

Brooded coral larval respiration (Cumbo, 2012) from Taiwan 2010 (MCR LTER project, Climate_Coral_Larvae project)

Website: <https://www.bco-dmo.org/dataset/528695>

Version: 2014-09-08

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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Dataset Description

The physiological development of brooded larvae from the pocilloporid corals *Pocillopora damicornis* and *Seriatopora caliendrum* in southern Taiwan was examined.

These data include larval respiration rates from experiments conducted in June and July, 2010.

Related datasets:

[brooded coral - carbonate chemistry](#)

[brooded coral - release](#)

[brooded coral - settlement competency](#)

[brooded coral - size July](#)

[brooded coral - size protein symbionts photosynth](#)

These data are published in Cumbo, VR, Fan TY, Edmunds PJ. (2012) Physiological development of brooded larvae from two pocilloporid corals in Taiwan. *Marine Biology* 159: 2853-2866. DOI 10.1007/s00227-012-2046-y. See Figs. 1d and 3e.

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

Methods & Sampling

Dark respiration of larvae Larval respiration was measured as O₂ uptake by a group of 6 swimming larvae in Wheaton vials (2 mL) that were incubated in darkness at the same temperature as the treatments (~28C) (Edmunds et al. 2011). O₂ was measured using a ruthenium-based optrode (FOXY-R, 1.58 diameter, Ocean Optics) connected to a spectrophotometer (USB2000, Ocean Optics) and interfaced with a computer running Ocean Optics software (O2Sensor, version 1.00.08). The optrode was two-point calibrated in a zero solution (sodium sulfite and 0.010 mol L⁻¹ sodium tetraborate) and water-saturated air at the experimental temperature. At each sampling, four replicates of 6 larvae were placed in Wheaton vials filled with filtered seawater (1 l, FSW) and sealed with Parafilm; these were accompanied by four control vials that were processed in an identical manner but without larvae. The O₂ saturation of the water used to fill the vials was recorded using the optrode and again in each vial following incubations lasting 1.5-2.0 h. The incubations were completed in a temperature-regulated bath (±0.1C, Hipoint, models LC-06), and the vials were inverted prior to measuring O₂ saturation; larval motility during the incubations prevented the formation of boundary layers. O₂ saturation was converted to concentration using gas tables [N. Ramsing and J. Gundersen at <http://www.unisense.com> (based on Garcia and Gordon 1992)], and the temperature and salinity of the seawater, and the change in O₂ concentration converted to nmol O₂ min⁻¹ larva⁻¹ after adjusting for control O₂ fluxes.

Data Processing Description

BCO-DMO processing notes:

- added conventional header with dataset name, PI name, version date, reference information
- added lab, lat, lon, expt columns
- renamed parameters to BCO-DMO standard
- combined data from Figures 1d and 3e

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Data Files

File
brood_respiration.csv (Comma Separated Values (.csv), 18.87 KB) MD5:14605e477d44ef5eb180996dd82376ca
Primary data file for dataset ID 528695

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Parameters

Parameter	Description	Units
expt	experiment id	unitless
lab	laboratory	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
date	local date of measurement	yyyy-mm-dd
lunar_day	lunar day of measurement	integer
treatment	whether tank contained larvae or not	unitless
tank	tank id number	integer
replicate	replicate id number	integer
release	larval release relative to full moon: early, peak, or late; N_A = not applicable	unitless
temp	seawater temperature	degrees Celsius
species	coral species name	unitless
num_larvae	number of larvae in respiration chamber	integer
vo_chamber	volume of respiration chamber	ml
duration	duration of respiration incubation	minutes
O2_sat_pcmt_start	oxygen saturation relative to air at start of incubation	percent
O2_sat_pcmt_final	oxygen saturation relative to air at end of incubation	percent
respiration	respiration rate (6 larvae/chamber)	umol O2/chamber/hr

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Instruments

Dataset-specific Instrument Name	water bath
Generic Instrument Name	In-situ incubator
Dataset-specific Description	A temperature-regulated bath ($\pm 0.1C$, Hipoint, models LC-06)
Generic Instrument Description	A device on a ship or in the laboratory that holds water samples under controlled conditions of temperature and possibly illumination.

Dataset-specific Instrument Name	optrode
Generic Instrument Name	Optode
Dataset-specific Description	A ruthenium-based optrode (FOXY-R, 1.58 diameter, Ocean Optics) connected to a spectrophotometer (USB2000, Ocean Optics) and interfaced with a computer running Ocean Optics software (OOISensor, version 1.00.08).
Generic Instrument Description	An optode or optrode is an optical sensor device that optically measures a specific substance usually with the aid of a chemical transducer.

