Long-Term Monitoring of a High-Latitude Coral Reef System off Southeast Florida, USA: a Partnership Between Academia and Resource Management

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Introduction

Significant coral reef community development exists along the eastern shelf of the United States from the Dry Tortugas through the Florida Keys (Monroe County) and Southeast (SE) Florida (Miami-Dade, Broward, Palm Beach, and Martin Counties). State county, and federal resource managers have partnered with NCRI/NSUOC to monitor the health of the SE Florida reef system. NCRI/NSUOC is working on two annual monitoring projects. The Broward County Annual Monitoring Project is a county-wide project which began in 1997 and was designed to identify potential impacts to the reef system from beach renourishment activities. The SE Florida Coral Reef Evaluation and Monitoring Project (SECREMP) is a region-wide project established in 2003 as an expansion of the Florida Keys Coral Reef Evaluation and Monitoring Project (CREMP). SECREMP has sites across all four SE Florida counties (Miami-Dade, Broward, Palm Beach, and Martin) and with CREMP provides status and trend information for the entire Florida reef tract.

Broward County

- Monitoring period and number of sites
  - 1997 – 1999 = 18 sites (Broward County)
  - 2000 – 2003 = 23 sites (NCRI/NSUOC)
  - 2003 – Present = 25 sites (NCRI/NSUOC)
- Site Layout
  - 20m x 1.5m belt-transect
    - 20, 0.75m2 quadrats are sampled along both sides of transect (Fig. 1)
    - Sample area = 30m^2 (40 x 0.75m^2 = 30m^2)
  - 1 Sediment trap
  - 2, 30m x 2 m fish transects
- Benthic data
  - Stony corals (includes colonies >2cm diameter)
    - Density
    - Species richness and diversity
    - Whole colony size (in situ measurement of length x width)
    - Cover (Σ colony live tissue areas/transect area)
  - Octocoral
    - Density (entire transect)
    - Richness (Genus some colonies to species) (half transect =15m^2 area)
    - Size (height) class (half transect =15m^2 area)
  - Sponge density ('fleshy' sponges >2cm)
  - 0.75m^2 quadrat images

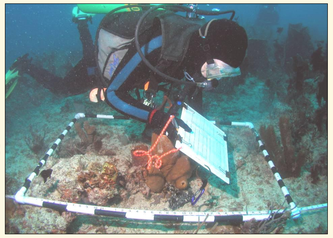

Figure 1: Diver sampling a 0.75m^2 quadrat along the belt transect.

Figure 2: Diver taking a quadrat framer image.

SECREMP

- Monitoring period and number of sites/County
  - 2003-2005 = 10 sites
    - Miami-Dade = 3
    - Broward = 4
    - Palm Beach = 3
  - 2006 – Present = 13 sites; 3 sites added in Martin County
- Site Layout = 4 stations (Fig. 3)
    - station = 2m x 22m
    - Sample area = 88m^2 (4 x 44m^2)
- Benthic data
  - Stony corals = Station Species Inventory (SSI)
    - Species richness: stony coral species present within each station is recorded.
    - Disease: Diseased colony location within each station is recorded and images are taken
  - Functional group cover: video is taken along 3 transects within each station (Fig 4). Camera height off the substrate is maintained with the use of lasers. Total area within each site included in the video assessment is 105.6m^2 (4 stations x 26.4m^2/sta).

    Functional groups include:
    - Stony coral species
    - Octocoral
    - Sponge
    - Macroalgae
    - Substrate
  - Bioerosion (Clionid sponge growth): the area covered by Clionid growth within each station is measured and the location of each sponge recorded. If eroding a stony coral colony, the coral species is recorded.
- Temperature: 2 loggers/site (started in 2007)

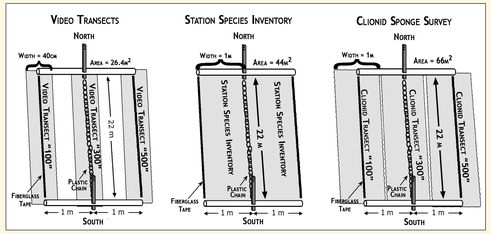

Figure 3: Video, SSI, and Bioerosion areas sampled within each SECREMP station.

