

TESTIMONY

RESEARCH AND MONITORING, THE FLORIDA REEF TRACT

PRESENTED TO

THE SUBCOMMITTEE ON ENVIRONMENT OF THE COMMITTEE ON SPACE AND TECHNOLOGY AND THE SUBCOMMITTEE ON OCEANOGRAPHY, GREAT LAKES, AND THE OUTER CONTINENTAL SHELF OF THE COMMITTEE ON MERCHANT MARINE AND FISHERIES, THE UNITED STATES HOUSE OF REPRESENTATIVES. FOR A HEARING, KEY LARGO SHERATON HOTEL, 23 APRIL 1992, KEY LARGO, FL

PRESENTED BY

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"Seaward of the Florida Keys lies a unique state and national treasure. This treasure is not gold, silver, or diamonds; the treasure is the subtropical marine ecosystem of mangrove forests, seagrass meadows, and coral reef communities" (Jaap 1991). Coral reefs are well known for their beauty and complex diversity of life. They are the oceanic equivalent of the tropical rain forest, in providing an almost infinite variety of habitats for plants and animals. The ecosystem is important for its economic, ecological, coastal protection, aesthetic, and wilderness values.

The Florida Reef Tract extends from Fowey Rocks to Dry Tortugas (Vaughan 1914, Jaap 1983, Jaap and Hallock 1990, attached Figure). There are 6000 patch reefs and 60 miles of bank reefs between Fowey Rock and Sand Key (Marszalek et al. 1977). The Florida Marine Research Institute's Geobased Information System group and the NOAA National Marine Sanctuary Program are currently mapping this area so that its reefs, seagrasses, and mangroves will be more accurately defined. The biodiversity of the area is poorly understood. With the exception of a few taxonomic categories, for example corals and fish, the number of resident species is wretchedly documented.

The Department of Natural Resources began its research in the Florida Keys marine ecosystem in the early 1960s. That research continues and is being expanded with support from saltwater fishing license monies and trust funds received from vessel groundings. Historically, research focused on pink shrimp, spiny lobster, stone crab, and fin fish fisheries. Habitat research has concentrated on coral reef, seagrass, and mangrove ecology and episodic phenomena. The coral reef research group has established long term study sites at John Pennekamp Coral Reef State Park, Looe Key, Western Sambo Reef, and six locations at Fort Jefferson National Monument, Dry Tortugas (Jaap et al. 1990).

Coral reefs can exist for thousands of years. Geological changes usually occur very slowly, in a similar time-scale (thousands of years), for example sea level change correlated with glacial and interglacial periods. However, the component reef communities change more frequently, in a time-scale of decades to centuries. The etiology of change is often poorly understood. For example, in 1878, a perturbative phenomena identified as "black water" decimated stag horn corals (*Acropora* spp.) at Dry Tortugas (Meyer 1902, Feinstein et al. 1955). We still do not know what this "black water" was, and perhaps we never will.

"Sustaining ecological research is one of the essential approaches for developing an understanding and for predicting the effects of human activities on ecological processes" (Likens 1988). Long-term ecological research (LTER) seeks to uncover processes that seem hidden because they occur slowly or because effects lag years behind the causes (National Research Council 1990). In the absence of long-term research, serious misjudgments can be made, hindering attempts to manage the environment: "lack of historical perspective can place short-term studies in the invisible present" (Swanson and Sparks 1990). Franklin (1988) identified several important areas of LTER research, including slow processes, rare episodic phenomena, processes with high variability, subtle processes, complex phenomena, testing theory, validating concepts, and selecting hypothesis.

There are a number of hypotheses regarding the deterioration of coral reefs, both in general and in specific cases. Long-term ecological research on coral reefs is in its infancy. Few databases accurately document trends in reef communities over decades or longer. The studies that are of a sufficient duration report that shallow-water reef communities are primarily governed by physical processes (Connell 1978, Jackson 1991) and deeper reef communities appear to be primarily governed by biological interaction (Jackson and Buss 1975).

Conventional wisdom assumes that user abuse (vessel groundings, exceeding carrying capacity of the habitat, overexploitation of fishery stocks) and pollution (eutrophication) are principal causes of deterioration of the Florida Keys coral reefs. Global climate change can also be evoked as a potential agent of change. Four episodes in which the coral reefs bleached (1987, 1989, 1990, 1991) document the possibility that CO₂ greenhouse warming and increased ultraviolet radiation caused by ozone depletion may be affecting Florida reefs.

The epidemic mass mortality of populations of the herbivorous black spiny sea urchin (*Diadema antillarum*) populations in 1983 may have influenced algal standing crop due to reduced grazing. Evidence is inconclusive to render final judgements regarding any of the aforementioned issues.

A multi-disciplinary approach to determine the causes of coral reef change is being taken in the SeaKeys program (Ogden 1991). The integration of physical, chemical, and biological investigations is slowly presenting a clearer picture of the processes that govern Florida's coral reefs. Our research at Dry Tortugas, John Pennekamp Coral Reef State Park, Looe Key, and Western Sambo is an integral part of this program.

