours.

Related Reference:

Miller, L.P., B.J. Allen, F.A. King, D.R. Chilin, V.M. Reynoso and M.W. Denny (2015). Warm microhabitats drive both increased respiration and growth rates of intertidal consumers. Marine Ecology Progress Series 522: 127-143 doi: http://dx.doi.org/10.3354/meps11117

These data are also available at the Stanford Digital Repository: https://purl.stanford.edu/mz343tz6255

Download R code: 2013_limpet_mass_analysis.R

Related Datasets (includes metadata)	Download original data files
limpet mass and body volume	2013_limpet_mass_master.csv
limpet aquatic respiration	2013_summer_aquatic_respiration_rates.csv
limpet aerial respiration	2013_summer_aerial_respiration_rates.csv

Methods & Sampling

Oxygen measurements taken using Ocean Optics FOXY fluorescence-based optode. Limpet mass data for all measured animals is included. Detailed methodology is available in Miller et al (2015).

Data Processing Description

Growth measurements were made by analyzing limpet shell projected area in ImageJ. Limpet respiration time series were used to estimate oxygen consumption rate. Complete analysis for size measurements and derived respiration rates are provided in the attached R code.

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Data Files

File
R_code_photos.csv (Comma Separated Values (.csv), 1.64 KB) MD5:81c144f4c90bddb1d4fa7009f9914ce4 Primary data file for dataset ID 630140

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Parameters

Parameter	Description	Units
description	description of the file	unitless
file_link	link to file for download	unitless

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Deployments

Denny_2013

Website	https://www.bco-dmo.org/deployment/630067
Platform	Hopkins Marine Station
Start Date	2013-01-01
End Date	2013-12-31
Description	Limpet growth and respiration studies

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Project Information

Environmental Variability, Functional Redundancy, and the Maintenance of Ecological Processes: Experiments in a Model Ecosystem (Experiments in a Model Ecosystem)

Coverage: Rocky intertidal zone; Hopkins Marine Station, Pacific Grove, CA USA

From NSF award abstract:
Functional traits of species are those that determine either species-specific responses to environmental conditions or their influence on ecological processes. Current theory suggests that communities with many species that perform a given function in a similar way but have different sensitivities to environmental conditions will exhibit greater temporal stability of ecosystem properties. So-called functional redundancy should lead to compensation among species, as some will do better when others do worse in response to environmental variability. Anthropogenic global warming is a major driver of current and anticipated changes in population dynamics, species interactions, and community structure from local to global scales. Resulting changes in biodiversity therefore have the potential to significantly alter important ecosystem properties such as productivity, nutrient cycling, and resistance to disturbance or invasion. Although ecologists have typically emphasized the response of populations and communities to changing climatic averages (e.g., increasing temperature and rainfall), global circulation models also predict significant increases in the intensity, frequency and duration of extreme weather and climate events in many parts of the world; that is, increases in the variability of the physical environment. Unfortunately, our current knowledge about the effects of increasing climatic variation on natural ecosystems is generally quite poor. Predicting how communities will likely respond to changing environmental variability has therefore been recognized as a critical research priority.

This project will advance our understanding of how projected changes in temperature variability will affect the behavior, demography, and interactions of key taxa on rocky shores, a model system for testing theoretical ecological predictions with field experiments. Environmental temperatures strongly influence the physiology, behavior, and demography of most organisms, and changes in average temperature have already been implicated in geographic range shifts of many species. A novel manipulative technique will be used to test the effects of changes in thermal variability on performance by a guild of congeneric grazing limpets, the productivity of their benthic microalgal food, and the resulting interaction strengths between the two taxa. Energy transfer among trophic levels is a key ecosystem process linked to local food-web support and rates of nutrient cycling. This research will evaluate not only species-specific effects of thermal variability on limpet survival, growth, and grazing activity, but also the potential for functional redundancy among limpet species to maintain that ecosystem function over time as environmental variability increases. Data generated from this study will provide a framework for future investigations of the consequences of climate change in this diverse and productive habitat.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1131038
NSF Division of Ocean Sciences (NSF OCE)	OCE-1130095

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