

## 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.



Photo: M. Meier  
An LTER investigator photographs reef organisms for quantitative analysis.



Photo: A. Brooks

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

A central goal of the MCR LTER is to elucidate the mechanistic basis of change in coral reef ecosystems, which will yield 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 will create the capacity to forecast future responses and will provide information necessary for the development of effective management strategies.

# Moorea Coral Reef Long Term Ecological Research

## Many Disciplines to Achieve 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.

Useful 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.

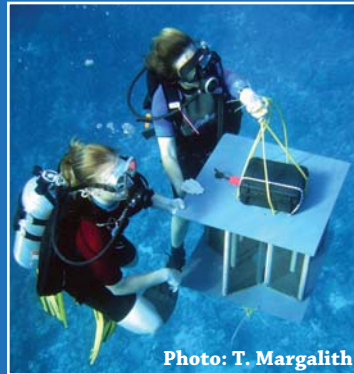


Photo: T. Margalith

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

## 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 (reef slope, lagoon, fringing reef) are sampled annually at localities around the island. Abundances of a variety of reef organisms including corals, fish, algae, and zooplankton 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.



Photo: T. Margalith

An MCR LTER researcher hauls in a light trap.



Photo: R. Schmitt

## MCR LTER 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. Principal scientific goals include:

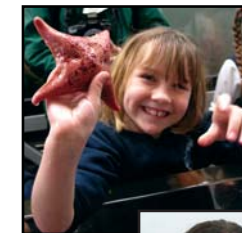


Photo: M. Schmitt

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

- 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 Activities



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



Photos: M. Schmitt

Integral components of the Moorea Coral Reef LTER include student training and public outreach. Our Outreach and Education program consists of:

- Integrative university student training
- K-12 Schoolyard Program
- Support of local education programs

## The Moorea Coral Reef (MCR) LTER Site

The National Science Foundation ([www.nsf.gov](http://www.nsf.gov)) 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 ([www.lternet.edu](http://www.lternet.edu)) in September 2004.

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



Moorea

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.

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.

Photo: R. Wilder

Orange-fin anemonefish and juvenile three-spot dascyllus on their host sea anemone. Photo: R. Schmitt

For more information see:

<http://mcr.lternet.edu>

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# Moorea Coral Reef

 Long Term  
Ecological Research