Figure 4: Diver recording station transect video (yellow chain).

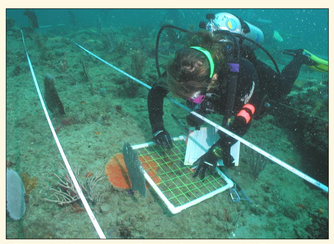

Figure 5: Diver measuring station transect *Cliona deletrix* area.

Temporal Results - Summary

In summary, both projects have shown that stony coral, octocoral, and sponge (functional groups most commonly involved in coral reef monitoring projects) densities and cover have been relatively stable since 2000 in Broward and 2003 for the region (SECREMP).

- Stony coral cover within the county and region is generally 2-3% and has not significantly changed (Fig. 6).
- Octocoral percent cover (SECREMP) (Fig. 7) is greater (12-14%) than stony coral cover (Fig. 6) and sponge cover (4-6%) (Fig. 7) and has also been relatively stable with some reduced cover in 2006 and 2007.
- Sponge density (colonies/m^2) (Broward) is greater and appears to be more variable than octocoral and stony coral density (Fig. 8).

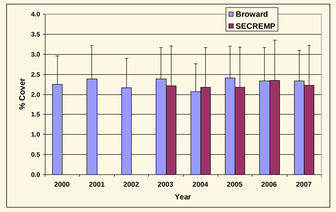

Figure 6: Mean (+SE) stony coral cover both projects.

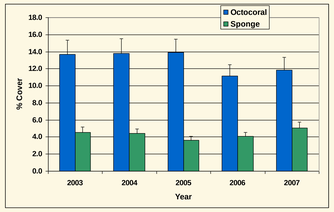

Figure 7: Mean (+SE) octocoral and sponge % cover (SECREMP).

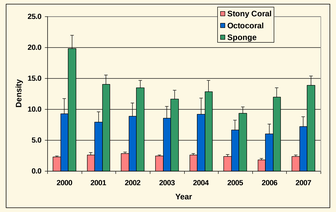

Figure 8: Mean (+SE) stony coral, octocoral and sponge density (Broward).

Acropora cervicornis

A large *A. cervicornis* patch (Fig. 9) was included in both monitoring projects to capture information on this important population

- Broward County: sampled 2003-Present; quadrat images and NCRI CPCe used to determine cover
- SECREMP: sampled 2003-Present; standard methods (Fig. 10)
- Figure 11 shows the percent *A. cervicornis* cover for both projects from 2003-2007. Cover has fallen from a high in 2004 even though the patch appeared to remain healthy. Reduced cover within the transects may not be indicative of overall patch condition due to normal patch dynamics.

Figure 9: Example of a large *A. cervicornis* patch in Broward County.

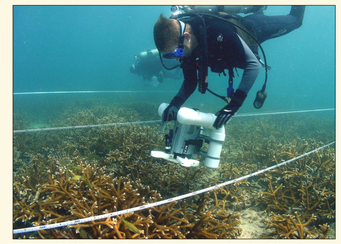

Figure 10: Video taken along *A. cervicornis* video transect (SECREMP).

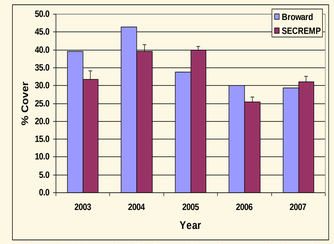

Figure 11: Mean (+SE) *A. cervicornis* cover both projects.

Conclusion and Future Efforts

- Both projects highlight the importance and success of the current partnership between academia and resource management
- The condition of at least 1 *A. cervicornis* patch will continue to be monitored. NCRI/NSUOC has recently implemented additional monitoring efforts designed to obtain detailed information on patch dynamics and health that are not captured from permanent transects.
- Although the effort is being re-evaluated, NCRI/NSUOC will to continue to partner with Broward EPGMD on a Broward County annual monitoring effort.
- NCRI/NSUCO will continue to work with Florida DEP and FWC/FWRI. Plans have been established to add 3 additional sites to the SECREMP project in 2009.

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