

EPA/NOAA Coral Reef Evaluation & Monitoring Project

2003 Executive Summary

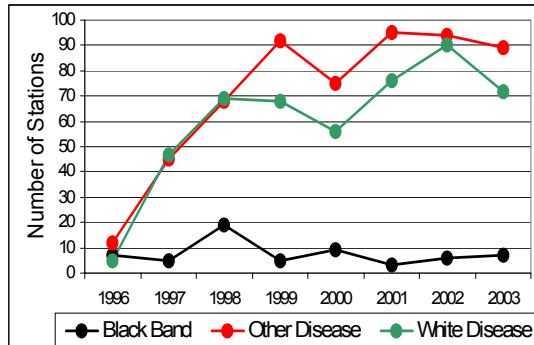


Figure 1. Incidence of coral disease 1996-2003.

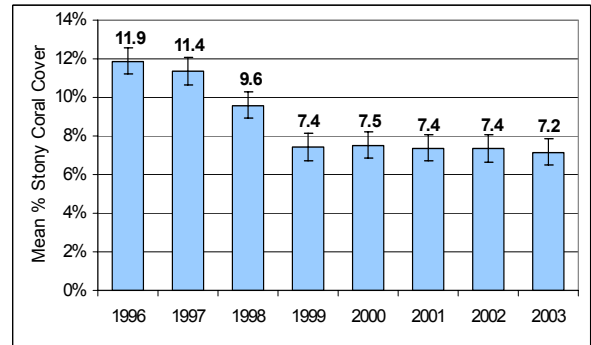


Figure 2. Mean % stony coral cover Sanctuary-wide 1996-2003.

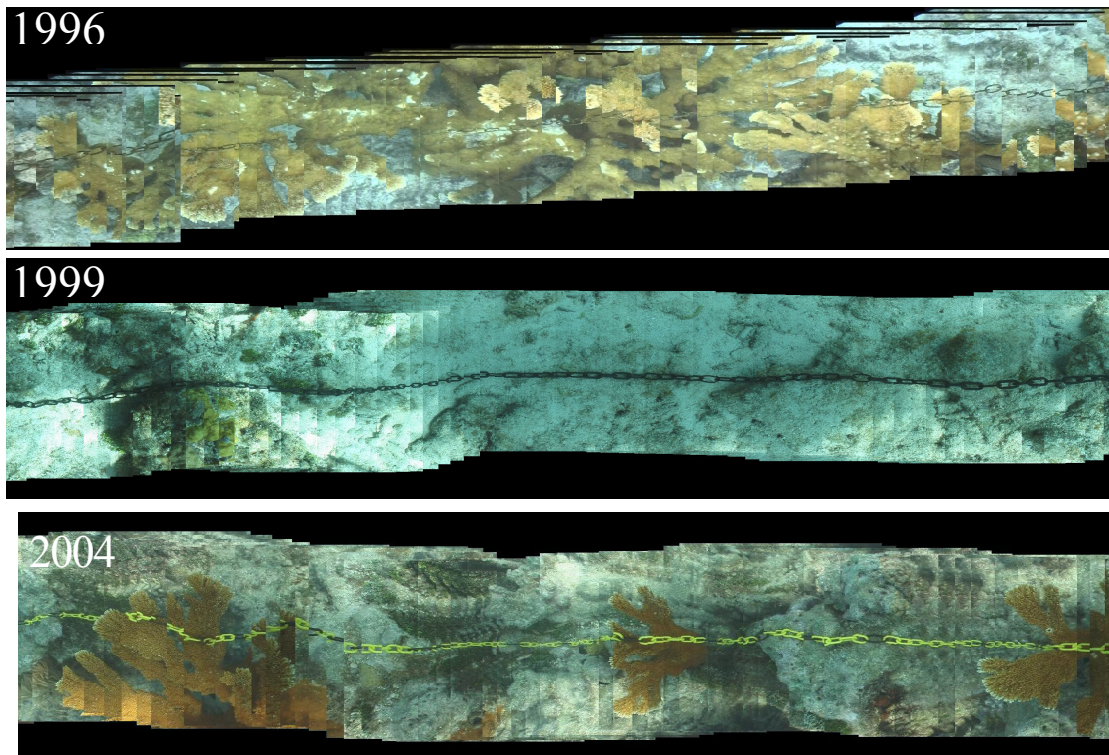


Figure 3. Photo mosaics of Western Sambo Station 2 showing catastrophic decline in *Acropora palmata* after hurricanes Georges in 1998 and Irene in 1999 and subsequent partial recovery into 2004.

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The Florida Keys National Marine Sanctuary (FKNMS) and Protection Act (HR5909) designated over 2,800 square nautical miles of coastal waters as the FKNMS. In cooperation with NOAA, the US Environmental Protection Agency and the State of Florida implemented a Water Quality Protection Program to monitor seagrass habitats, coral reefs and hardbottom communities, and water quality. The Coral Reef Evaluation and Monitoring Project (CREMP) sampling strategy and methods were developed in conjunction with EPA, FKNMS, Continental Shelf Associates, and the Principal Investigators in 1994. The major criteria for coral reef monitoring included Sanctuary-wide spatial coverage, repeated sampling, and statistically valid findings to document status and trends of the coral communities. The results were intended to assist managers in understanding, protecting, and restoring the living marine resources of the FKNMS.

