

6 Nearshore Mitigation Reef Site C

Monitoring Dates: May 22 and December 27, 2006

Location: approximately 1,000 feet offshore of the north end of the Stuart Public Beach, Martin County, Florida

GPS Coordinates: N27 13.335 / W80 10.513 (center of the reefsite)

Crewmembers: 5/22/06 – Dr. Lee Harris, Kerry Dillon, Mark Cloer
12/27/06 – Dr. Lee Harris, Kerry Dillon & Laura Herren

6.1 History of Mitigation Reef C:

This reef site was constructed during the summer of 2000. Materials utilized were from dismantled concrete and steel components from the old Evans Crary Bridge. Larger sections were placed in the Ernst permitted offshore reefsite in 60 to 70 feet of water, while smaller sections were utilized for the shallower nearshore mitigation reefsites.

Nearshore reef C was constructed on 7/19, 22, 25, 28 & 8/16 2000 with five total bargeloads of the following materials:

- 120 concrete piles from 20 – 40 ft. long each
- 24 concrete pilecaps approx. 30 ft. x 4 ft. x 5 ft. each
- 19 steel/concrete roadway sections approx. 40 ft. x 5 ft. x 4 ft. each

These materials were deployed from an unanchored barge using several temporary surface buoys to mark the areas for material deployment. Nearshore reefsite C is approximately 1000 feet offshore of the beach, with water depths to natural bottom 15 – 24 ft. deep. The shallowest spot to the top of the reef components measured in 2000 was 7 feet, with the average water depth above reef components being 12 – 15 feet. In 2006 the shallowest spot located was 9 feet.

6.2 Reef Components Stability

This area appeared to have the most changes following the 2004 and 2005 hurricanes. The clusters of material located were fewer and farther apart. The water depths to the sand bottom were significantly shallower than during the previous monitoring events, so that burial of a significant amount of the material in this area is suspected. There has been some settlement (and/or burial) and scour around the bridge pieces that were located in 2006. The scour provides habitat similar to that provided by similar scour around nearshore natural reefs in the area. Many of the components that are stacked on top of each other appear to be stable, and are continuing to provide many overhangs and crevices, which are an excellent habitat for a variety of marine organisms to thrive.

6.3 Fish Species & Abundance Findings:

The fish species census is shown in Table 7 for Mitigation Reef C.

Table 7. Mitigation Reef C Fish Census

Species	2004	2006	Juvenile or Adult
Porkfish	100's	10's	J & A
Porkfish	100's	10's	A
Reef Croaker	10's	0	--
Stripped Croaker	0	100's	A
Grey snapper	10's	2	A
Sheepshead	7	0	--
Beaugregory	2	10's	A
Spottail pinfish	1	3	A
Common Snook	2	1	A
Atlantic Spadefish	2	0	--
Highhat	1	3	J
Blue Runners	10's	0	--
Gray Triggerfish	1	0	--
Barracuda	1	0	--
Lane Snapper	1	0	--
Red Pogy	4	0	--
Fry (unidentified species)	100's	0	--
Nurse shark	2	0	--
Gag Grouper	1	0	--
Black Margate	10's	10's	A & J
Porcupinefish	1	0	--
Scamp	1	0	--
Atlantic Bumper	10's	0	--
Hairy Blenny	0	4	A
Cubaru	0	10's	A & J
Round Scad (Cigar Minnow)	0	100's +	A
Tomtates	0	10's	J & A
Unidentified species of snapper	0	1	A
Spiny Lobster	0	2	A
Townsend Angelfish	0	1	A
Goliath Grouper	0	2	A

6.4 Benthic Species Identification

On December 27, 2006 divers spent 42 minutes on Mitigation Reef C photographing benthic invertebrates and macroalgae. Benthic species listed in Table 8 were identified using the roving diver technique on December 27, 2006.

