6.1 History of the Tetrahedron Patches Artificial Reef:

As part of a Florida Fish and Wildlife Conservation Commission construction grant (FWC Grant #00190 for $15,000) and with additional funding from Martin County, five patch reefs using concrete tetrahedron modules were constructed in March and June 2002. The materials utilized were 4 feet and 5 feet solid concrete tetrahedrons with a steel rebar lifting eye. This reef is approximately ½ mile south of an existing tetrahedron stack reef constructed in April 2001. The patch reef was built with the same total tonnage as the stack reef, and is located in similar water depth and same distance offshore of the Martin County shoreline (6.5 miles).

The tetrahedron patch reef was built on March 28 and June 28, 2002 utilizing one barge load of concrete modules for each deployment. A total of approximately 460 units were placed from an anchored barge, approximately 230 units each deployment. There are five patches or "clusters" on the reef, each separated by a sand/shell seafloor. Distances vary between the clusters and are a nominal 80 to 100 feet from outer edges of each cluster. Color-coded tie wraps were added to tetrahedron modules in each of the patch areas to aid future monitoring efforts. Sub-surface buoys also were added in 2003 at each patch to aid in monitoring.

6.2 Dive Data

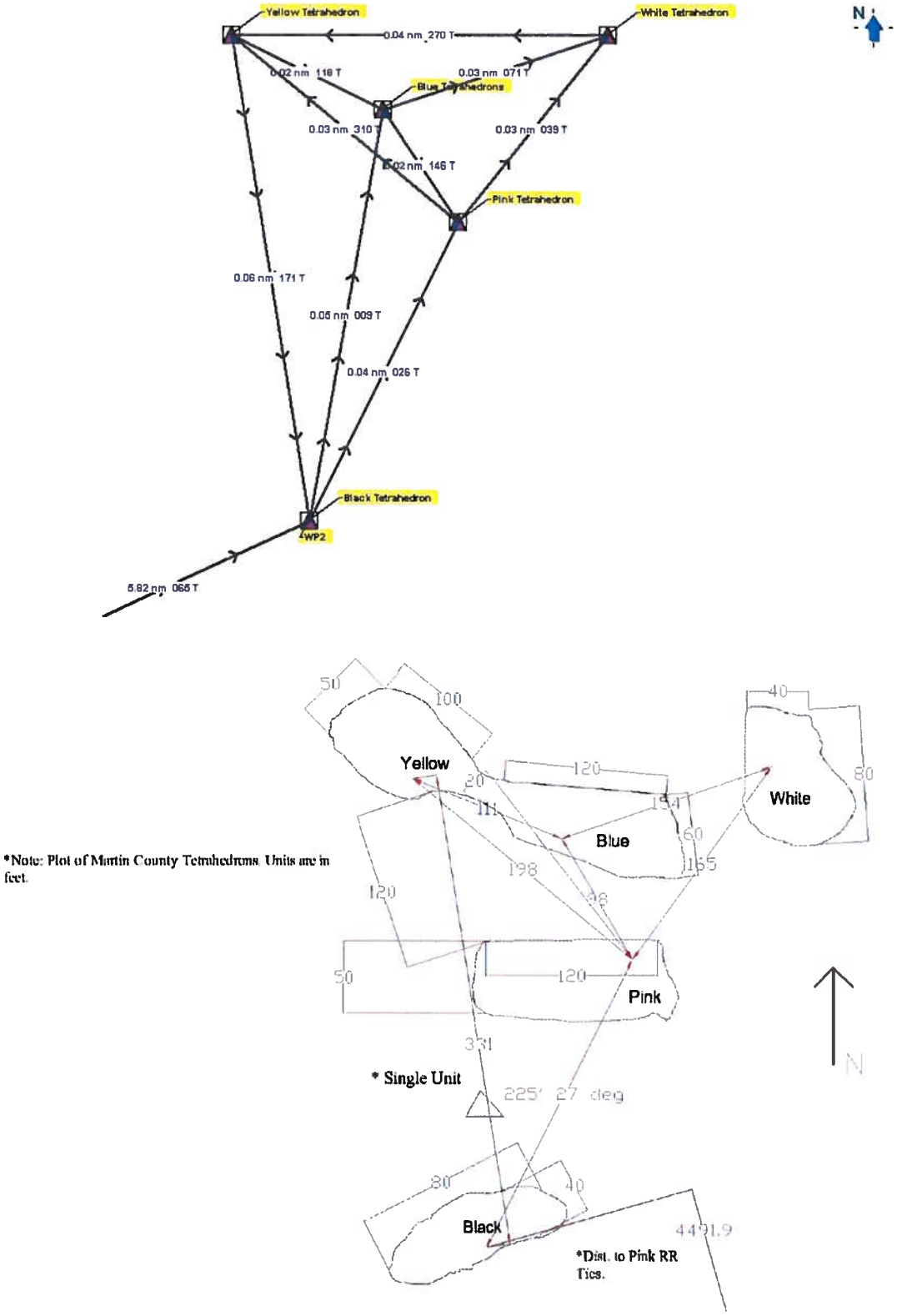
Max. depth at bottom in sand = 95 feet (96 feet in scour)
Min. depth at top of shallowest tetrahedron (pink and black patch) = 88 feet
Underwater visibility this day = 40 feet
Bottom water temperature = 68° F
Surface water temperature = 74° F
Current direction and speed = ½ knot to the north
Divers breathing mode and gases = SCUBA with NITROX 36%

