P. verrucosa growth data used to parameterize growth-rate curve

Website: https://www.bco-dmo.org/dataset/808261
Data Type: Other Field Results
Version: 1
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Project
» Collaborative Research: Ocean Acidification and Coral Reefs: Scale Dependence and Adaptive Capacity (OA coral adaptation)

Program
» Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES): Ocean Acidification (formerly CRI-OA) (SEES-OA)

Contributors	Affiliation	Role
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Abstract
P. verrucosa growth data used to parameterize growth-rate curve acquired at the Moorea LTER site, 17.5 S 149.8 W depth 10m between 2011 and 2017

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Coverage

Spatial Extent: **N**:-17.46576 **E**:-149.79617 **S**:-17.48642 **W**:-149.84559
Temporal Extent: 2011 - 2017

Dataset Description

This dataset is closely related to see related dataset:

The two data sets derive from the same quadrats, and same images of those quadrats. The data here are not available in the related LTER data set, with the exception of the variable labeled "coral". This variable is the total coral cover averaged over all the quadrats in the LTER data set, and thus can be derived from the LTER data set. This "coral" variable is included here because it is necessary for the analysis for which these individual-colony data have been assembled.

Methods & Sampling

Photoquadrats (0.5 × 0.5 m) were randomly located along a single 40-m transect permanently marked at 10-m at each of LTER sites 1 and 2 along the north shore of Mo'orea, French Polynesia. Quadrats were photographed annually in March or April. Photoquadrats were recorded using SLR cameras (Nikon) in housings (Ikelite) that were mounted on a framer. Cameras were attached to strobes (Nikonos SB 105), and images included a scale.

Data Processing Description

Photo images were screened for individual Pocillopora verrucosa colonies that could be (a) unequivocally identified as the same colony in consecutive years, (b) did not exhibit full or partial mortality (to the extent that observers could tell), and (c) remained entirely within the photographed quadrat in both years. Colony diameter was calculated as the geometric mean of the major and minor axis.

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Data Files

File
growth_data.csv (Comma Separated Values (.csv), 76.14 KB) MD5:ed2f0e8d8cf67a6fbc5ed93be17fe47a Primary data file for dataset ID 808261

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Related Publications

Hall, T. E., Freedman, A. S., de Roos, A. M., Edmunds, P. J., Carpenter, R. C., & Gross, K. (2020). Stony coral populations are more sensitive to changes in vital rates in disturbed environments.
doi:10.1101/2020.02.17.952424
Results

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Related Datasets

References

Moorea Coral Reef LTER, & Edmunds, P. (2019). MCR LTER: Coral Reef: Long-term Population and Community Dynamics: Corals, ongoing since 2005 [Data set].
doi:10.6073/PASTA/721FDCDE85B630D1B4548B677D9B1D86
https://doi.org/10.6073/pasta/721fdcde85b630d1b4548b677d9b1d86

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Parameters

Parameter	Description	Units
site	LTER site at which colony is found	unitless
ID	unique identifier for each coral colony	unitless
year	year at the beginning of measurement	unitless
d_begin	effective colony diameter at beginning of annual interval (year t)	meter (m)
d_end	effective colony diameter at end of annual interval (year t+1)	meter (m)
coral	LTER site-wide coral cover at the beginning of annual interval i.e proportion of all photo-quadrats in a site.	proportion
lat_min	minimum latitude of sampling location bounding box	decimal degrees
lat_max	maximum latitude of sampling location bounding box	decimal degrees
lon_min	minimum longitude of sampling location bounding box	decimal degrees
lon_max	maximum latitude of sampling location bounding box	decimal degrees

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Project Information

Collaborative Research: Ocean Acidification and Coral Reefs: Scale Dependence and Adaptive Capacity (OA coral adaptation)

Website: http://mcr.lternet.edu

Coverage: Moorea, French Polynesia

Extracted from the NSF award abstract:

This project focuses on the most serious threat to marine ecosystems, Ocean Acidification (OA), and addresses the problem in the most diverse and beautiful ecosystem on the planet, coral reefs. The research utilizes Moorea, French Polynesia as a model system, and builds from the NSF investment in the Moorea Coral Reef Long Term Ecological Research Site (LTER) to exploit physical and biological monitoring of coral reefs as a context for a program of studies focused on the ways in which OA will affect corals, calcified algae, and coral reef ecosystems. The project builds on a four-year NSF award with research in five new directions: (1) experiments of year-long duration, (2) studies of coral reefs to 20-m depth, (3) experiments in which carbon dioxide will be administered to plots of coral reef underwater, (4) measurements of the capacity of coral reef organisms to change through evolutionary and induced responses to improve their resistance to OA, and (5) application of emerging theories to couple studies of individual organisms to studies of whole coral reefs. Broader impacts will accrue through a better understanding of the ways in which OA will affect coral reefs that are the poster child for demonstrating climate change effects in the marine environment, and which provide income, food, and coastal protection to millions of people living in coastal areas, including in the United States.

