Coral bleaching and mortality

Website: https://www.bco-dmo.org/dataset/1000902
Version: 1
Version Date: 2026-06-11

Project
» Collaborative Research: Tipping points in coral reefs and their associated microbiomes: interactive effects of herbivory, nutrient enrichment, and temperature (RECHARGE)

Contributors	Affiliation	Role
Burkepile, Deron	University of California-Santa Barbara (UCSB)	Principal Investigator
Adam, Tom C.	University of California-Santa Barbara (UCSB)	Co-Principal Investigator

Table of Contents

- Coverage
- Dataset Description
- Parameters
- Project Information
- Funding

Coverage

Spatial Extent: **Lat**:0 **Lon**:0

[table of contents | back to top]

Parameters

Parameters for this dataset have not yet been identified

[table of contents | back to top]

Project Information

Collaborative Research: Tipping points in coral reefs and their associated microbiomes: interactive effects of herbivory, nutrient enrichment, and temperature (RECHARGE)

Coverage: Mo'orea, French Polynesia

NSF Award Abstract:
Coral reefs are some of the most diverse, yet most imperiled, ecosystems on the planet. Global change has driven the decline of corals worldwide with many reefs now lacking corals and being overrun by macroalgae. This research examines the impacts of several factors of thermal stress, overfishing of important herbivorous fishes, and nutrient pollution on the health of corals and their ability to recover after large coral-killing disturbances. Importantly, the investigators address the impacts of global change on the coral microbiome, the microbes that associate with corals and impact coral health. The overarching hypothesis is that factors such as overfishing and nutrient pollution impact coral health via impacts to their microbes. This 6-year experiment on the coral reefs of Mo'orea, French Polynesia examines what levels of herbivory, mostly by parrotfishes and surgeonfishes, are needed to provide resistance and resilience of corals and their microbiomes when reefs are exposed to elevated nutrients and ocean temperatures. Notably, the team tests how local stressors (overfishing, nutrient pollution) potentially interact with global stressors (climate change and rising ocean temperatures) to impact coral reef health. This research may yield insight into how to manage local factors (reducing fishing, mitigating nutrient pollution) to help corals survive the global stress of climate

change. The field experiment provides a realistic platform to test questions about how local management of fisheries can alter reef health and provides data about the recoverability of reefs should new water quality management be put into place. This interdisciplinary work trains a new generation of both marine ecologists and microbiologists, including one postdoctoral researcher, two graduate students, as well as numerous undergraduates. The main international outreach effort is to map the microbiome of the island of Mo'orea. Mo'orea is approximately 130 square-kilometers in area and has five major watersheds that transport sediment and nutrients to the nearshore coral reef ecosystems. Thus poor stewardship of these watersheds likely contributes to the local phase shifts currently occurring in several areas of the lagoon. Therefore the team has engaged the local community to help collect microbiome samples from 50 terrestrial, 50 stream, 25 coastal sites, and 25 offshore sites around the island. The sampling effort is generating an island-wide map of the microbial communities associated with the soils, streams, and coastal waters that can be linked to adjacent coral reef health - The Moorea Microbiome! As part of this outreach effort, the team also collaborates with filmmakers to make a trilingual (English, French, and Tahitian) film about the project to serve as local engagement and teaching tool to help educate school groups and different stakeholders about both the seen and unseen connections between land and sea on their island.

On the island of Mo'orea, French Polynesia, coral communities have exhibited strikingly different trajectories, with some reefs recovering from disturbances and others undergoing protracted coral decline, accompanied by an increase in macroalgae. This diversity in coral community dynamics makes Mo'orea an excellent model system for testing why some reefs are resilient and return to abundant coral while others are not and undergo persistent phase shifts to macroalgal dominance. This 6-year experiment will measure the dynamics of benthic communities, coral demography, and the coral microbiome across seasonal change in ocean temperature, allowing the team to (1) link changes in coral microbiomes (e.g., a rise in pathogenic bacteria) to the trajectories of coral decline or recovery and (2) link nutrients, herbivory, and temperature to phase shifts in both benthic communities and coral microbiomes. Importantly, the team is testing the resistance of phase shifts of benthic communities and coral microbiomes by measuring their changes after removing the nutrient enrichment treatment at the end of year 3 and tracking recovery of the system for 3 more years. Thus, this project begins to answer whether reef and microbial community phase shifts can be easily reversed once they occur. Many studies have focused on the factors that disassemble coral reef communities, but this is the first to examine how reef communities can be reassembled from the microbiome upwards.

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.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2023701
NSF Division of Ocean Sciences (NSF OCE)	OCE-2023424

[table of contents | back to top]