# Estimates of bleaching mortality and colony size for Pocillopora spp. corals at Moorea in 2019

**Website**: https://www.bco-dmo.org/dataset/856464
**Data Type**: Other Field Results
**Version**: 1
**Version Date**: 2021-07-23

**Project**
» Collaborative research: Coral community resilience: testing the role of hidden diversity in pocilloporid corals at Moorea (Pocilloporid Coral Diversity)



| Contributors | Affiliation | Role |
|---|---|---|
| Burgess, Scott | Florida State University (FSU) | Principal Investigator |
| Edmunds, Peter J. | California State University Northridge (CSUN) | Co-Principal Investigator |
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**Abstract**
This dataset includes estimates of bleaching mortality and colony size for Pocillopora spp. corals at Moorea in 2019. These data have been published in Figure 4 of Burgess et al. (2021).

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## Coverage

**Spatial Extent**: **Lat**:-17.5333 **Lon**:-149.8333

### Methods & Sampling

Photoquadrats (0.7 × 0.7m) were recorded at 10 m depth on the fore reef at six sites (24 quadrats from each of six sites covering the north, east, and west shore). Photoquadrats used to estimate bleaching mortality were collected along a transect that was immediately adjacent (~2m) to the MCR LTER transects at site 1 and 2. Bleaching mortality was measured by following the fate of individual Pocillopora spp. colonies in photoquadrats (marked with 12 inch stainless steel threaded rods) taken in February 2019, before the bleaching event, and again in August 2019, approximately four months after the peak of the bleaching event. Because we sampled the same photoquadrat in February and August, the status and fate of 1186 individual colonies could be tracked over time.

Colony size was quantified as the diameter (in centimeters) along the longest axis of the coral in planar view from the photoquadrat images. The size of a colony was not recorded if the colony was only partially in the frame and the longest axis could not be identified. As a result, size was measured for 641 out of 1023 (62%) colonies assigned to a bleaching category in May 2019, and 1125 out of 1186 (95%) of colonies observed in February 2019 and categorized as alive or dead in August 2019. Size was estimated using ImageJ software.

Each photograph included a reference scale with which each image was individually size-calibrated. The smallest colony size detectable in the images was ~ 2 cm.

### Data Processing Description

Size was estimated using ImageJ software. Data were processed using R 3.6.3. These data have been published in Figure 4 of Burgess et al. (2021).

**BCO-DMO Processing:**
- renamed fields (columns) to conform with BCO-DMO naming conventions;
- replaced "NA" with "nd" to indicate "no data".

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## Data Files

| File |
|---|
| **mortality_2019.csv** (Comma Separated Values (.csv), 26.86 KB)<br>MD5:969c923de1a945467d06515c6b3f11d5<br>Primary data file for dataset ID 856464 |

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## Supplemental Files

| File |
|---|
| **Figure_4_Make.R** (Octet Stream, 13.77 KB)<br>MD5:8b8026d372829135d374704e786b6ff1<br>R code to produce Figure 4, and the accompanying analyses presented in the text, in:<br><br>Burgess SC, Johnston EC, Wyatt ASJ, Leichter JJ, Edmunds PJ (2021) Response diversity in corals: hidden differences in bleaching mortality among cryptic Pocillopora species. Ecology.<br><br>Uses 'Data on Mortality 2019.csv' |

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## Related Publications

Burgess, S. C., Johnston, E. C., Wyatt, A. S. J., Leichter, J. J., & Edmunds, P. J. (2021). Response diversity in corals: hidden differences in bleaching mortality among cryptic Pocillopora species. Ecology, 102(6). doi:10.1002/ecy.3324
*Results*

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## Related Datasets

### Different Version

Burgess, S., Johnston, E., Wyatt, A., Leichter, J., & Edmunds, P. (2021). Response diversity in corals: hidden differences in bleaching mortality among cryptic Pocillopora species (Version 3) [Data set]. Dryad. https://doi.org/10.5061/DRYAD.FQZ612JS0 https://doi.org/10.5061/dryad.fqz612js0

