

Science at Dry Tortugas

National Park Service
U.S. Department of the Interior

South Florida Natural Resources Center
Everglades and Dry Tortugas National Park



Dry Tortugas National Park has a long history of marine research. Currently, the park is funding several scientific monitoring and research projects that address key ecosystem management issues. Additional scientific projects that complement the park work are being conducted by other National Park Service and federal and state partners, including the National Oceanic and Atmospheric Administration (NOAA), U.S. Environmental Protection Agency, and Florida Fish and Wildlife Conservation Commission.

Completed and Ongoing Scientific Work

Exotic Plants. Until recently, invasive exotic plants such as Australian pine (*Casuarina equisetifolia*) and sisal hemp (*Agave sisalana*) were a serious problem on park keys. Concerted systematic eradication treatments of these and other exotics were conducted between 1992 and 1999, predominately on Loggerhead Key. Since 2003, the occurrence of the most problematic invasive exotics has been reduced to a manageable level. Annual monitoring and re-treatment are required to control these and other species, such as seaside mahoe (*Thespesia populnea*) and beach naupaka (*Scavola taccada*). Within the developed area of Garden and Loggerhead Keys, several non-invasive exotic plant species, including coconut trees (*Cocos nucifera*), remain. Those species that do not have historical significance will be replaced with native plants of similar habit.

Sea Birds. The park Sooty and Brown Noddy Tern (*Sterna fuscata* and *Anous stolidus*) colony is the largest nesting colony in the continental United States. A research project to determine the nesting dynamics of the colony has been ongoing since 1960. Surveys indicate that a stable population of approximately 30,000 to 35,000 nesting pairs of Sooty Terns and greater than 4,000 nesting pairs of Brown Noddies breed on the keys. Nesting takes place from February through September, during which time the nesting habitat on Bush Key is closed to visitors.

Sea Turtles. Loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles commonly nest in the Dry Tortugas. An effort to monitor their nesting was conducted from 1995 to 2004, excluding 2002. A total of 2,125 nests produced an estimated 121,589 hatchlings entering the Gulf of Mexico. In 2004, 134 loggerhead and 59 green sea turtle nests were documented and, for the first time

ever recorded at Dry Tortugas National Park, leatherback sea turtles (*Dermodochelys coriacea*) nested, producing three nests. An unusually high number of tropical storms, including four major hurricanes, negatively affected the 2004 nesting season. Ninety-six nests were lost and salt water inundated many of the remaining nests. Annual monitoring allows inter-annual variability in nesting success to be tracked and its impact on the population to be assessed.

Reef Fishes. Monitoring for the coral reef fish assessment project, which includes game species, is conducted every two years in collaboration with an interagency Florida Keys reef fish assessment project. The decline in reef-associated gamefishes is a major ecological resource management concern. A recent study concluded that 45% (13 of 29) of fish species in the park are over-fished and 62% (18 of 29) of fish species exceed the federal fishing mortality target by two to six times. The study also concluded that the reef fishery is in worse condition inside the park than in the surrounding area. This study is critical to obtaining baseline fisheries information for the newly-established Research Natural Area (RNA).

Reef Corals. The goal of the coral monitoring and assessment project is to evaluate the ecological status of the common and rare reef coral communities in the park through annual monitoring. The project is conducted in collaboration with an interagency south Florida coral reef evaluation and monitoring project. The Dry Tortugas has undergone an extensive decline in stony corals. Staghorn coral (*Acropora cervicornis*) reefs have declined more than 99% since 1977, live brain coral (*Colpophyllia natans*) cover on Bird Key reef declined 69% between 2001 and 2002, and, in 2003, the largest known thicket of fused staghorn coral (*Acropora prolifera*) in Florida experienced mass mortality due to disease. In 2004, disease and/or bleaching were observed at 19 of 21 monitoring stations. The sources of disease are unknown.

Bermuda chubs (*Kyphosus sectatrix*)
photo by William Perry, Everglades National Park

Parks for Science and Science for Parks

Dry Tortugas National Park offers unique opportunities for research and scholarship. Modern scientific research in the Tortugas dates back to the late nineteenth century. The Carnegie Institute's Marine Laboratory, now celebrating its 100th anniversary, played a significant role in this long history of exploration, discovery, and innovation. Geographic isolation and a long history of resource protection continue to provide opportunities to study tropical marine ecosystems in the park.

The South Florida Natural Resources Center (SFNRC) is in the process of updating the Resource Management Plan which guides park stewardship. With input from the National Park Service (NPS) and other federal, state, and academic partners, the SFNRC will develop research and monitoring plans for Dry Tortugas National Park that consider gaps in basic scientific understanding of the ecosystem, specific information needed to make sound park management decisions, and related monitoring and research efforts taking place in adjacent waters. The RNA of Dry Tortugas National Park protects valuable near-shore habitats and complements the deep-water habitat protection afforded by the NOAA-managed Tortugas Ecological Reserve. Long-term studies and monitoring will



Elkhorn coral (*Acropora palmata*)

photo by Geoff Chilcoat, University of Georgia

serve to document existing baseline conditions and analyze how park natural resources respond to the RNA's protection. Both the South Florida & Caribbean Inventory and Monitoring Network and the Florida & Caribbean Exotic Plant Management Team of the NPS Southeast Regional Office play important roles in working with Dry Tortugas National Park in these monitoring efforts.

Monitoring programs to evaluate effects of reduced fishing pressure on key fishery species and related ecological attributes and processes will be developed. Similarly, monitoring programs will be designed to assess benefits to seafloor habitats, coral reefs, and seagrass habitats resulting from a reduction in anchoring within the

RNA, as well as to assess the potential for anchoring damage to be displaced to areas outside the protected zone. The ecological effects of SCUBA and snorkeling activities on corals around designated mooring buoy sites will also be monitored and assessed. Changing patterns of visitor use may have both positive and negative ecological consequences for sea turtle and marine bird habitats and behavior, as well as for the coral reef, and must therefore be tracked. Other areas of concern being considered include assessment of water quality, the status of endangered species, extreme events such as hurricanes and their effects on vegetation and wildlife, and the long-term effects of climate change.



Sooty Tern (*Sterna fuscata*)

photo by Michael Ryan, Dry Tortugas National Park

Monitoring and assessment will not be limited to the RNA. Park areas outside the protected zone may have different science needs, such as the need to monitor continuing effects of fishing pressure. A variety of science needs related to vegetation will also be addressed, including the mapping of island vegetation communities and annual monitoring and treatment of exotics. Coordination of monitoring inside and outside the protected zone will allow for a comparison of the status of resources over time and provide the basis for adaptive management response. Research on issues such as causes of coral decline will also be addressed.

Regional coordination of research efforts and synthesis of the results will improve our understanding of the linkages between stresses on natural resources inside and outside the park and increase the effectiveness of scientific efforts in the region. Dry Tortugas National Park is seeking funding for this effort from sources within the NPS and Department of the Interior. The park also welcomes collaboration with other funding partners interested in supporting the science and management of this unique and valuable marine ecosystem.