Dataset-specific Instrument Name	spectrophotometer
Generic Instrument Name	Spectrophotometer
Dataset-specific Description	USB2000, Ocean Optics
Generic Instrument Description	An instrument used to measure the relative absorption of electromagnetic radiation of different wavelengths in the near infra-red, visible and ultraviolet wavebands by samples.

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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.

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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.pangaea.de/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.pangaea.de/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 \(Excel file\)](#)

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Program Information

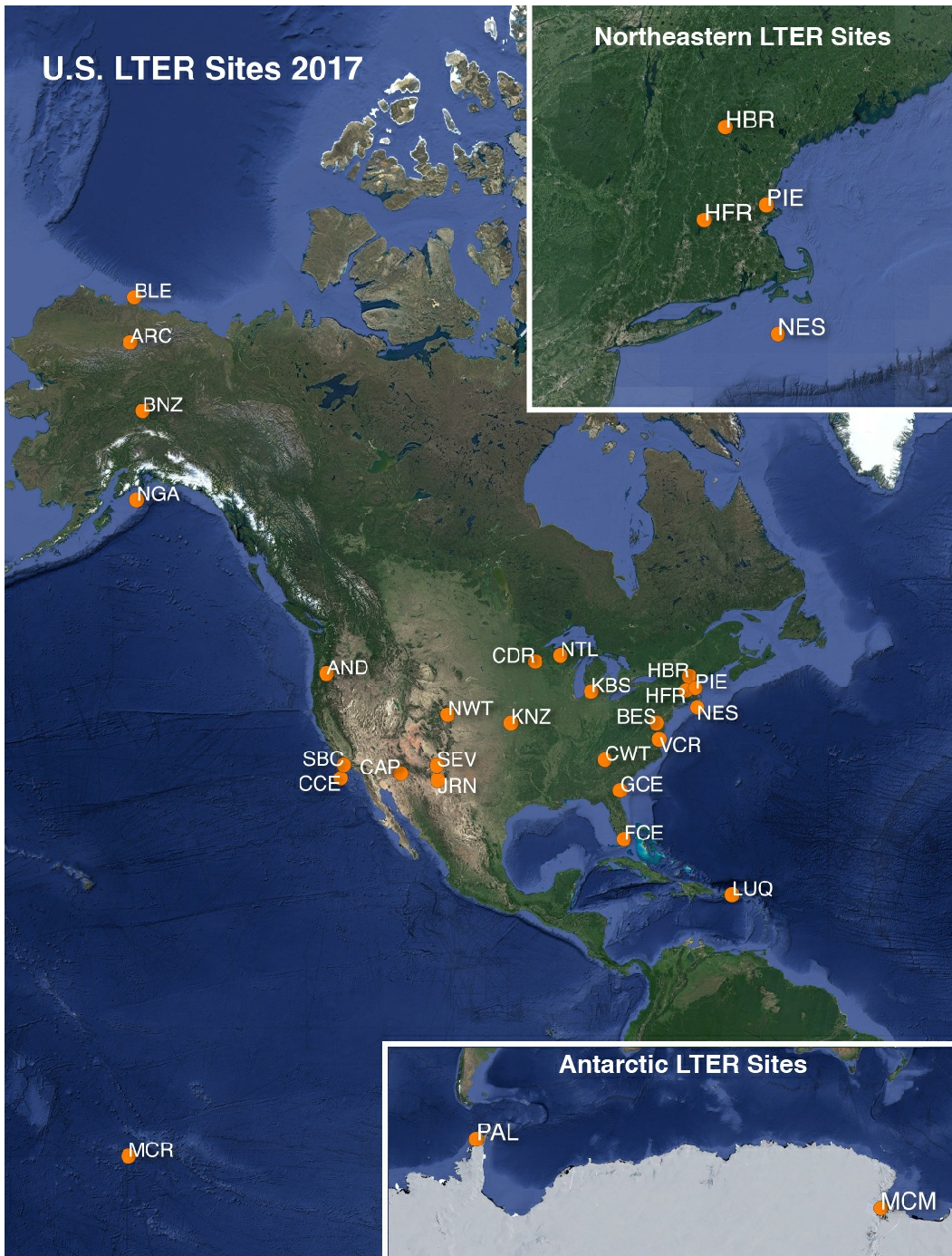
Long Term Ecological Research network (LTER)

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/>

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Funding

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

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