

# Seawater clarity in Moorea, French Polynesia from 2003 to 2022

Website: <https://www.bco-dmo.org/dataset/918312>

Data Type: Other Field Results

Version: 1

Version Date: 2024-01-23

## Project

» [Moorea Coral Reef Long-Term Ecological Research site](#) (MCR LTER)

## 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="#">Burgess, Scott</a>	Florida State University (FSU)	Scientist
<a href="#">Martorena, Stephane</a>	University of California-Santa Barbara (UCSB-ERI)	Scientist

## Abstract

Data Abstract: These data describe seawater clarity (as measured through Kd490) with data accessed 15 March 2022. Results paper abstract, Edmunds et al. (2024, doi:10.1007/s00442-024-05517-y) : \* [See "Related Datasets" section for access to related datasets discussed here] Understanding population dynamics is a long-standing objective of ecology, but the need for progress in this area has become urgent. For coral reefs, achieving this objective is impeded by a lack of information on settlement versus post-settlement events in determining recruitment and population size. Declines in coral abundance are often inferred to be associated with reduced densities of recruits, which could arise from mechanisms occurring at larval settlement, or throughout post-settlement stages. This study uses annual measurements from 2008 to 2021 of coral cover, the density of coral settlers (S), the density of small corals (SC), and environmental conditions, to evaluate the roles of settlement versus post-settlement events in determining rates of coral recruitment and changes in coral cover at Moorea, French Polynesia. Coral cover, S, SC, and the SC:S ratio (a proxy for post-settlement success), and environmental conditions, were used in generalized additive models (GAMs) to show that: (a) coral cover was more strongly related to SC and SC:S than S, and (b) SC:S was highest when preceded by cool seawater, low concentrations of Chlorophyll a, and low flow speeds, and S showed evidence of declining with elevated temperature. Together, these results suggest that changes in coral cover in Moorea are more strongly influenced by post-settlement events than settlement. The key to understanding coral community resilience may lie in elucidating the factors attenuating the bottleneck between settlers and small corals.

## Table of Contents

- [Coverage](#)
- [Dataset Description](#)
  - [Methods & Sampling](#)
  - [Data Processing Description](#)
  - [BCO-DMO Processing Description](#)
- [Data Files](#)
- [Supplemental Files](#)
- [Related Publications](#)
- [Related Datasets](#)
- [Parameters](#)
- [Project Information](#)
- [Program Information](#)
- [Funding](#)

## Coverage

**Spatial Extent:** N:-17.475083 E:-149.8101 S:-17.4819 W:-149.84833

**Temporal Extent:** 2003-01-16 - 2022-01-16

## Methods & Sampling

The ecological methods are described in detail in Edmunds et al. (2024, doi:10.1007/s00442-024-05517-y), and are briefly summarized below.

The study utilized the time series of the Moorea Coral Reef LTER, as they relate to coral community dynamics on the north shore fore reef. Annual measurements of coral cover, the density of coral settlers, and the density of small corals were used together with records of the environmental conditions to which they were exposed. Analyses focused on 2008-2021, which captured the final years of the last population outbreak of the crown of thorns (COTs) sea star, the coral population recovery that took place between 2010 and 2019, and coral mortality attributed to bleaching in 2019. Biological data came from two sites (LTER1 and LTER2) that are ~ 3 km apart, with environmental data from the same or similar sites (temperature), one of the two sites (flow at LTER1), or from 4.5 km resolution remote sensing data (Chlorophyll a).

## Data Processing Description

Water Clarity data obtained by remote sensing. Accessed through ERDDAP:

"Diffuse Attenuation K490, Aqua MODIS, NPP, L3SMI, Global, 4km, Science Quality, 2003-present (Monthly Composite)" NASA/GSFC OBPG (Dataset ID: erdMH1kd490mday)

\* Accessed for grid -17.3693 to -17.4693 by -149.9414 to -149.8414, 2003-01-16 to 2022-01-16

\* [https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdMH1kd490mday.htm?k490%5B\(2003-01-16\):1:\(2021-02-16T00:00:00Z\)%5D%5B\(-17.3693\):1:\(-17.4693\)%5D%5B\(-149.9414\):1:\(-149.8414\)%5D](https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdMH1kd490mday.htm?k490%5B(2003-01-16):1:(2021-02-16T00:00:00Z)%5D%5B(-17.3693):1:(-17.4693)%5D%5B(-149.9414):1:(-149.8414)%5D)

\* ERDDAP "Summary": This dataset has Level 3, Standard Mapped Image, 4km, chlorophyll-a concentration data from NASA's Aqua Spacecraft. Measurements are gathered by the Moderate Resolution Imaging Spectroradiometer (MODIS) carried aboard the spacecraft. This is Science Quality data.

