

Coral Reef Benthic Community Response to Ten Years of Management in Fully Protected Marine Zones of the Florida Keys: Report of 2007 Field Work

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The primary purpose of this project was to resume our study of coral recruitment, juvenile coral mortality and benthic community structure in fully protected (“no-take”) zones and adjacent reference sites in the Florida Keys National Marine Sanctuary (FKNMS). This work will form part of our ten year assessment of the efficacy of the protected areas in restoring coral populations in the FKNMS. The fully protected zones (FPZs) consisted of South Carysfort (Carysfort Sanctuary Preservation Area) in the Upper Keys, and Eastern Sambo Research-Only Area and Western Sambo Ecological Reserve in the Lower Keys. The reference sites were Maitland, located near the *M/V Maitland* ship-grounding site in the Upper Keys, and Middle Sambo Reef and Pelican Shoal in the Lower Keys. These sites have been studied continually from 1998 until 2005. Other monitoring sites were established in the Upper Keys in 2002, at Molasses Reef FPZ with nearby Pickles Reef selected as a reference area but we did not anticipate being able to work on those sites this year due to the current level of funding support.

Goals for the 2007 Field Work

Our principal aims were to relocate our study sites, perform the random video transects and survey the permanent quadrats for coral recruitment and juvenile coral survival at each of the two depths at each of the six study sites. If time permitted we hoped to photograph the permanent quadrats and videotape large colonies of the key reef-building corals *Montastraea “annularis”* and *Montastraea cavernosa* at each of our sites that were initially tagged and assessed in 2003.

We also hoped to collect benthic algal samples to assess patterns of algal biomass and species diversity for comparison to our baseline study with Dr. Margaret Miller (NMFS) from 1998 to 2000. As well, we planned an assessment of spatial and temporal changes in turbidity at our four Lower Keys sites.

Accomplishments and Results

We successfully collected 10 video transects at each depth at our 4 study sites. The surveys were performed with a new High Definition camera and we hope the increased image resolution will improve species identification, especially for benthic algae and non-coral invertebrates. The transect analyses for coral cover and benthic community structure have begun at DISL. The video team was able to locate 5-8 of the large marked *Montastraea* colonies at each depth at the 4 sites. The video images are being analyzed for changes in colony size at GSU by a student assistant. About 90% of the permanent quadrats were re-surveyed. The surveyors were using photographs from 2005 to re-survey the quadrats and many quadrats showed apparent disturbance from storm waves (substrata re-arranged, large organisms completely absent). Juvenile coral mortality appeared high and recruitment low. In particular it will be difficult to accurately estimate recruitment because we lack data from 2006. We were only able to photograph the permanent quadrats at the Western Sambo shallow and deep sites and only half of the quadrats at Eastern Sambo Deep. We collected 5-7 benthic algal samples from 0.25 m²

areas in randomly selected permanent quadrats at each site and the algae have been identified, dried and weighed. The predominant macroalgae at most sites were *Dictyota menstrualis*, *Halimeda goreauii*, and *Halimeda tuna*. A comparison with baseline data from 1998-2000 has not been done yet. We deployed 4 submersible Onset temperature and light data loggers at the deep locations (16 m) at the 4 sites from mid July to late August. A separate surface logger was placed on the vessel and then moved ashore after our departure. Concurrent measurements of Secchi depth and incident light will be used to estimate light attenuation at each site. Three submerged loggers were retrieved by FKNMS staff, along with the shore logger, and the data were successfully downloaded. cursory inspection of the data indicates significant differences in water clarity between the sites on different days. Our intention is to estimate mean percent light reduction at depth as a proxy for turbidity at each site. We were successful in relocating our sites at South Carysfort FPZ and Maitland reefs and were able to complete the video transects at each depth at each site. In addition the video team was able to videotape several large *Montastraea* colonies at each depth. We completed all the quadrat surveys at the shallow and deep locations at each site and photographed all the quadrats. It was difficult to assess potential hurricane impacts during the surveys as these sites have generally had fewer corals and benthic invertebrates that could have been affected. It is significant that we were able to re-survey the Maitland site as we were not able to visit the site due to Hurricane Dennis in 2005. Also we were able to collect 5-8 benthic algal samples from the permanent quadrats at each depth.

Limitations for the field work

We were restricted in being able to complete our work due to three factors: reduced funding support, restricted availability of FKNMS vessel support time in the Lower Keys, and no vessel support in the Upper Keys. We had to make decisions on how to use our funds to accomplish the greatest amount of sampling time.

We had great support in the Lower Keys from Steve Baumgartner, Scott Donahue, and Capt. Ben Sniffen but, due to other science commitments, we were only able to have 7 days of vessel time. We elected to use available funds to hire a private dive charter at the beginning of the trip for a half day of training and familiarization at Middle Sambo shallow site. We probably needed another full day of vessel support to complete the quadrat surveys and photographs and collect additional algal samples.

In the Upper Keys we were not provided with any vessel support by the Upper FKNMS office due to other commitments and the NURC facility had no vessel support available for us. NURC did allow us to use the condos and lab space for a few days without charge and also allowed us the use of their double NITROX tanks for our entire trip. We had to use a private charter operation, "Island Ventures," for our vessel support and air and NITROX. We only had funds for three days of vessel charter and were lucky to accomplish all the survey work at South Carysfort and Maitland.

We have to express our concern about the lengthy delay in the delivery of funds to FIO, which only took place in late October, 5 months past the start date of May 1. The bulk of the funding for field support had to be provided by Dr. Smith at Georgia State through extensive use of State purchasing cards and credit cards and his personal credit cards. This placed him in

considerable difficulty with his Sponsored Research office and with the Biology Dept chair. Dr. Aronson also had to use institutional credit cards and internal accounts to support his part of the project. FIO was only able to provide travel for Dr. Ogden and an FIO support diver for three days. The CRCP program must address whatever the impediments were that prevented the delivery of the promised funding support within the typical 3 months post-award period.

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