

Light measurements from coral-light experiments (Dufault, 2013, JEB) from Taiwan, 2010 (MCR LTER project, Climate_Coral_Larvae project)

Website: <https://www.bco-dmo.org/dataset/527500>

Version: 2014-08-30

Project

- » [Moorea Coral Reef Long-Term Ecological Research site](#) (MCR LTER)
- » [The ecophysiological basis of the response of coral larvae and early life history stages to global climate change](#) (Climate_Coral_Larvae)

Program

- » [Long Term Ecological Research network](#) (LTER)

Contributors	Affiliation	Role
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Table of Contents

- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Program Information](#)
- [Funding](#)

Dataset Description

The effect of light and PCO₂ on the calcification and survival of *Pocillopora damicornis* recruits settled from larvae released in southern Taiwan was tested.

These data include the irradiance (PAR) measurements for each light treatment in each of the tanks over the duration of the experiment.

Related datasets:

- [coral-light expt.- carbonate chemistry](#)
- [coral-light expt.- temp_salinity](#)
- [coral-light expt.- growth](#)
- [coral-light expt.- protein](#)
- [coral-light expt.- survival](#)

These data were published in Aaron M Dufault, Aaron Ninokawa, Lorenzo Bramanti, Vivian R Cumbo, Tung-Yung Fan, Peter J Edmunds (2013) The role of light in mediating the effects of ocean acidification on coral calcification. *Journal of Experimental Biology* 216: 1570-1577. doi:10.1242/jeb.080549

[Download complete data for this publication \(Excel file\)](#)

Methods & Sampling

In March 2011 and June 2012, recruits were incubated at 31, 41, 70, 122 and 226 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ under ambient (493 μatm) and high PCO₂ (878 μatm). After 5 days, calcification was measured gravimetrically and survivorship estimated as the number of living recruits.

Light inside each container was measured twice daily using a small (1 mm diameter) cosine-corrected PAR sensor attached to a pulse amplitude-modulated fluorometer (Diving-PAM, Heinz Walz GmbH, Effeltrich, Germany). The small size of the sensor allowed light to be measured ~1 cm above the coral recruits while they were inside the plastic container and beneath the treatment lids. This sensor was calibrated using a separate light meter (LI-1400 Datalogger fitted with a LI-192 sensor, LI-COR Biosciences).

Data Processing Description

BCO-DMO processing notes:

- combined expt. 1 and 2
- added conventional header with dataset name, PI name, version date, reference information
- renamed parameters to BCO-DMO standard
- added lab, lat, lon, expt columns
- added days values for expt. 1
- changed values in expt 2 treatment_light from percent to integers to match expt. 1
- sorted by expt, treatment_pCO₂, tank, days, time

[[table of contents](#) | [back to top](#)]

Data Files

File
light.csv (Comma Separated Values (.csv), 26.19 KB) MD5:c6b72e1fe27a60716960f808d289e2ae
Primary data file for dataset ID 527500

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
lab	laboratory	unitless
lat	latitude; north is positive	degrees
lon	longitude; east is positive	degrees
expt	experiment identification number	unitless
tank	tank identification number	unitless
treatment_pCO2	relative partial pressure of carbon dioxide (pCO2) target for treatment	unitless
days	number of days into the experiment	days
date	date	yyyy/mm/dd
time	time	HHMM
treatment_light	light level for treatment	umol photons/m2/s
PAR	photosynthetically active radiation	uE/cm^2/sec

[[table of contents](#) | [back to top](#)]

Instruments

Dataset-specific Instrument Name	Fluorometer
Generic Instrument Name	Fluorometer
Dataset-specific Description	Pulse amplitude-modulated fluorometer (Diving-PAM, Heinz Walz GmbH, Effeltrich, Germany)
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

Dataset-specific Instrument Name	Light Meter
Generic Instrument Name	Light Meter
Dataset-specific Description	LI-1400 Datalogger fitted with a LI-192 sensor, LI-COR Biosciences
Generic Instrument Description	Light meters are instruments that measure light intensity. Common units of measure for light intensity are umol/m2/s or uE/m2/s (micromoles per meter squared per second or microEinsteins per meter squared per second). (example: LI-COR 250A)