The ERDDAP data was subset using the values provided above, and only columns UTC time and Kd490 are provide in this dataset (lat,lon columns omitted).

## BCO-DMO Processing Description

\* Sheet 1 of file " " was imported into the BCO-DMO data system with values "NA" as missing data values.

\*\* Missing data values are displayed differently based on the file format you download. They are blank in csv files, "NaN" in MatLab files, etc.

\* dataset references to results publication Edmunds et al 2023 changed to 2024 since that was the year associated with the DOI after final publication. Edmunds et al. (2024, doi:10.1007/s00442-024-05517-y)

\* Column names adjusted to conform to BCO-DMO naming conventions designed to support broad re-use by a variety of research tools and scripting languages. [Only numbers, letters, and underscores. Can not start with a number]

\* "T00:00:00Z" removed from all UTC\_time column values. It was all the same. This is an artifact of 0 padding ERDDAP adds. Discussed with the submitter.

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

## Data Files

File
<b>918312_v1_water-clarity.csv</b> (Comma Separated Values (.csv), 49.51 KB) MD5:c41a8ee22725aae1190516528c32c041
Primary data file for dataset ID 918312, version 1

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

## Supplemental Files

File
<p><b>Site list</b></p> <p>filename: site_locations.csv (Comma Separated Values (.csv), 215 bytes) MD5:d13ffae75e572529594f401de6a97cc</p> <p>Site location list in Moorea (LTER0,LTER1,LTER2) for datasets related to Edmunds et al. (2024, doi:10.1007/s00442-024-05517-y) and Edmunds et al. (2020, doi:10.1093/icesjms/fsaa015).</p> <p>Columns:</p> <p>location, geolocation name</p> <p>site, site identifier</p> <p>lat_dd, site latitude, decimal degrees</p> <p>lon_dd, site longitude, decimal degrees</p> <p>lat_deg_decm, site latitude, degrees decimal minutes</p> <p>lon_deg_decm, site longitude, degrees decimal minutes</p>

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

## Related Publications

Edmunds, P. J., Maritorea, S., & Burgess, S. C. (2024). Early post-settlement events, rather than settlement, drive recruitment and coral recovery at Moorea, French Polynesia. *Oecologia*, 204(3), 625–640. <https://doi.org/10.1007/s00442-024-05517-y>  
*Results*

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

## Related Datasets

### IsRelatedTo

Edmunds, P. J., Burgess, S., Maritorea, S. (2024) **Benthic seawater temperature at 10m depth in Moorea, French Polynesia from 2005 to 2021**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-01-23 doi:10.26008/1912/bco-dmo.918318.1 [[view at BCO-DMO](#)]  
*Relationship Description: Datasets in support of results publication Edmunds et al. (2023).*

Edmunds, P. J., Burgess, S., Maritorea, S. (2024) **Density of coral settlers detected on settlement tiles each year at two 10m sites on the north shore of Moorea, French Polynesia from 2008 to 2020**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-01-23 doi:10.26008/1912/bco-dmo.918324.1 [[view at BCO-DMO](#)]  
*Relationship Description: Datasets in support of results publication Edmunds et al. (2023).*

Edmunds, P. J., Burgess, S., Maritorea, S. (2024) **Density of small corals at two 10m sites on the north shore of Moorea, French Polynesia from 2005 to 2021**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-01-23 <http://lod.bco-dmo.org/id/dataset/918330> [[view at BCO-DMO](#)]  
*Relationship Description: Datasets in support of results publication Edmunds et al. (2023).*

Edmunds, P. J., Burgess, S., Maritorea, S. (2024) **Flow speed on the north shore of Moorea, French from 2007 to 2021**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-01-23 doi:10.26008/1912/bco-dmo.918306.1 [[view at BCO-DMO](#)]  
*Relationship Description: Datasets in support of results publication Edmunds et al. (2023).*

Edmunds, P. J., Burgess, S., Maritorea, S. (2024) **Percentage cover of the benthos by live coral at 10 m depth at sites in Moorea Moorea, French Polynesia from 2008 to 2021**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-01-23 doi:10.26008/1912/bco-dmo.918265.1 [[view at BCO-DMO](#)]  
*Relationship Description: Datasets in support of results publication Edmunds et al. (2023).*

Edmunds, P. J., Burgess, S., Maritorea, S. (2024) **Seawater chlorophyll concentration offshore from Moorea, French Polynesia from 2008 to 2020**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-01-23 doi:10.26008/1912/bco-dmo.918299.1 [[view at BCO-DMO](#)]  
*Relationship Description: Datasets in support of results publication Edmunds et al. (2023).*