We are proceeding with the long-term research needed to understand the dynamics of the reef communities on an appropriate spatial and temporal scale. This includes sampling the adult and juvenile plants and animals. Plant and animal populations are dependent on recruitment of replacements to sustain the species. Two years of sampling imply that scleractinian coral recruitment rates are relatively low on settlement plates. This could be because of the stress of bleaching episodes during the past few years.

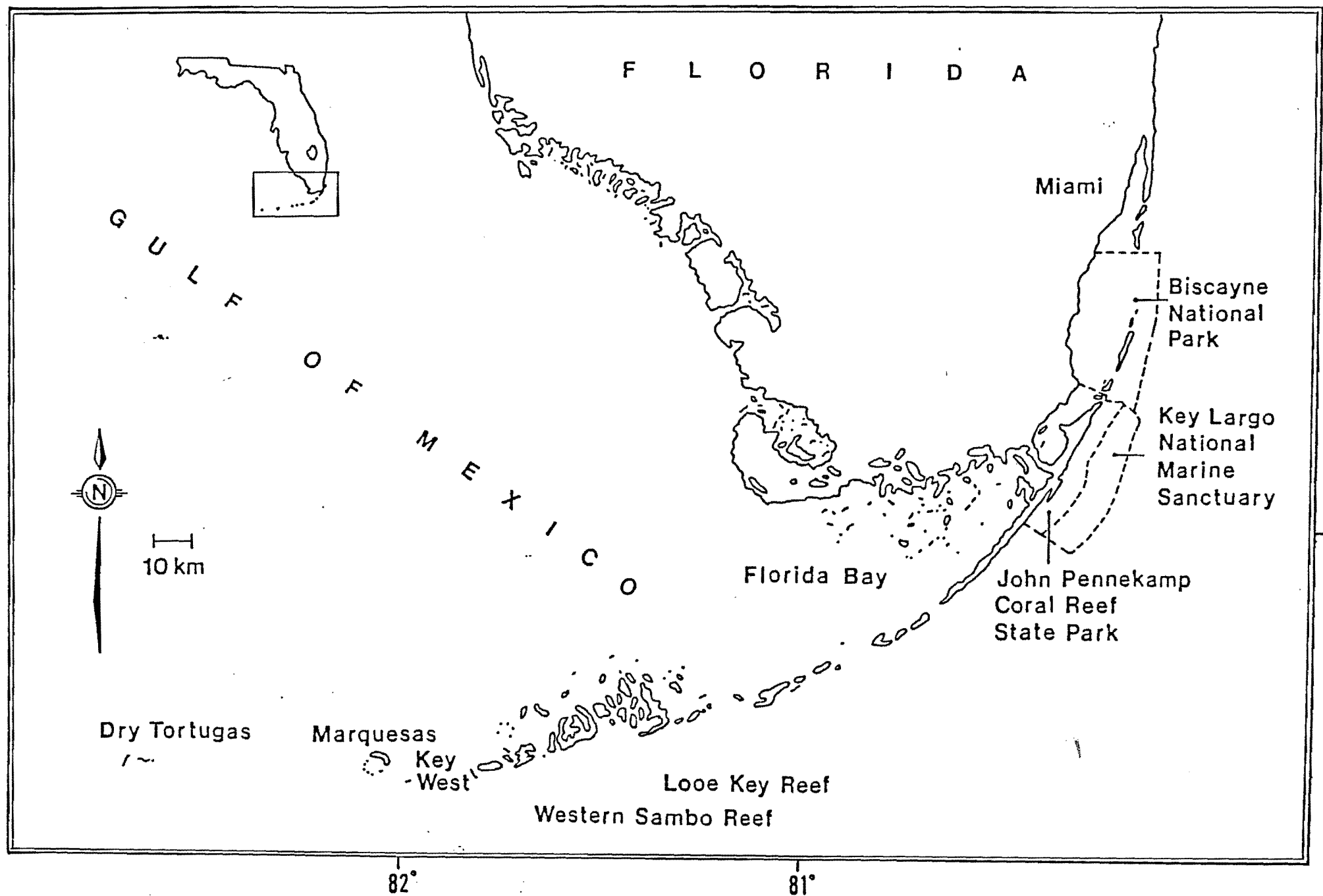
Extreme devastation to coral reefs has been caused by merchant vessel groundings. In an effort to determine if recovery from this devastation can be expedited, the Florida Marine Research Institute has experimentally transplanted a reef community on the *Mavro Vetric* grounding site at Pulaski Shoal, Dry Tortugas (Jaap and others 1990). The goal of the study is to test the hypothesis that recruitment of reef plants and animals will be improved by moving adult organisms into barren, scarified areas.

The Florida Department of Natural Resources supports expanded research on coral reefs and improved stewardship of coral reef resources. These goals require coordination and a joint effort on the part of federal and state agencies, academic institutions, and conservation action groups. Future generations are depending on our prudent management of the coral reefs.

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