Dataset-specific Instrument Name	PAR sensor
Generic Instrument Name	Photosynthetically Available Radiation Sensor
Generic Instrument Description	A PAR sensor measures photosynthetically available (or active) radiation. The sensor measures photon flux density (photons per second per square meter) within the visible wavelength range (typically 400 to 700 nanometers). PAR gives an indication of the total energy available to plants for photosynthesis. This instrument name is used when specific type, make and model are not known.

[[table of contents](#) | [back to top](#)]

Deployments

lab_Edmunds_NMMBA

Website	https://www.bco-dmo.org/deployment/58892
Platform	Natl Museum Mar. Bio. and Aquar. Taiwan
Start Date	2010-03-18
End Date	2010-03-24
Description	Experiments related to the research project: 'RUI- The ecophysiological basis of the response of coral larvae and early life history stages to global climate change' were conducted at the laboratories of the National Museum of Marine Biology and Aquarium in Southern Taiwan.

[[table of contents](#) | [back to top](#)]

Project Information

Moorea Coral Reef Long-Term Ecological Research site (MCR LTER)

Website: <http://mcr.lternet.edu/>

Coverage: Island of Moorea, French Polynesia

From <http://www.lternet.edu/sites/mcr/> and <http://mcr.lternet.edu/>:

The Moorea Coral Reef LTER site encompasses the coral reef complex that surrounds the island of Moorea, French Polynesia (17°30'S, 149°50'W). Moorea is a small, triangular volcanic island 20 km west of Tahiti in the Society Islands of French Polynesia. An offshore barrier reef forms a system of shallow (mean depth ~ 5-7 m), narrow (~0.8-1.5 km wide) lagoons around the 60 km perimeter of Moorea. All major coral reef types (e.g., fringing reef, lagoon patch reefs, back reef, barrier reef and fore reef) are present and accessible by small boat.

The MCR LTER was established in 2004 by the US National Science Foundation (NSF) and is a partnership between the University of California Santa Barbara and California State University, Northridge. MCR researchers include marine scientists from the UC Santa Barbara, CSU Northridge, UC Davis, UC Santa Cruz, UC San Diego, CSU San Marcos, Duke University and the University of Hawaii. Field operations are conducted from the UC Berkeley Richard B. Gump South Pacific Research Station on the island of Moorea, French Polynesia.

MCR LTER Data: The Moorea Coral Reef (MCR) LTER data are managed by and available directly from the MCR project data site URL shown above. The datasets listed below were collected at or near the MCR LTER sampling locations, and funded by NSF OCE as ancillary projects related to the MCR LTER core research themes.

This project is supported by continuing grants with slight name variations:

LTER: Long-Term Dynamics of a Coral Reef Ecosystem
LTER: MCR II - Long-Term Dynamics of a Coral Reef Ecosystem
LTER: MCR IIB: Long-Term Dynamics of a Coral Reef Ecosystem
LTER: MCR III: Long-Term Dynamics of a Coral Reef Ecosystem
LTER: MCR IV: Long-Term Dynamics of a Coral Reef Ecosystem

The ecophysiological basis of the response of coral larvae and early life history stages to global climate change (Climate_Coral_Larvae)

Coverage: Moorea, French Polynesia; Southern Taiwan; California State University Northridge

Tropical coral reefs face a suite of environmental assaults ranging from anchor damage to the effects of global climate change (GCC). The consequences are evident throughout the tropics, where many coral reefs have lost a substantial fraction of their coral cover in a few decades. Notwithstanding the importance of reducing the impacts of environmental stresses, the only means by which these ecosystems can recover (or simply persist) is through the recruitment of scleractinians, which is a function of successful larval development, delivery, settlement, metamorphosis, and post-settlement events. Despite wide recognition of the importance of these processes, there are few pertinent empirical data, and virtually none that address the mechanisms mediating the success of early coral life stages in a physical environment varying at multiple spatio-temporal scales.

