

# Brooded coral larval release schedule relative to lunar day from *P. damicornis* and *S. caliendrum* in Taiwan, June and July 2010 (Cumbo, 2012) (MCR LTER project, Climate\_Coral\_Larvae project)

Website: <https://www.bco-dmo.org/dataset/528641>

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
<a href="#">Edmunds, Peter J.</a>	California State University Northridge (CSUN)	Principal Investigator
<a href="#">Cumbo, Vivian R.</a>	California State University Northridge (CSUN)	Scientist
<a href="#">Copley, Nancy</a>	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

## Table of Contents

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

## 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 the larval release schedule relative to lunar day in June and July, 2010.

### Related datasets:

[brooded coral - carbonate chemistry](#)

[brooded coral - respiration](#)

[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. 1a and 2.

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

## Methods & Sampling

In June, larvae were harvested from 11 colonies of *P. damicornis* and 12 colonies of *S. caliendrum* collected from 5 m depth at Hobihu Reef (Nanwan Bay) on June 11, one day before the new moon. In July, 12 colonies of *P. damicornis* were collected from the same location on 9 July 2011, 2 days before the new moon. All colonies were ~20-cm diameter and were transported to the National Museum of Marine Biology and Aquarium (NMMBA) and placed in individual flow-through aquaria for larval release. In the larval release area, aquaria were supplied with filtered seawater (~50 l/m) and exposed to sunlight shaded to a mean maximum intensity of photosynthetically active radiation (PAR, 400-700 nm) at 1200 hours of ~121 μmol quanta m<sup>-2</sup> s<sup>-1</sup> (measured with a LiCor LI-192SA sensor). Larvae were collected in catchers fitted with plankton mesh (110 μm) and positioned to receive seawater overflowing from each aquarium. Catchers were inspected at 0600 hours for *S. caliendrum* and 0745 hours for *P. damicornis*, and any larvae found were counted. The earlier collection time for *S. caliendrum* was necessary to obtain swimming larvae prior to their rapid settlement.

## 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 1a and 2

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

## Data Files

File
<b>brood_release.csv</b> (Comma Separated Values (.csv), 39.86 KB) MD5:2bf0e3c26c1a4fd86d4b7a6088f909a8
Primary data file for dataset ID 528641

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

## 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
species	coral species name	unitless
date	local date of measurement	yyyy-mm-dd
lunar_day	lunar day of measurement	integer
colony_num	number of colonies	integer
larvae_released	number of larvae released	integer
comments	comments	unitless

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

## Instruments

<b>Dataset-specific Instrument Name</b>	LI-COR LI-192SA PAR
<b>Generic Instrument Name</b>	LI-COR LI-192 PAR Sensor
<b>Dataset-specific Description</b>	LI-COR LI-192 SA sensor
<b>Generic Instrument Description</b>	The LI-192 Underwater Quantum Sensor (UWQ) measures underwater or atmospheric Photon Flux Density (PPFD) (Photosynthetically Available Radiation from 360 degrees) using a Silicon Photodiode and glass filters encased in a waterproof housing. The LI-192 is cosine corrected and features corrosion resistant, rugged construction for use in freshwater or saltwater and pressures up to 800 psi (5500 kPa, 560 meters depth). Typical output is in $\mu\text{m s}^{-1} \text{m}^{-2}$ . The LI-192 uses computer-tailored filter glass to achieve the desired quantum response. Calibration is traceable to NIST. The LI-192 serial numbers begin with UWQ-XXXXX. LI-COR has been producing Underwater Quantum Sensors since 1973. These LI-192 sensors are typically listed as LI-192SA to designate the 2-pin connector on the base of the housing and require an Underwater Cable (LI-COR part number 2222UWB) to connect to the pins on the Sensor and connect to a data recording device. The LI-192 differs from the LI-193 primarily in sensitivity and angular response. 193: Sensitivity: Typically 7 $\mu\text{A}$ per 1000 $\mu\text{mol s}^{-1} \text{m}^{-2}$ in water. Azimuth: $< \pm 3\%$ error over $360^\circ$ at $90^\circ$ from normal axis. Angular Response: $< \pm 4\%$ error up to $\pm 90^\circ$ from normal axis. 192: Sensitivity: Typically 4 $\mu\text{A}$ per 1000 $\mu\text{mol s}^{-1} \text{m}^{-2}$ in water. Azimuth: $< \pm 1\%$ error over $360^\circ$ at $45^\circ$ elevation. Cosine Correction: Optimized for underwater and atmospheric use. ( <a href="http://www.lcor.com">www.lcor.com</a> )

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

## Deployments

### lab\_Edmunds\_NMMBA

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58892">https://www.bco-dmo.org/deployment/58892</a>
<b>Platform</b>	Natl Museum Mar. Bio. and Aquar. Taiwan
<b>Start Date</b>	2010-03-18
<b>End Date</b>	2010-03-24
<b>Description</b>	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 ( $17^\circ 30'S$ ,  $149^\circ 50'W$ ). 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 HCO<sub>3</sub><sup>-</sup> 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 pCO<sub>2</sub> 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 pCO<sub>2</sub>. 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 pCO<sub>2</sub>. 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 pCO<sub>2</sub> 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.

