

A Living Laboratory  
By: Erin O'Reilly

Imagine diving into turquoise water and being met by an underwater rainforest- a new world. The reef is a colorful patchwork composed of lively corals shaped like wrinkled brains, pillars, cabbages, and antlers. Though often mistaken for rocks or plants, corals are animals that serve as a foundation for life in reef ecosystems. Scattered along the reef are giant clams with bright blue lips; large groupers; and black tip reef sharks patrolling the area. This lush underwater garden is alive and well in the Pacific Islands Marine National Monument (PRIMNM). Unfortunately, most reefs around the world are degraded, so this submerged garden represents a ghost of former coral reef health.



*Photo credit: Jim Maragos/USFWS*

Yet despite their remote location and few direct human interactions, there is still one major threat to the Pacific Remote Islands: climate change.

Warming sea surface temperatures and increasing ocean acidification affect corals around the world. However, there is uncertainty about the true level of impact caused by these stressors. To determine how climate change effects coral reefs, 16 years of data collected by the National Oceanic and Atmospheric Administration (NOAA) in the Pacific Remote Islands will be synthesized and interpreted for the first time to create a definitive reference point for coral reef health in the PRIMNM.

This project provides a unique opportunity to evaluate the degradation of a pristine reef due to rising ocean temperatures and acidification. It is extremely rare to have a living laboratory to

track the direct impacts of climate change over time. By determining the ecological status in the Monument, a reference point will be developed to measure future change. This marker will be the foundation for making management decisions for the Monument and other reefs around the world.

The outcomes of the analyses will track how important coral indicators such as temperature, coral cover, and fish population dynamics have changed over time. Additionally, ocean temperature will be projected into the future to show how climate change will affect the level of coral bleaching. When corals are bleached, they can no longer support a wide variety of biodiversity, provide shelter and food, or serve as nursery grounds for fish communities. A bleached reef indicates an unhealthy coral reef ecosystem that can no longer sustain a healthy ocean environment. This project will highlight the impact of climate change on reef health, which can be extrapolated to provide a blueprint for reef conservation worldwide.

The project team includes a group of UCSB's Bren School of Environmental Science & Management Master's candidates: Shannon Boyle, Vanessa De Anda, Kara Koenig, Erin O'Reilly and Monique Schafer; NOAA's Coral Reef Ecosystem Program (CREP) team; and academic advisors Mark Buntaine and Owen Liu. The Bren graduate students will travel to Hawaii this summer to complete analysis in collaboration with the CREP team.



*From Left: Shannon Boyle, Erin O'Reilly, Kara Koenig, Monique Schafer, and Vanessa De Anda  
Photo Credit: Olivia Boyle*