The objective of this research is to complete one of the first comprehensive ecophysiological analyses of the early life stages of corals through a description of: (1) their functionality under 'normal' conditions, and (2) their response to the main drivers of GCC. These analyses will be completed for 2 species representative of a brooding life history strategy, and the experiments will be completed in two locations, one (Taiwan) that provides unrivalled experience in coral reproductive biology, and superb microcosm facilities, and the other (Moorea), with access to a relatively pristine environment, a well described ecological and oceanographic context (through the MCR-LTER), and the capacity to bring a strong biogeographic contrast to the project. The results of the study will be integrated through modeling to explore the effects of GCC on coral community structure over the next century.

The following publications and data resulted from this project:

2013 Wall CB, Fan TY, Edmunds PJ. Ocean acidification has no effect on thermal bleaching in the coral *Seriatopora calandrum*. Coral Reefs 33: 119-130.
[Symbiodinium_Seriatopora_photosynthesis](#)
[Symbiodinium_Seriatopora_PI_curve](#)
[Symbiodinium_Seriatopora_temp-salinity-light](#)
[Symbiodinium_Seriatopora_water_chemistry](#)
[- Download complete data for this publication \(Excel file\)](#)

2013 Wall CB, Edmunds PJ. *In situ* effects of low pH and elevated HCO₃⁻ on juvenile *Porites* spp. in Moorea, French Polynesia. Biological Bulletin 225:92-101.
Data at MCR and PANGAEA: [doi:10.1594/PANGAEA.833913](https://doi.org/10.1594/PANGAEA.833913)
[- Download complete data for this publication \(Excel file\)](#)

2013 Vivian R Cumbo, Peter J Edmunds, Christopher B Wall, Tung-Yung Fan. Brooded coral larvae differ in their response to high temperature and elevated pCO₂ depending on the day of release. Marine Biology DOI 10.1007/s00227-013-2280-y.
Data also at PANGAEA: [doi:10.1594/PANGAEA.831612](https://doi.org/10.1594/PANGAEA.831612)
[brooded coral larvae 2 - carbonate chemistry](#)
[brooded coral larvae 2 - larval release March 2003-2008](#)
[brooded coral larvae 2 - respiration_photosynth_mortality](#)
[- Download complete data for this publication \(Excel file\)](#)

2013 Edmunds PJ, Cumbo VR, Fan TY. Metabolic costs of larval settlement and metamorphosis in the coral *Seriatopora calandrum* under ambient and elevated pCO₂. Journal Experimental Marine Biology and Ecology 443: 33-38 Data also at PANGAEA: [doi:10.1594/PANGAEA.821644](https://doi.org/10.1594/PANGAEA.821644)
[Coral post-settlement physiology](#)
[- Download complete data for this publication \(Excel file\)](#)

2013 Aaron M Dufault, Aaron Ninokawa, Lorenzo Bramanti, Vivian R Cumbo, Tung-Yung Fan, Peter J Edmunds. The role of light in mediating the effects of ocean acidification on coral calcification. Journal of Experimental Biology 216: 1570-1577.
[coral-light expt.- PAR](#)
[coral-light expt.- carbonate chemistry](#)
[coral-light expt.- temp_salinity](#)
[coral-light expt.- growth](#)
[coral-light expt.- protein](#)
[coral-light expt.- survival](#)
[- Download complete data for this publication \(Excel file\)](#)

2012 Cumbo, VR, Fan TY, Edmunds PJ. Effects of exposure duration on the response of *Pocillopora damicornis* larvae to elevated temperature and high pCO₂. J Exp Mar Biol Ecol 439: 100-107.
Data is also at PANGAEA: [doi:10.1594/PANGAEA.823582](https://doi.org/10.1594/PANGAEA.823582)
[brooded coral larvae 3 - carbonate chemistry](#)
[brooded coral larvae 3 - light](#)
[brooded coral larvae 3 - mortality](#)
[brooded coral larvae 3 - protein](#)
[brooded coral larvae 3 - respiration and protein](#)
[brooded coral larvae 3 - respiration raw data](#)
[brooded coral larvae 3 - symbiont density](#)
[brooded coral larvae 3 - tank temperature](#)
[- Download part 1 of data for this publication \(Excel file\)](#)
[- Download tank parameters data for this publication \(Excel file\)](#)

