

MOOREA CORAL REEF LTER



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The Moorea Coral Reef (MCR) Site

The National Science Foundation

The National Science Foundation established the Long Term Ecological Research (LTER) program in 1980 to address the challenges of research and education on ecological phenomena that occur over long periods of time. The Moorea Coral Reef LTER became the 26th site in the LTER network in September 2004.



Above: The island of Moorea, French Polynesia

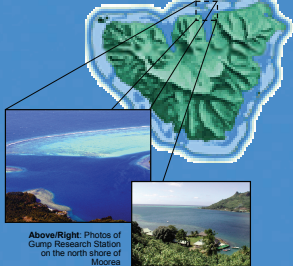
The MCR LTER Site

The MCR LTER site is the complex of coral reefs that surround the 60 kilometer perimeter of Moorea in the Society Islands of French Polynesia. Moorea is in the central South Pacific, 15 kilometers west of Tahiti, 4400 kilometers south of Honolulu, Hawaii and 6600 kilometers southwest of Los Angeles, California.



The Project

The project is a partnership between the University of California, Santa Barbara and the California State University Northridge that also includes researchers and students from additional University of California campuses (Davis, Santa Cruz, San Diego) and the University of Hawaii.



Above/Right: Photos of Gump Research Station on the north shore of Moorea

Field Operations

Field operations are conducted from the UC Berkeley Richard B. Gump South Pacific Research Station (<http://moorea.berkeley.edu>). The Gump Station, with its extraordinary setting, variety of accessible tropical marine habitats, experienced staff, and modern facilities makes an ideal base for scientific research and education. The Gordon and Betty Moore Foundation provided generous funding for facilities and equipment for both the Moorea Coral Reef LTER and the Gump Station.

Understanding Coral Reef Dynamics

How and why do coral reef ecosystems change over time? What determines their response to and recovery from disturbance?

Coral reefs have immense ecological value. Not only do they rank among the top of all ecosystems with respect to annual total gross productivity, coral reefs support the highest species diversity of any marine habitat, containing, for example, about one third of all species of fish. Coral reef ecosystems can be affected by perturbations ranging from short-term and relatively localized disturbances, where return to the original state is possible, to more chronic, widespread influence of shifts in climate over decades that may fundamentally alter the ecosystem.



Above: An LTER investigator photographs reef organisms for quantitative analysis.

A central goal of the MCR LTER is to elucidate the mechanistic basis of change in coral reef ecosystems, which yields insight into their dynamics, including how they respond to a variety of disturbances that operate across a range of spatial and temporal scales. The results are helping to create the capacity to forecast future responses and provide information necessary for the development of effective management strategies.



Above: Dye studies help estimate water residence time within a branching coral.

Left: MCR LTER investigators study interactions between corals and their associates, such as the arc-eye hawkfish.

Many Disciplines / A Common Goal

Disentangling cause and effect relationships in coral reef ecosystems requires an interdisciplinary, decadal- and landscape-scale program. For example, many biological processes are influenced by abiotic events (such as hydrodynamics) that can operate at spatial scales ranging from less than a millimeter to hundreds of kilometers.



Right: MCR LTER researcher hauling in a light trap



Left: Graduate students retrieve a larval fish light trap buoyed above the reef.

Unified knowledge about how ecosystems operate requires interdisciplinary research across levels of biological organization, building from the sub-organismal to the ecosystem levels. Our team of MCR LTER investigators represents the disciplines of ecology, physiology, microbiology, molecular biology and genetics, geochemistry, remote sensing, and biological, physical and chemical oceanography.

Studying Coral Reefs in Time and Space

In addition to field experiments, we measure biological, physical and chemical aspects of the coral reef ecosystem at Moorea to assess long-term trends, to provide a contextual basis for our experiments and other scientific studies, and to facilitate comparisons with other LTER sites in the network. Three habitat types (fore reef, lagoon, fringing reef) are sampled annually at localities around the island (right). Abundances of a variety of reef organisms including corals, fish, zooplankton and algae are measured, as well as functional aspects such as primary productivity and fluxes of materials, and physical variables including water temperature, salinity, currents and tides.



The Research Program

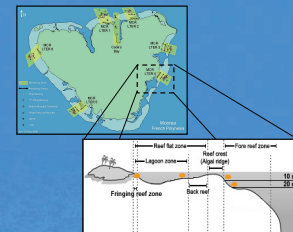
The MCR LTER Research Program focuses on improving our understanding of the long-term consequences of disturbance and climate regimes in coral reef ecosystems. Our objective is to identify major controls over reef dynamics and how they are influenced jointly by climate and disturbance. Accordingly, MCR LTER projects are shedding light on key processes that influence ecosystem function and community structure.



Above: LTER researchers load a small boat for work in the lagoon.

Principal Scientific Goals Include

- Elucidating the mechanistic basis of oceanographic effects on coral reefs
- Evaluating mechanisms and effects of climate forcing
- Examining how species interactions affect growth, survivorship and dynamics of corals and associated organisms
- Exploring food web relationships and nutrient dynamics
- Understanding the ecological controls and functional significance of biodiversity



Outreach and Education

The Moorea Coral Reef LTER Education and Outreach program consists of three components: (1) supporting education programs for the local communities in French Polynesia, (2) a K-12 Schoolyard Program, and (3) providing integrative postdoctoral, graduate, and undergraduate student training.

Local Community Education

The PIs and researchers work with local educators to translate the goals and findings of the program to the public and to school education programs. The Gump Research Station has developed the Atina Center on its grounds for this purpose. One of the primary functions of the Atina Center is to provide an infrastructure that visiting scientists can utilize to disseminate the results of their research to the local community.



Above: Director of the Atina Center at a workshop at the Gump Station

K-12 Schoolyard Program

The Moorea Coral Reef LTER collaborates with successful K-12 programs at UCSB and CSUN to offer a Schoolyard Program, with a focus on teacher professional development as well as educational experiences for students. K-12 teachers from the US work alongside MCR LTER scientists in Moorea as part of the NSF RET program.



Above: School children in the US and Moorea learn about reef animals.

University Education

The PIs and researchers use the Moorea Coral Reef LTER as a catalyst for developing advanced education and research training programs. In addition to the traditional opportunities to develop and hone research skills, both undergraduate and graduate students learn fundamental skills necessary to organize and carry out interdisciplinary, collaborative research. They interact extensively with both postdoctoral students and senior investigators affiliated with the MCR LTER.

For More Information:

<http://mcr.hernet.edu>

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