6.3 Tetrahedron Patches Orientation:

Figure 11 shows a detailed chart and map of the five concrete tetrahedron patch reefs. To construct the desired reef layout, the barge position was maintained by anchors and was closely monitored during deployment, and modules were dropped from the same spot on the barge during the deployment of each patch reef. Three patches (pink, blue, and yellow) have roughly elliptical patterns, with the major axes oriented generally east-west. The white and black patches are roughly circular in shape. Although each patch is a separate entity with sand/shell bottom between them, a few isolated tetrahedrons exist around the perimeters of each patch.

6.4 Representative Photographs

Underwater photographs taken on April 26, 2006 are shown in Figure 12. The upper right photograph shows one of the subsurface underwater buoys. Seabass, angelfish, and divers are shown in the photographs.



*Note: Plot of Martin County Tetrahedrons. Units are in feet.

Figure 11. Charts of the Concrete Tetrahedron Patch Reefs

Figure 12. Tetrahedron Patch Reef Photographs

6.5 Reef Components Stability

The individual tetrahedron concrete modules are solid units, which weigh up to 3600 lbs. each in air. At this depth of 100 feet they are designed to be stable against wave forces accompanying a 50-year storm event. Since the deployment in 2002, no significant movement or shifting of units has not been observed, nor was any notable scouring or sinking into the bottom documented.

All of the patches have heights above the seafloor ranging from 4 to 7 feet, except for the white patch, which has a maximum profile of 3 feet. This is due to the fact that all of the patches except for the white patch have stacking of units.

6.6 Fish Species and Abundance Findings:

Fish identification and abundance was determined utilizing the guidelines setup by the Reef Environmental Education Foundation, as described previously. Table 7 presents the fish species observed and documented during monitoring on April 26, 2006

Table 7. Tetrahedron Patches Reef Fish Census

Marine Species Identified	*2006 Observed*	*2005 Observed*	*Juvenile or Adult (2006)*
Little Tunny (Bonito)	Not Seen	5	--
Red Snapper	1	15	A
Red Grouper	1	1	A
Whitespotted Filefish	Not seen	1	--
Southern Stingray	Not seen	1	--
Striped Croaker	50 +	5	J and A
Blue Angel	2	1	A
Spotfin Butterfly	2	2	A
Rock Hind	Not seen	1	J
Gray triggerfish	10's	10's	A
Vermilion snapper	3	7	A
Black Seabass	10's	10's	J and A
Greater Amberjack	5	1	A
Sheepshead	17	7	J and A
Tomtate	10's	100's	J and A
Sheepshead porgy	10's	4	A
Bo Gregory	Not seen	1	--
Scamp	1	1	A
Fry (unidentified species)	Not seen	1000's	--
Gag Grouper	Not seen	1 A, 2 J	--
Snapper (unidentified species)	3	Not seen	A
Pinfish	2	Not seen	A
Peacock Flounder	1	Not seen	A
Pigfish	5	Not seen	A
Round Scad (Cigar Minnow)	100's	Not seen	A

6.7 Benthic Species Identification

Benthic species listed in
Table 8 were identified using the roving diver technique, as described previously. Species identified in 2006 were similar to that observed in 2005.