2012 Cumbo, VR, Fan TY, Edmunds PJ. Physiological development of brooded larvae from two pocilloporid corals in Taiwan. Marine Biology 159: 2853-2866.
[brooded coral - carbonate chemistry](#)
[brooded coral - release](#)
[brooded coral - respiration](#)
[brooded coral - settlement competency](#)
[brooded coral - size July](#)
[brooded coral - size protein symbionts_photosynth](#)
[- Download complete data for this publication \(Excel file\)](#)

2012 Dufault, Aaron M; Vivian R Cumbo; Tung-Yung Fan; Peter J Edmunds. Effects of diurnally oscillating pCO₂ on the calcification and survival of coral recruits. Royal Society of London (B) 279: 2951-2958. doi:10.1098/rspb.2011.2545
Data is also at PANGAEA: [doi:10.1594/PANGAEA.830185](https://doi.org/10.1594/PANGAEA.830185)
[recruit_growth_area](#)
[recruit_growth_weight](#)
[recruit_seawater_chemistry](#)
[recruit_survival](#)
[- Download complete data for this publication \(Excel file\)](#)

2011 Edmunds PJ, Cumbo V, Fan TY. Effects of temperature on the respiration of brooded larvae from tropical reef corals. *Journal of Experimental Biology* 214: 2783-2790.
[CorallArvae_comparison_respir](#)
[CorallArvae_release](#)
[CorallArvae_respir](#)
[CorallArvae_size](#)
[- Download complete data for this publication \(Excel file\)](#)

[[table of contents](#) | [back to top](#)]

