

# Aquaria water quality PAR measurements from full factorial study of *Acropora cervicornis* at Mote Marine Laboratory in Nov-Dec 2019

**Website:** <https://www.bco-dmo.org/dataset/873446>

**Data Type:** Other Field Results, experimental

**Version:** 1

**Version Date:** 2022-04-22

## Project

» [CAREER: Applying phenotypic variability to identify resilient \*Acropora cervicornis\* genotypes in the Florida Keys](#) (Resilient Acerv)

Contributors	Affiliation	Role
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## Abstract

\*\* Please write an abstract to include here \*\* Water quality PAR was monitored as part of a full factorial experiment to determine the survival probability and photochemical efficiency of 25 unique genotypes of *Acropora cervicornis* in November and December 2019 at Mote Marine Laboratory.

## Table of Contents

- [Coverage](#)
- [Dataset Description](#)
  - [Methods & Sampling](#)
- [Related Datasets](#)
- [Parameters](#)
- [Instruments](#)
- [Project Information](#)
- [Funding](#)

## Coverage

**Spatial Extent:** Lat:24.6616 Lon:-81.4541

**Temporal Extent:** 2019-11-13 - 2019-12-06

## Methods & Sampling

Water quality was monitored as part of a full factorial experiment to determine the survival probability and photochemical efficiency of 25 unique genotypes of *Acropora cervicornis* in November and December 2019. Coral fragments of *A. cervicornis* were exposed to high temperatures and/or high  $p\text{CO}_2$  treatments in flow-through tanks at Mote Marine Laboratory.

During the exposure period, water quality for each tank was measured daily and color index of the coral fragments was assessed. Treatment tank water quality was monitored using a YSI Professional Plus (Pro Plus) Multi-parameter handheld with a quart containing a Pro Series Galvanic Dissolved Oxygen Sensor, a Pro Series pH Sensor (calibrated using 4, 7, and 10 buffers), and a Pro Series temperature and conductivity sensor. PAR was measured using the Licor handheld (Li-COR LI-1500) with an underwater quantum sensor (Li-Cor LI-192). Imaging-PAM Chlorophyll fluorometer (Walz GmbH, Effeltrich, Germany) was used to measure photochemical efficiencies and the coral health chart/ color index card was provided by CoralWatch.

Details on additional water quality measurements can be found in these datasets:

- Acer Aquaria water quality pH and DO, <https://www.bco-dmo.org/dataset/873433>
- Acer Aquaria water quality TA, DIC, and CO2, <https://www.bco-dmo.org/dataset/873459>

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

## Related Datasets

### IsSupplementTo

Muller, E. M., Petrik, C. (2022) **Temperature and pCO2 effects on survivability of 25 genotypes of Acropora cervicornis coral at Mote Marine Laboratory in Nov-Dec 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-03-18 <http://lod.bco-dmo.org/id/dataset/871765> [[view at BCO-DMO](#)]

*Relationship Description: Full-factorial study to which the aquaria water quality data relates*

### IsContinuedBy

Muller, E. M., Petrik, C. (2022) **Aquaria water quality total alkalinity, DIC, and CO2 measurements from full factorial study of Acropora cervicornis at Mote Marine Laboratory in Nov-Dec 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-04-22 <http://lod.bco-dmo.org/id/dataset/873459> [[view at BCO-DMO](#)]

*Relationship Description: Third of three datasets on aquaria water quality from full-factorial study of Acropora cervicornis*

### Continues

Muller, E. M., Petrik, C. (2022) **Aquaria water quality pH and dissolved oxygen measurements from full factorial study of Acropora cervicornis at Mote Marine Laboratory in Nov-Dec 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-04-22 <http://lod.bco-dmo.org/id/dataset/873433> [[view at BCO-DMO](#)]

*Relationship Description: First of three datasets on aquaria water quality from full-factorial study of Acropora cervicornis*

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

## Parameters

Parameter	Description	Units
ISO_DateTime_UTC	Date and Time of measurement in ISO8601 format	unitless
Latitude	Latitude	decimal degrees
Longitude	Longitude	decimal degrees
Medium	Medium in which measurement was taken	unitless
Raceway_ID	Identification of flowthrough raceway tank	unitless
Tank_num	Tank number	unitless
PAR	Photosynthetic Active/Available Radiation (PAR) as photo irradiance (or photosynthetic photon flux density?)	micromole photons per square meter per second (umol photos/m <sup>2</sup> /sec)
Shade_conditions	Shade conditions of the tanks when measurements taken	units
Date_local	Date of measurement (GMT-5)	units
Time_local	Time of measurement (GMT-5 local time)	units

## Instruments

<b>Dataset-specific Instrument Name</b>	treatment tank
<b>Generic Instrument Name</b>	Aquarium
<b>Dataset-specific Description</b>	Aquaria water quality was measured in tanks used for coral treatment experiments
<b>Generic Instrument Description</b>	Aquarium - a vivarium consisting of at least one transparent side in which water-dwelling plants or animals are kept

<b>Dataset-specific Instrument Name</b>	Walz imaging pulse amplitude modulation chlorophyll fluorometer
<b>Generic Instrument Name</b>	Fluorometer
<b>Dataset-specific Description</b>	Photochemical efficiencies in coral fragments were measured using an Imaging Pulse Amplitude Modulation (I-PAM) Chlorophyll fluorometer from Walz GmbH (Effeltrich, Germany)
<b>Generic Instrument Description</b>	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.