[CorallLarvae\\_comparison\\_respir](#)

[CorallLarvae\\_release](#)

[CorallLarvae\\_respir](#)

[CorallLarvae\\_size](#)

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

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

---

## Program Information

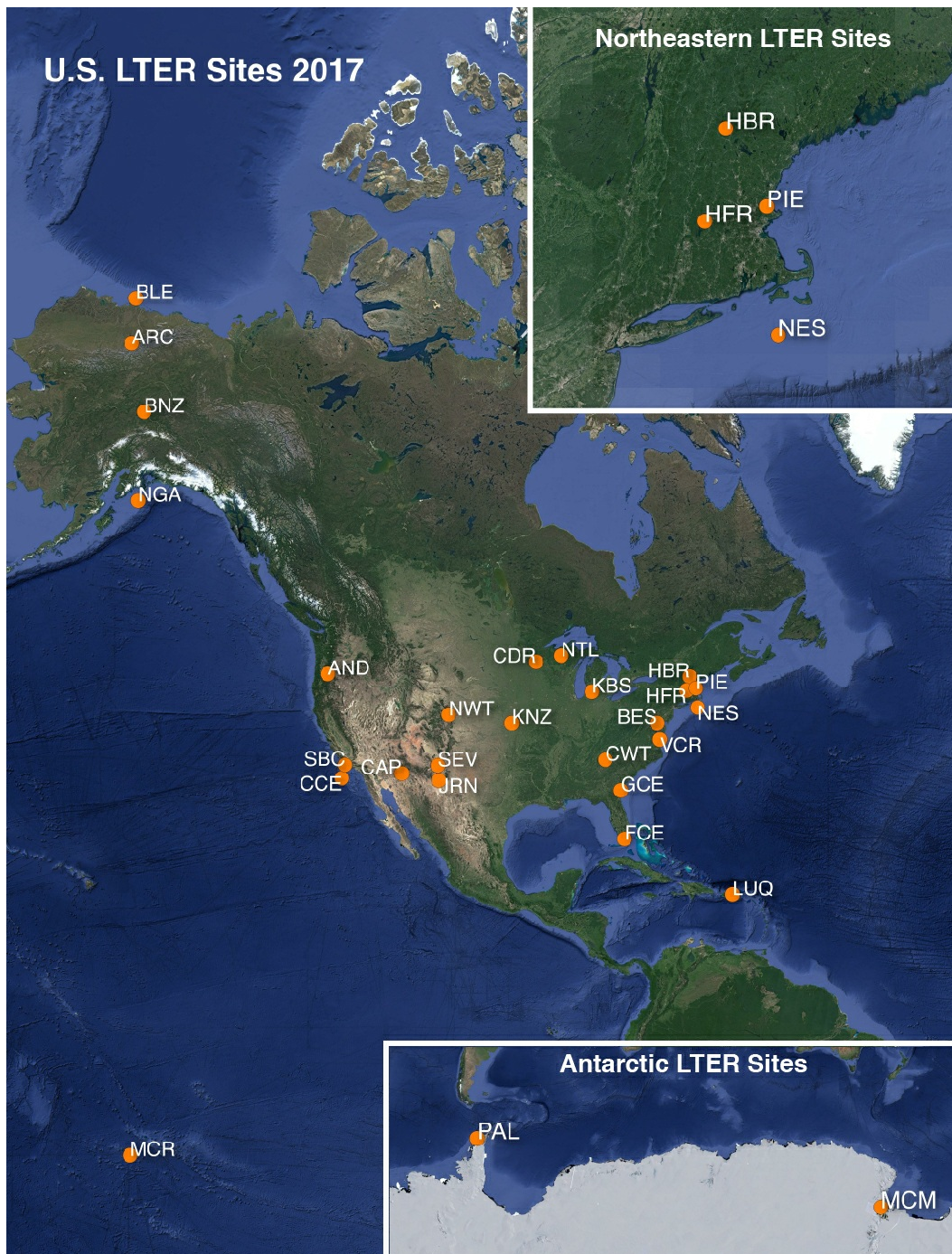
**Long Term Ecological Research network (LTER)**

**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
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-0844785</a>

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