Table 8. Tetrahedron Patches Reef Benthic Species Census

Benthic Species Identified	*2006 Abundance*	*2005 Abundance*	*Comments*
Green Algae			
Codium decorticatum	2-10	2-10	
Codium spp.	11-100	11-100	
Caulerpa racemosa	11-100	11-100	
Brown Algae			
Sargassum spp.	> 100	> 100	Long strands 5 – 7 feet long attached
Spatoglossum spp.	2-10	2-10	
Red Algae			
Halymenia spp.	1	1	
Botryocladia spp.	11-100	11-100	
Amphiroa spp.	2-10	2-10	
Dasya spp.	2-10	2-10	
Laurencia spp.	2-10	2-10	
Sponges			
Orange encrusting sponge	2-10	2-10	
Unidentified encrusting sponges	11-100	11-100	
Cnidarians			
Unidentified anemone	11-100	11-100	
Unidentified hydroids	11-100	11-100	
Feather hydroids	11-100	11-100	
Tunicates			
Clavelina spp.	11-100	11-100	
Polyandrocarpa spp.	11-100	11-100	
Urchins			
Echinometra lucunter	2-10	2-10	
Sea cucumbers			
Isostichopus badionotus	1	1	
Mollusks			
Pinshell oyster (*Atrina seminude)*	> 1000	> 1000	
Crustacean			
Barnacles (*Balanus*)	> 1000	> 1000	
Several unidentified species of crabs	1	1	
Spiny Lobster (*Panulirus argus*)	2	1	

6.8 Tetrahedron Patches Reef Summary

The five-tetrahedron patch reefs were located in 2006, and appeared to be have been unaffected by the hurricanes of 2004 and 2005. The Category 2 and 3 hurricanes of 2004 and 2005 did not alter the structural layout or the total benthic coverage on the tetrahedrons, although the easternmost patch is sunken deeper in the seafloor than the others. Sargassum is still overgrown

on most of the tetrahedrons with long strands extending upward. Alga, sponges, tunicates and other attaching benthic organisms have flourished on the concrete surfaces as was noted in the previous monitoring reports.

Total fish species identified decreased slightly during the 2006 monitoring down to 18 from the 2005 total of 20. There were 5 species identified in 2006 that were not seen in 2005. The most significant of these being a species of snapper that could not positively be identified. After not being seen in 2005, red grouper was once again seen here in 2006. Another significant species seen in 2006 is Striped Croaker, a species that is currently on the Federal list of species of special concern. This species natural range is limited to the central East Coast of Florida waters and has previously been identified on the nearshore mitigation artificial reefs of Martin County and other artificial reefs of St. Lucie County. There were 7 species not seen in 2006 that were previously documented at this site, the most notable were gag grouper, and rock hind, both of which are migratory species that probably roam from site to site over time.

7 Railroad Tie Stack Reef

Construction date: March 13, May 9, June 23, 2003
Monitoring Date: May 23, 2006
Location: Approximately 7 miles offshore St. Lucie Inlet - Martin County, Florida
GPS coordinates: N27° 12.201 / W80° 02.310 at the summit of the reef site
Crewmembers: Kerry Dillon, Jack Glanville, and Mark Cloer

7.1 History of the Railroad Tie Stack Artificial Reef:

This is the first artificial reef site to be built in Martin County from donated concrete railroad ties. As part of a grant from the Florida Fish and Wildlife Commission (FWC Grant #02108 for $25,000) and with additional funding from Martin County, the Railroad Tie Stack Reef was constructed in March, May and June 2003. This reef was built utilizing discarded concrete railroad ties donated by the Florida East Coast Railroad Company. Each railroad tie is approximately 11' x 14" x 10" and weighs 600 to 700 lbs. each. Approximately 1500 tons of concrete railroad ties were placed in three deployments from an anchored barge in 93 feet of ocean water. Deployment dates were March 13, May 9, and June 23, 2003.

7.2 Dive Data

Max. Depth at bottom = 91 feet
Min. depth at top center of summit = 72 feet
Size of structure = 120 feet long by 50 feet wide by 18 feet high
Underwater visibility this day = 50 feet
Bottom water temperature = 71° F
Surface water temperature = 76° F
Current direction and speed < ½ knot to the north
Divers breathing mode and gases = SCUBA with NITROX 38 and 32%

7.3 Representative Photographs

Underwater photographs taken on April 26, 2006 are shown in Figure 13. The upper right photograph shows one of the subsurface underwater buoys. Sheepshead, angelfish, and divers are shown in the photographs.