

# Linear growth of individual Montipora and Porites corals competing for space in Moorea, French Polynesia during 2010 (OA Corals project)

**Website:** <https://www.bco-dmo.org/dataset/640126>

**Data Type:** experimental

**Version:** 2016-03-10

## Project

» [RUI: Ocean Acidification- Category 1- The effects of ocean acidification on the organismic biology and community ecology of corals, calcified algae, and coral reefs](#) (OA\_Corals)

## 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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## Dataset Description

Two laboratory experiments were completed using *Porites lutea* and *Montipora aequituberculata* from back and fringing reef habitats. First, in Moorea, French Polynesia, we evaluated the efficacy of linear extension as a dependent variable characterizing the response of corals in competitive encounters, as well as a means to test for an effect of elevated pCO<sub>2</sub> on linear extension. Second, at Sesoko Island, Okinawa, we applied the techniques developed in Moorea to test the effects of elevated pCO<sub>2</sub> on the ability of corals to compete with one another for space.

### Related Reference:

Evensen, Nicolas R., Peter J. Edmunds, Kazuhiko Sakai. Effects of pCO<sub>2</sub> on spatial competition between the corals *Montipora aequituberculata* and *Porites lutea*. MEPS 541:123-134 (2015) doi:10.3354/meps11512.

### Related Datasets:

[MEPS 2015: chemistry](#)

[MEPS 2015: field survey](#)

## Methods & Sampling

The ecological relevance of interactions between *M. aequituberculata* and *P. lutea* lies in the common occurrence of these corals in shallow reef habitats, and the frequency with which they encounter one another, as observed during preliminary field observations. To quantify these effects, we evaluated coral community structure in the back reef of Moorea along the East and West shores that are sampled annually as part of the Moorea Coral Reef LTER (Edmunds 2013). Photoquadrats recorded in the back reef of these shores (at LTER sites 3 and 6) in 2010, and analyzed for coral cover using Coral Point Count [CPCe] software [Kohler & Gill 2006]), were used to quantify the abundance of *Montipora* and massive *Porites*. These images were also used for an additional analysis in which colonies of *Porites* and *Montipora* were scored for contact with one another. All colonies of *Porites* and *Montipora* were evaluated for contact, with contact scored when colonies were < 5 mm from one another, and these points of contact inferred to be sites of interspecific competition. The number of colonies of each taxon involved in interspecific competition was expressed as a percentage of the total number of colonies in each taxon that were present in all the photoquadrats evaluated. It was however not possible to determine the outcome (i.e., which colony was dominant versus subordinate) of most competitive encounters in the planar photographs.

For further details, see Evenson et al (2015)

## Data Processing Description

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## Data Files

File
<b>linear_ext.csv</b> (Comma Separated Values (.csv), 12.33 KB) MD5:907664d579ec8419bea03988e48dd577
Primary data file for dataset ID 640126

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## Parameters

Parameter	Description	Units
location	survey location	unitless
lat	latitude; north is positive	degrees Celsius
lon	longitude; east is positive	degrees Celsius
species	coral species name	unitless
tile	tile number on which the corals were paired	integer
tank	number of tank the tiles were placed in	integer
treatment_pCO2	whether tank was exposed to high or ambient pCO2 levels (Ambient = ~400 $\mu$ atm; High = ~1000 $\mu$ atm)	unitless
arrangement	competitive arrangements in which the coral measured was placed: M_D = control pairing (Montipora-Dead coral); M_M = intraspecific pairing (Montipora-Montipora); M_P = interspecific (Montipora-Porites)	unitless
linear_extension_mm	total linear growth (mm) of individual corals over the course of the incubation	millimeters
daily_extension_microns	the linear extension divided by the number of days of incubation	microns

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## Instruments

<b>Dataset-specific Instrument Name</b>	
<b>Generic Instrument Name</b>	Camera
<b>Dataset-specific Description</b>	Digital camera (Nikon D70, 6.1 Megapixel resolution) fitted with a macro lens (Nikon 60 mm 265" f/2.8D).
<b>Generic Instrument Description</b>	All types of photographic equipment including stills, video, film and digital systems.

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## Deployments

### MCR\_Edmunds

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/640059">https://www.bco-dmo.org/deployment/640059</a>
<b>Platform</b>	Richard B Gump Research Station - Moorea LTER
<b>Start Date</b>	2010-01-01
<b>End Date</b>	2016-12-31
<b>Description</b>	Ongoing studies on corals

### Edmunds\_TBRC\_Okinawa

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/640067">https://www.bco-dmo.org/deployment/640067</a>
<b>Platform</b>	TBRC_Sesoko_Is_Okinawa
<b>Start Date</b>	2010-01-01
<b>End Date</b>	2016-12-31
<b>Description</b>	Ongoing studies on corals

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## Project Information

**RUI: Ocean Acidification- Category 1- The effects of ocean acidification on the organismic biology and community ecology of corals, calcified algae, and coral reefs (OA\_Corals)**

**Coverage:** Moorea, French Polynesia

While coral reefs have undergone unprecedented changes in community structure in the past 50 y, they now may be exposed to their gravest threat since the Triassic. This threat is increasing atmospheric CO<sub>2</sub>, which equilibrates with seawater and causes ocean acidification (OA). In the marine environment, the resulting decline in carbonate saturation state (Omega) makes it energetically less feasible for calcifying taxa to mineralize; this is a major concern for coral reefs. It is possible that the scleractinian architects of reefs will cease to exist as a mineralized taxon within a century, and that calcifying algae will be severely impaired. While there is a rush to

understand these effects and make recommendations leading to their mitigation, these efforts are influenced strongly by the notion that the impacts of pCO<sub>2</sub> (which causes Omega to change) on calcifying taxa, and the mechanisms that drive them, are well-known. The investigators believe that many of the key processes of mineralization on reefs that are potentially affected by OA are only poorly known and that current knowledge is inadequate to support the scaling of OA effects to the community level. It is vital to measure organismal-scale calcification of key taxa, elucidate the mechanistic bases of these responses, evaluate community scale calcification, and finally, to conduct focused experiments to describe the functional relationships between these scales of mineralization.

This project is a 4-y effort focused on the effects of Ocean Acidification (OA) on coral reefs at multiple spatial and functional scales. The project focuses on the corals, calcified algae, and coral reefs of Moorea, French Polynesia, establishes baseline community-wide calcification data for the detection of OA effects on a decadal-scale, and builds on the research context and climate change focus of the Moorea Coral Reef LTER.

This project is a hypothesis-driven approach to compare the effects of OA on reef taxa and coral reefs in Moorea. The PIs will utilize microcosms to address the impacts and mechanisms of OA on biological processes, as well as the ecological processes shaping community structure. Additionally, studies of reef-wide metabolism will be used to evaluate the impacts of OA on intact reef ecosystems, to provide a context within which the experimental investigations can be scaled to the real world, and critically, to provide a much needed reference against which future changes can be gauged.

**Datasets listed in the "Dataset Collection" section include references to results journal publications published as part of this project.**

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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](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](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**

<b>Funding Source</b>	<b>Award</b>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1041270</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1236905</a>

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