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| Site | Sampling site, label corresponds to the site used in the Moorea Coral Reef Long-Term Ecological Research (MCR-LTER) program | unitless |
| Sector | Sector identifier within sites | unitless |
| Quadrat | Quadrat identifier within sectors | unitless |
| Coral_ID | Coral colony identifier | unitless |
| Longest_cm | Longest diameter (in centimeters) along the longest axis of the coral in planar view from the photoquadrat images taken in February 2019 | centimeters (cm) |
| Mortality | 0 = alive in August 2019; 1 = dead in August 2019 | unitless |
| Partial_colony_mortality | 0 = no partial mortality; 1 = alive with partial mortality, in August 2019 | unitless |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | |
| **Generic Instrument Name** | Camera |
| **Generic Instrument Description** | All types of photographic equipment including stills, video, film and digital systems. |

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## Project Information

**Collaborative research: Coral community resilience: testing the role of hidden diversity in pocilloporid corals at Moorea (Pocilloporid Coral Diversity)**

**Coverage**: Moorea, French Polynesia

*NSF Award Abstract:*
While most coral reefs in the world are threatened by multiple disturbances that are driving coral cover downward, the coral reefs at Mo'orea, French Polynesia, provide a striking exception. However, it is not yet clear what makes the coral communities of Mo'orea an exception to the trend of global decline in coral cover,

and what drives spatial variation in recovery patterns around the island. The most recent wave of recovery on the outer reefs is dominated by corals in the genus Pocillopora (the cauliflower coral). While the colonies of this coral all look similar to one another, they actually represent multiple 'hidden' species that are genetically divergent but visibly indistinguishable. The morphological similarity makes it hard to identify species in the field, and this often forces researchers to pool these corals into a single group, which has impeded a full understanding of coral recovery. The ecological differences among these hidden species remain poorly understood, but they may be a crucial factor keeping the ecosystem in a coral-dominated state. This project is studying how 'hidden diversity' provides a form of 'ecological insurance' that provides reef-building coral communities around this island with ecological and evolutionary options that buffer reefs from unpredictable and unfavorable environmental conditions. If multiple cryptic species exhibit a diversity of responses to disturbance and stress, then it increases the ability of the community to recover and re-organize after impacts compared to that if all the species responded the same way. By studying the reefs at Mo'orea, this project provides unique, important, and transferable knowledge to better understand fundamental mechanism driving coral community recovery following catastrophic damage, and will provide much-needed information to better manage coral reefs and favor them remaining in a coral-dominated state. A PhD student and a postdoctoral researcher at Florida State University (FSU) are being supported and mentored during the project, and a program of professional growth is being provided for a technician who will work on the project. The investigators are working with science educators from Florida schools to introduce marine biology clubs that will provide outreach opportunities for FSU and California State University Northridge participants to engage high school students and teachers in the research themes at the core of this project.

This project will test the hypothesis that the presence of morphologically similar yet genetically divergent lineages of corals in the genus Pocillopora drives rapid recovery of coral communities dominated by Pocillopora on the outer reefs of Mo'orea, French Polynesia. By creating a diverse portfolio in the capacity of the Pocillopora community to recover and reorganize after disturbance, hidden ecological differences among coral lineages in their response to disturbance is expected to promote community resilience. A well-studied genetic marker will be used to distinguish coral colonies among different lineages. Field-based projects, co-located with Moorea Coral Reef-Long-Term Ecological Research (MCR-LTER) sites, will determine how pocilloporid lineages differ in their distribution and abundance, spatial and temporal patterns of annual recruitment, symbiont composition, and post-settlement growth and survival. These data will be used to build Integral Projection Models (IPMs) to compare population differences among lineages in their sensitivity to size-dependent perturbations, and their capacity for population growth following disturbance. Results from the field projects and IPMs will be synthesized to estimate response diversity as the multivariate dispersion of lineage dissimilarity, and to assess the extent to which it predicts variation among sites in the recovery rate of pocilloporid percent cover, estimated empirically from the MCR-LTER time series. The intellectual merits of this project lie in developing new and transferable understanding of: i) the ecological differences within an ecologically important coral genus, ii) why pocilloporids at Mo'orea are an exception to the global trend of declining coral cover, and iii) the potential for hidden response diversity to act as a fundamental mechanism determining the capacity for coral communities to reestablish and reorganize following disturbances.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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## Funding


| Funding Source | Award |
|---|---|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1829898 |
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1829867 |


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