This project focuses on the effects of Ocean Acidification on tropical coral reefs and builds on a program of research results from an existing 4-year award, and closely interfaces with the technical, hardware, and information infrastructure provided through the Moorea Coral Reef (MCR) LTER. The MCR-LTER, provides an unparalleled opportunity to partner with a study of OA effects on a coral reef with a location that arguably is better instrumented and studied in more ecological detail than any other coral reef in the world. Therefore, the results can be both contextualized by a high degree of ecological and physical relevance, and readily integrated into emerging theory seeking to predict the structure and function of coral reefs in warmer and more acidic future oceans. The existing award has involved a program of study in Moorea that has focused mostly on short-term organismic and ecological responses of corals and calcified algae, experiments conducted in mesocosms and flumes, and measurements of reef-scale calcification. This new award involves three new

technical advances: for the first time, experiments will be conducted of year-long duration in replicate outdoor flumes; CO2 treatments will be administered to fully intact reef ecosystems in situ using replicated underwater flumes; and replicated common garden cultivation techniques will be used to explore within-species genetic variation in the response to OA conditions. Together, these tools will be used to support research on corals and calcified algae in three thematic areas: (1) tests for long-term (1 year) effects of OA on growth, performance, and fitness, (2) tests for depth-dependent effects of OA on reef communities at 20-m depth where light regimes are attenuated compared to shallow water, and (3) tests for beneficial responses to OA through intrinsic, within-species genetic variability and phenotypic plasticity. Some of the key experiments in these thematic areas will be designed to exploit integral projection models (IPMs) to couple organism with community responses, and to support the use of the metabolic theory of ecology (MTE) to address scale-dependence of OA effects on coral reef organisms and the function of the communities they build.

The following publications and data resulted from this project:

Comeau S, Carpenter RC, Lantz CA, Edmunds PJ. (2016) Parameterization of the response of calcification to temperature and pCO2 in the coral Acropora pulchra and the alga Lithophyllum kotschyanum. Coral Reefs 2016. DOI 10.1007/s00338-016-1425-0.
calcification rates (2014)
calcification rates (2010)

Comeau, S., Carpenter, R.C., Edmunds, P.J. (2016) Effects of pCO2 on photosynthesis and respiration of tropical scleractinian corals and calcified algae. ICES Journal of Marine Science doi:10.1093/icesjms/fsv267.
respiration and photosynthesis I
respiration and photosynthesis II

Evensen, N.R. & Edmunds P. J. (2016) Interactive effects of ocean acidification and neighboring corals on the growth of Pocillopora verrucosa. Marine Biology, 163:148. doi: 10.1007/s00227-016-2921-z
coral growth
seawater chemistry
coral colony interactions

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Program Information

Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES): Ocean Acidification (formerly CRI-OA) (SEES-OA)

Website: https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503477

Coverage: global

NSF Climate Research Investment (CRI) activities that were initiated in 2010 are now included under Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES). SEES is a portfolio of activities that highlights NSF's unique role in helping society address the challenge(s) of achieving sustainability. Detailed information about the SEES program is available from NSF (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504707).

In recognition of the need for basic research concerning the nature, extent and impact of ocean acidification on oceanic environments in the past, present and future, the goal of the SEES: OA program is to understand (a) the chemistry and physical chemistry of ocean acidification; (b) how ocean acidification interacts with processes at the organismal level; and (c) how the earth system history informs our understanding of the effects of ocean acidification on the present day and future ocean.

Solicitations issued under this program:
NSF 10-530, FY 2010-FY2011
NSF 12-500, FY 2012
NSF 12-600, FY 2013
NSF 13-586, FY 2014

NSF 13-586 was the final solicitation that will be released for this program.

PI Meetings:
1st U.S. Ocean Acidification PI Meeting(March 22-24, 2011, Woods Hole, MA)
2nd U.S. Ocean Acidification PI Meeting(Sept. 18-20, 2013, Washington, DC)
3rd U.S. Ocean Acidification PI Meeting (June 9-11, 2015, Woods Hole, MA – Tentative)

NSF media releases for the Ocean Acidification Program:

Press Release 10-186 NSF Awards Grants to Study Effects of Ocean Acidification

Discovery Blue Mussels "Hang On" Along Rocky Shores: For How Long?

Discovery nsf.gov - National Science Foundation (NSF) Discoveries - Trouble in Paradise: Ocean Acidification This Way Comes - US National Science Foundation (NSF)

Press Release 12-179 nsf.gov - National Science Foundation (NSF) News - Ocean Acidification: Finding New Answers Through National Science Foundation Research Grants - US National Science Foundation (NSF)

Press Release 13-102 World Oceans Month Brings Mixed News for Oysters

Press Release 13-108 nsf.gov - National Science Foundation (NSF) News - Natural Underwater Springs Show How Coral Reefs Respond to Ocean Acidification - US National Science Foundation (NSF)

Press Release 13-148 Ocean acidification: Making new discoveries through National Science Foundation research grants

Press Release 13-148 - Video nsf.gov - News - Video - NSF Ocean Sciences Division Director David Conover answers questions about ocean acidification. - US National Science Foundation (NSF)

Press Release 14-010 nsf.gov - National Science Foundation (NSF) News - Palau's coral reefs surprisingly resistant to ocean acidification - US National Science Foundation (NSF)

Press Release 14-116 nsf.gov - National Science Foundation (NSF) News - Ocean Acidification: NSF awards $11.4 million in new grants to study effects on marine ecosystems - US National Science Foundation (NSF)

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1415300

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