Program Information

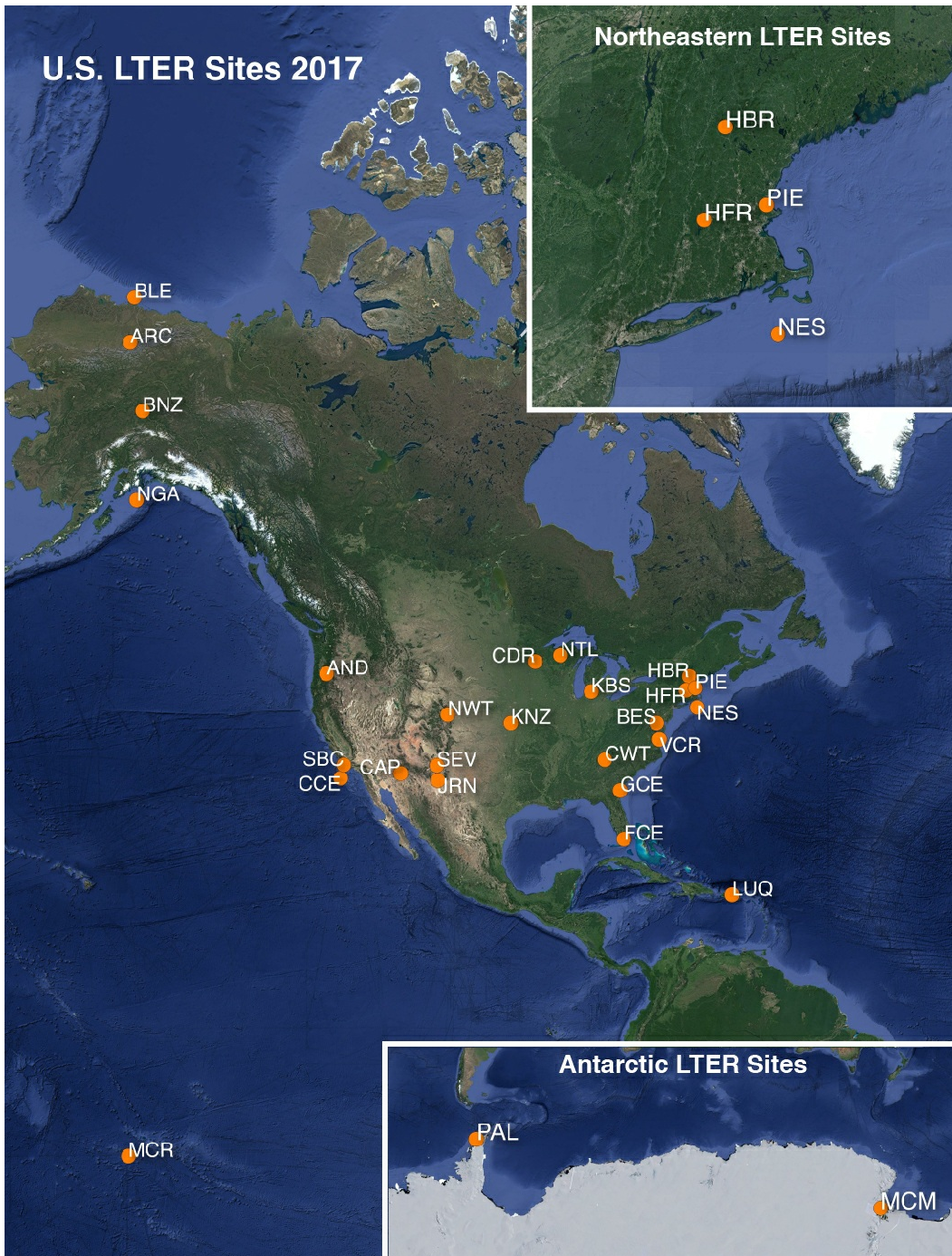
Long Term Ecological Research network (LTER)

Website: <http://www.lternet.edu/>

Coverage: United States

adapted from <http://www.lternet.edu/>

The National Science Foundation established the LTER program in 1980 to support research on long-term ecological phenomena in the United States. The Long Term Ecological Research (LTER) Network is a collaborative effort involving more than 1800 scientists and students investigating ecological processes over long temporal and broad spatial scales. The LTER Network promotes synthesis and comparative research across sites and ecosystems and among other related national and international research programs. The LTER research sites represent diverse ecosystems with emphasis on different research themes, and cross-site communication, network publications, and research-planning activities are coordinated through the LTER Network Office.



Site Codes

- AND Andrews Forest LTER
- ARC Arctic LTER
- BES Baltimore Ecosystem Stu
- BLE Beaufort Lagoon Ecosystems LTER
- BNZ Bonanza Creek LTER
- CCE California Current Ecosystem LTER
- CDR Cedar Creek Ecosystem Science Reserve
- CAP Central Arizona-Phoenix LTER
- CWT Coweeta LTER
- FCE Florida Coastal Everglades LTER
- GCE Georgia Coastal Ecosystems LTER
- HFR Harvard Forest LTER
- HBR Hubbard Brook LTER
- JRN Jornada Basin LTER
- KBS Kellogg Biological Station LTER
- KNZ Konza Prairie LTER
- LUQ Luquillo LTER
- MCM McMurdo Dry Valleys LT
- MCR Moorea Coral Reef LTER
- NWT Niwot Ridge LTER
- NTL North Temperate Lakes I
- NES Northeast U.S. Shelf LTER
- NGA Northern Gulf of Alaska I
- PAL Palmer Antarctica LTER
- PIE Plum Island Ecosystems LTER
- SBC Santa Barbara Coastal L
- SEV Sevilleta LTER
- VCR Virginia Coast Reserve L

2017 LTER research site map obtained from <https://lternet.edu/site/lter-network/>

[[table of contents](#) | [back to top](#)]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0844785

[[table of contents](#) | [back to top](#)]