### IsDerivedFrom

NASA/GSFC OBPG (2022) Diffuse Attenuation K490, Aqua MODIS, NPP, L3SMI, Global, 4km, Science Quality, 2003-present (Monthly Composite), Dataset ID: erdMH1kd490mday, version date 2022-06-19 (subset lat: -17.3693 to -17.4693, lon: -149.9414 to -149.8414, date: 2003-01-16 to 2022-01-16) accessed from [https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdMH1kd490mday.html?k490%5B\(2003-01-16\):1:\(2021-02-16T00:00:00Z\)%5D%5B\(-17.3693\):1:\(-17.4693\)%5D%5B\(-149.9414\):1:\(-149.8414\)%5D](https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdMH1kd490mday.html?k490%5B(2003-01-16):1:(2021-02-16T00:00:00Z)%5D%5B(-17.3693):1:(-17.4693)%5D%5B(-149.9414):1:(-149.8414)%5D)

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

## Parameters

Parameter	Description	Units
UTC_time	Date for data collection in ISO 8601 format	unitless
Kd490	Measure of water clarity	m <sup>-1</sup>

[ [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

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

---

## Program Information

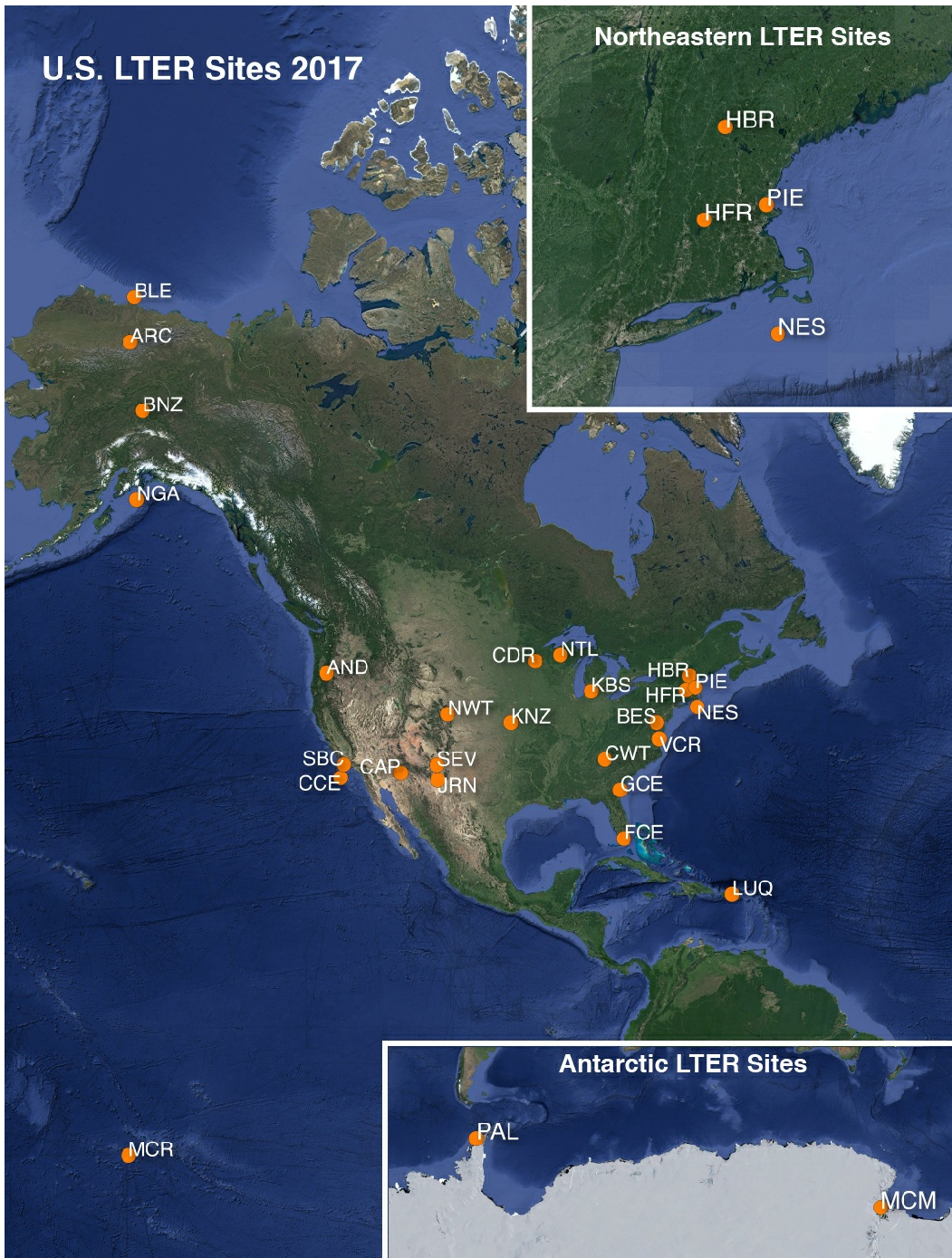
### Long Term Ecological Research network (LTER)

**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-2224354</a>

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