<b>Dataset-specific Instrument Name</b>	LI-COR LI-192 underwater quantum sensor
<b>Generic Instrument Name</b>	LI-COR LI-192 PAR Sensor
<b>Dataset-specific Description</b>	PAR was measured using the Licor handheld (LI-COR LI-1500) with an underwater quantum sensor (Li-Cor LI-192).
<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 $\mu\text{mol s}^{-1} \text{m}^{-2}$ . 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° at 90° 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° at 45° elevation. Cosine Correction: Optimized for underwater and atmospheric use. ( <a href="http://www.licor.com">www.licor.com</a> )

<b>Dataset-specific Instrument Name</b>	LI-COR handheld (Li-COR LI-1500)
<b>Generic Instrument Name</b>	Photosynthetically Available Radiation Sensor
<b>Dataset-specific Description</b>	PAR was measured using the Licor handheld (Li-COR LI-1500) with an underwater quantum sensor (Li-Cor LI-192).
<b>Generic Instrument Description</b>	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.

<b>Dataset-specific Instrument Name</b>	YSI Professional Plus (Pro Plus) Multi-parameter handheld
<b>Generic Instrument Name</b>	YSI Professional Plus Multi-Parameter Probe
<b>Dataset-specific Description</b>	Treatment tank water quality was monitored using a YSI Professional Plus (Pro Plus) Multi-parameter handheld with a quart containing a Pro Series Galvanic Dissolved Oxygen Sensor, a Pro Series pH Sensor, and a Pro Series temperature and conductivity sensor
<b>Generic Instrument Description</b>	The YSI Professional Plus handheld multiparameter meter provides for the measurement of a variety of combinations for dissolved oxygen, conductivity, specific conductance, salinity, resistivity, total dissolved solids (TDS), pH, ORP, pH/ORP combination, ammonium (ammonia), nitrate, chloride and temperature. More information from the manufacturer.

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

## Project Information

### **CAREER: Applying phenotypic variability to identify resilient *Acropora cervicornis* genotypes in the Florida Keys (Resilient Acerv)**

**Coverage:** Florida Keys, Summerland Key, FL 24.563595°, -81.278572°

#### *NSF Award Abstract:*

Caribbean staghorn coral was one of the most common corals within reefs of the Florida Keys several decades ago. Over the last 40 years disease, bleaching, overfishing and habitat degradation caused a 95% reduction of the population. Staghorn coral is now listed as threatened under the U.S. Endangered Species Act of 1973. Within the past few years, millions of dollars have been invested for the purpose of restoring the population of staghorn coral within Florida and the U.S. Virgin Islands. Significant effort has been placed on maintaining and propagating corals of known genotypes within coral nurseries for the purpose of outplanting. However, little is known about the individual genotypes that are currently being outplanted from nurseries onto coral reefs. Are the genotypes being used for outplanting resilient enough to survive the three major stressors affecting the population in the Florida Keys: disease, high water temperatures, and ocean acidification? The research within the present study will be the first step in answering this critically important question. The funded project will additionally develop a research-based afterschool program with K-12 students in the Florida Keys and U.S. Virgin Islands that emphasizes an inquiry-based curriculum, STEM research activities, and peer-to-peer mentoring. The information from the present study will help scientists predict the likelihood of species persistence within the lower Florida Keys under future climate-change and ocean-acidification scenarios. Results of this research will also help guide restoration efforts throughout Florida and the Caribbean, and lead

to more informative, science-based restoration activities.

*Acropora cervicornis* dominated shallow-water reefs within the Florida Keys for at least the last half a million years, but the population has recently declined due to multiple stressors. Understanding the current population level of resilience to three major threats - disease outbreaks, high water temperatures, and ocean acidification conditions - is critical for the preservation of this threatened species. Results from the present study will answer the primary research question: will representative genotypes from the lower Florida Keys provide enough phenotypic variation for this threatened species to survive in the future? The present proposal will couple controlled laboratory challenge experiments with field data and modeling applications, and collaborate with local educators to fulfill five objectives: 1) identify *A. cervicornis* genotypes resistant to disease, 2) identify *A. cervicornis* genotypes resilient to high water temperature and ocean acidification conditions, 3) quantify how high water temperature and ocean acidification conditions impact disease dynamics on *A. cervicornis*; 4) determine tradeoffs in life-history traits because of resilience factors; and 5) apply a trait-based model, which will predict genotypic structure of a population under different environmental scenarios.

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

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## Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1452538</a>

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