Forty sampling sites were selected using a stratified random sampling procedure (USEPA E-map) and permanent station markers were installed. Annual sampling began in 1996 and has continued through 2003. Three additional sites were selected and stations installed in the Dry Tortugas in 1999. In 2002, additional sampling techniques were incorporated including a bio-eroding sponge survey, an expanded stony coral disease survey, and a stony coral population abundance survey.

Results are reported for regions defined as Upper Keys (north Key Largo to Conch Reef), Middle Keys (Alligator Reef to Moser Channel), Lower Keys (Looe Key to Smith Shoal), and Tortugas (Dry Tortugas to Tortugas Banks).

Sanctuary-wide from 1996 to 2003, for a total of 105 stations, the number of stony coral species declined at 76 (72%) stations, increased at 15 (14%) stations, and remained unchanged at 14 (13%) stations. A decline in the number of stony coral species was recorded in all habitat types. The offshore deep and patch reef stations had the greatest numbers of stony coral taxa with 17 and 16 species, respectively. Hardbottom stations had the fewest number of stony coral species, averaging nine species per station. Between 1996 and 2003, the number of stony coral species decreased at 25 of 30 (83%) stations in the Upper Keys, increased at one station, and remained unchanged at four stations. In the Middle Keys, the number of stony coral species decreased at 18 of 29 (62%) stations, increased at seven stations, and remained unchanged at four stations. In the Lower Keys, the number of stony coral species decreased at 33 of 46 (72%) stations, increased at seven stations, and remained unchanged at six stations.

In 1996, coral disease was observed at only five stations Sanctuary-wide. By 2002 coral disease was observed at 102 stations. Incidences of stony coral disease were reported at 95 stations in 2003. Specifically, in 2003, White disease occurred at 72 stations, "Other disease" was recorded at 89 stations, and Black Band disease was recorded at seven stations (Figure 1).

Sanctuary-wide, mean percent stony coral cover declined from 11.9 in 1996 to 7.4 in 1999, a decline of 38%. The greatest change occurred between 1997 and 1999 when mean percent stony coral cover declined from 11.3 to 7.4 (significant at $p = 0.03$, Wilcoxon rank-sum test). The changes observed between 1999 and 2003 were determined to be statistically insignificant. Sanctuary-wide, stony coral cover has not changed significantly since 1999. In 2003, mean percent stony coral cover Sanctuary-wide was 7.2 (Figure 2).

From the inception of the project in 1996 through 2003, 57 (55%) stations had a significant decrease in stony coral cover, 39 (38%) stations showed no significant change, and only seven (7%) stations had a significant increase. Evidence of this loss and partial recovery can be seen in Figure 3, which

shows a catastrophic loss of *Acropora palmata* colonies at Western Sambo Station 2 after hurricanes Georges in 1998 and Irene in 1999. Although the majority of stations had a significant decrease in percent coral cover over the first four years of the project, between 1999 and 2003, mean percent coral cover remained unchanged at 70 (68%) stations, increased at 19 (18%) stations, decreased at 14 (14%) stations.

In 2003, functional group data showed the benthic community was composed of 64.5% substrate, 12.6% octocoral, 11.1 % macroalgae, 7.2% stony coral, 2.2% sponge, 2.0% zooanthids, and 0.5% seagrass Sanctuary-wide.

Beginning in 2002, a series of mid-water and coral mucus samples were examined for presence of human enteroviruses commonly found in sewage. Human enteroviruses were detected in coral mucus from two Upper Keys sites (El Radabob and Conch Reef), one Lower Keys site (Jaap Reef), and surprisingly, one Tortugas site (Black Coral Rock). In addition, enteroviruses were detected in the mid-water samples from Black Coral Rock and Western Head off Key West (Lower Keys). It is unknown if the source of these pollutants is local or the result of remote transport. Additional analysis is planned for 2004, and may help define the source of this pollution.

From its inception, the CREMP has documented long-term changes in the status and trends of coral reefs throughout the 2,800-square-nautical-mile FKNMS. The cessation of rapid decline documented in the early stages of the project is encouraging. However, there is a general consensus that multiple stressors acting at local, regional, and global scales are continuing to have negative affects on coral reefs in the Florida Keys and elsewhere. The CREMP will continue to collect data relative to benthic habitat condition at the 40 sites in the Sanctuary, and Dry Tortugas

The CREMP was expanded in 2003 with the addition of ten sites in Miami-Dade, Broward and Palm Beach counties through funding from the Florida Department of Environmental Protection and the U.S. Coral Reef Task Force. The expanded CREMP is the only comprehensive, long-term coral monitoring program in Florida.