Table 8. Mitigation Reef C Benthic Species Census

Benthic Species Identified	Common Name	Abundance
Green Algae		
<i>Bryopsis pennata</i>		Abundant
Red Algae		
<i>Gracilaria mammillaris</i>		Many
<i>Gelidium americanum</i>		Abundant
<i>Bryothamnion triquetrum</i>		Few
Sponges		
<i>Pseudaxinella lunaecharta</i>	Orange sticky sponge	Abundant
Encrusting sponges		Abundant
Unidentified yellow sponge		Few
Cnidarians		
<i>Aglaophenia latecarinata</i>	Feather plume hydroid	Abundant
<i>Leptogorgia hebes</i>	Regal sea fan	Abundant
<i>Leptogorgia virgulata</i>	Yellow sea whip	Abundant
<i>Phyllangia americana</i>	Hidden cup coral	Few
<i>Carijoa riisei</i>	White telesto	Many
Solitary anemome		Few
Mat anemone		Single
Worms		
Tubeworms		Few
Gastropods		
<i>Terebra salleana</i>	Eastern augers	Many
Bryozoans		
<i>Bugula turrita</i>	Fan bryozoan	Single
Tunicates		
<i>Eudistoma obscuratum</i>	Black condominium tunicate	Many
<i>Ascidia niger</i>	Black solitary tunicate	Many
Globular tunicates (<i>Styela</i> spp. – like)	Solitary tunicates	Abundant
White colonial tunicate		Many

A dramatic change in the benthic community documented in May 2004 was observed in December 2006. A greater variety of attached macroalgae was documented in 2004 than 2006. The green algae (*Codium*, *Caulerpa*, and *Halimeda*) documented in 2004 were replaced by *Bryopsis pennata* by December 2006. Most importantly, high concentration of the exotic invasive green alga *Caulerpa brachypus* documented in May 2004 (pre-Hurricane Francis) was absent in December 2006. In May 2004, four genera of brown algae (*Sargassum*, *Dictyota*, *Spatoglossum*, and *Padina*) were documented. No brown algae were located during the 2006 survey. The number of species of red algae also decreased significantly by December 2006. One of the greatest transitions between 2004 and 2006 was the percent cover of sponges (especially *Pseudaxinella lunaecharta*). The abundance and species of

tunicates did not differ much between the 2004 and 2006 surveys. No sea urchins or sea cucumbers were documented on Mitigation Reef C during the December 2006 survey. Representative benthic species from Mitigation Reef C are shown in Figure 4.

