

Coral Reef Ecosystem Studies (CREST)

Introduction

Coral reefs provide important ecosystem services such as shoreline protection and the support of lucrative industries including fisheries and tourism. Such ecosystem services are being compromised as reefs decline due to coral disease, climate change, overfishing, and pollution. There is a need for focused, integrated science to understand the complex ecological interactions and effects of these many stressors and to provide information that will effectively guide policies and best management practices to preserve and restore these important resources.

The U.S. Geological Survey Florida Integrated Science Center (USGS-FISC) is conducting a coordinated Coral Reef Research Project beginning in 2009. Specific research topics are aimed at addressing priorities identified in the “Strategic Science for Coral Ecosystems 2007-2011” document (U.S. Geological Survey, 2007).

Planned research will include a blend of historical, monitoring, and process studies aimed at improving our understanding of the develop-



Figure 2. Black-band disease has infected these coral colonies of *Diploria strigosa*, an important reef-building species.

ment, current status and function, and likely future changes in coral ecosystems. Topics such as habitat characterization and distribution, coral disease, and trends in biogenic calcification are major themes of understanding reef structure, ecological intesponses to global change.

Research activities will include:

- mapping and characterizing coral reefs and critical benthic habitats (fig. 1),
- identifying response of coral reefs to climate and sea-level changes,
- characterizing coral-associated microbial communities and investigating disease processes,
- investigating the causes of coral disease and how they are transmitted (fig. 2),
- evaluating existing and future threats to corals by increased atmospheric carbon dioxide and ocean acidification, and
- quantifying changes and trends in biogenic calcification.

Research Focus

The work is planned to primarily take place in two geographic areas: (1) the Dry Tortugas, and (2) the U.S. Virgin Islands (fig. 3). These locations cover a variety of coral reef ecosystems, thus allowing FISC scientists to address important science and management issues underlying the global problem of reef decline.

In the Dry Tortugas, corals will be cored for retrospective studies, and habitats will be mapped to classify presently unknown areas and identify areas of particular value for harboring endangered sea turtles (fig. 4). Rates of coral calcification will be assessed, and initial bioassay screening will be conducted to assess coral microbial communities on reefs slated to receive mooring buoys.



Figure 1. Maho Bay, located within the U.S. Virgin Islands National Park on the island of St. John, is typical of coral-ecosystem habitat found throughout the Caribbean.



Figure 3. The USGS-FISC Coral Reef Research Project will focus on sites in: the Dry Tortugas and the U.S. Virgin Islands.

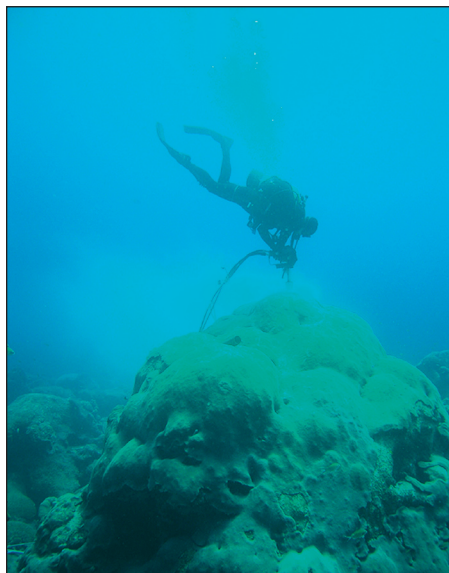


Figure 4. Core sampling provides information about coral growth rates and geologic history.



Figure 5. The threatened reef coral species, *Acropora cervicornis*, once widespread in the Dry Tortugas, has suffered from temperature extremes and coral disease.

In the U.S. Virgin Islands, causes of coral bleaching and diseases will be studied (figs. 2, 5). Distribution of type and quality of habitat will be evaluated in multiple managed reef areas on St. John. Research will include rates of coral calcification and trophic relationships and ecological processes inside and outside marine protected areas.

Through the FISC Coral Reef Research Project, the USGS will contribute knowledge about the mechanisms and effects of change on coral reefs.

Reference

U.S. Geological Survey, 2007, Strategic Science for Coral Ecosystems 2007-2011: U.S. Geological Survey Strategic Plan, Reston, VA, 22 p.

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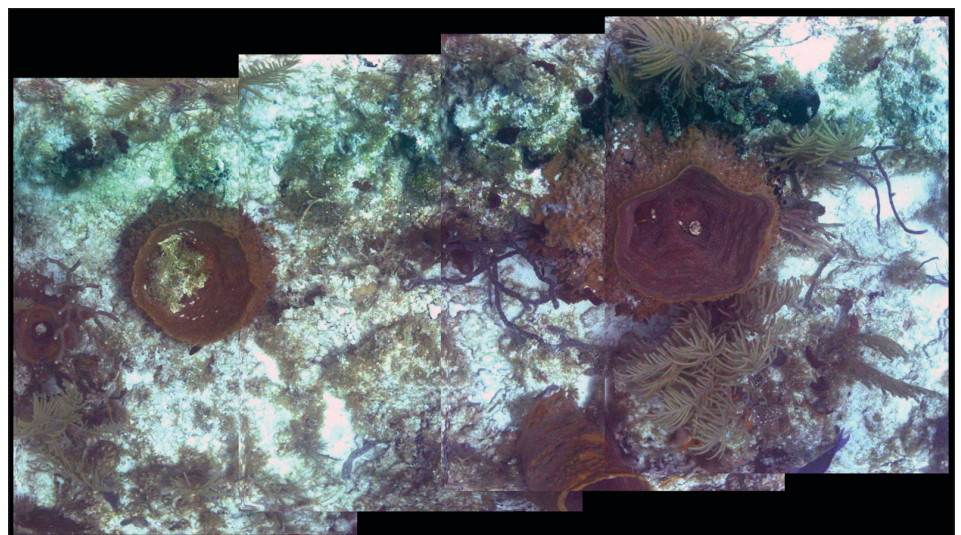


Figure 6. Photo mosaics, such as this one created using the USGS Along-Track Reef-Imaging System (ATRIS), will provide a detailed dataset to support benthic habitat characterization and mapping efforts.