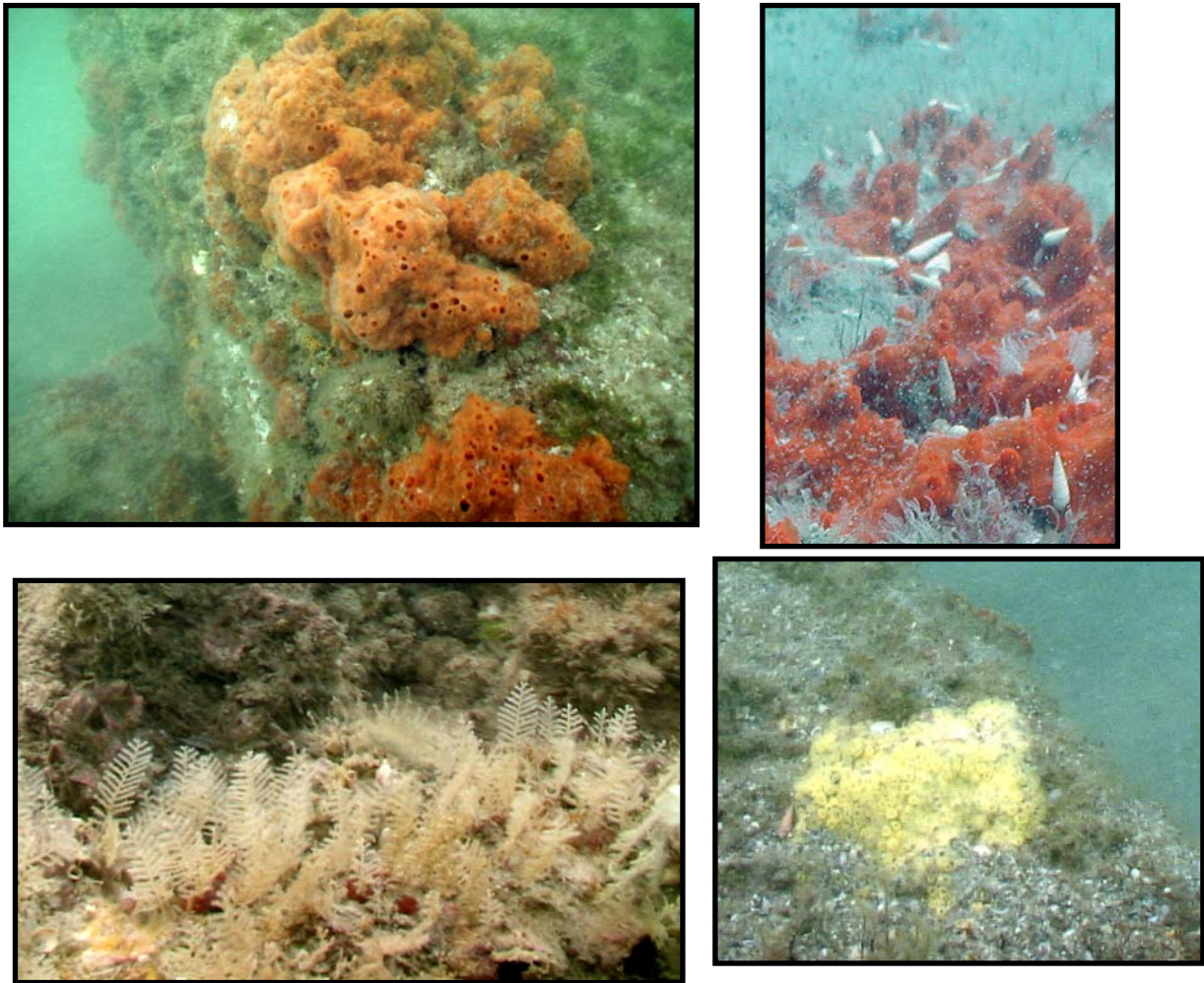


Figure 4. Representative benthic growth on Martin County Mitigation Reef C

a) upper left - orange sponge *Pseudaxinella lunaecharta*, b) lower left - feather plume hydroids *Aglaophenia latecarinata*, c) upper right - Eastern augers *Terebra salleana*, and d) lower right - unidentified yellow sponge.

6.5 Mitigation Reef C Summary

Of the three Martin County mitigation reefs, Site C had the largest quantity of concrete and steel materials deployed. This site was built with 5 total barge loads using fully loaded barges. Although site C had the most total amount of material deployed, it is more spread out, and so the footprint area is larger. At sites A & B it is relatively easy for a diver to find and swim from one grouping of materials to the others, but at site C larger gaps exist for the divers to traverse from one section to another.

As was reported in the 2004 report, many of the original pilings in these areas between stacked materials are now mostly and/or completely covered with sand. The grain size of the sand in 2006 was much coarser at site C than at site A, which could indicate more of the coarser beach sand that eroded from the beaches during the storms covering the material in Reef C than at the other 2 sites.

In the 2006 monitoring the total fish species count was down from 20 in 2004 to the recent census of 14 species identified and 1 additional unidentified species for a total of 15. Spiny lobster was seen in 2006, which was never reported here before.

The most notable finding in 2006 was the continued increase in attached benthic organisms thickness and coverage on all steel and concrete surfaces. The absence of the invasive species *Caulerpa brachypus* was also noted and has been a consistent finding up and down the Florida coast where the hurricanes passed, so that it is believed that this invasive species has been flushed away from the area.