

5.7 Tetrahedron Stack Artificial Reef

- Location: Sirotkin Reef
- Materials: Concrete
- Maximum Depth: 100 feet
- Reef High Point: 92 feet
- Year Created: 2001
- Monitoring Date: 9/13/2010
- Total Cost: \$35,766 (FWC & Martin County)

5.7.1 History of the Tetrahedron Stack Artificial Reef

As part of a Florida Fish & Wildlife Conservation Commission construction grant (FWC Grant # 13821 for \$25,000) and with additional funding from Martin County in the amount of \$10,766, a single stacked concrete tetrahedron reef was constructed in April of 2001. To date, this is the deepest (statewide) that such a reef has been built made of concrete tetrahedrons. The materials utilized were 5- and 6-foot solid concrete tetrahedrons with a cast in place lifting eye of steel rebar. The reef was constructed on April 4 & April 25, 2001 utilizing two barge loads of concrete modules. A total of 430 units were placed from an anchored barge, with approximately 215 units deployed on each date. The deployment resulted in a single reef with an elliptical shape oriented in a general northeast/southwest direction. When diving this site one cannot determine any separation of the first deployment's modules from the second.

These units are designed to interlock together and “stack” on top of each other to form many crevices, voids, and hiding places for fish, crustaceans, and other marine life. While some modules settled on their bases without stacking on top of other modules, approximately 40% landed on top of others. The large surface area of each module also provides habitat for benthic organisms to attach themselves. Figure 19 shows the configuration of the Tetrahedron Stack and Tetrahedron Patches Artificial Reefs.

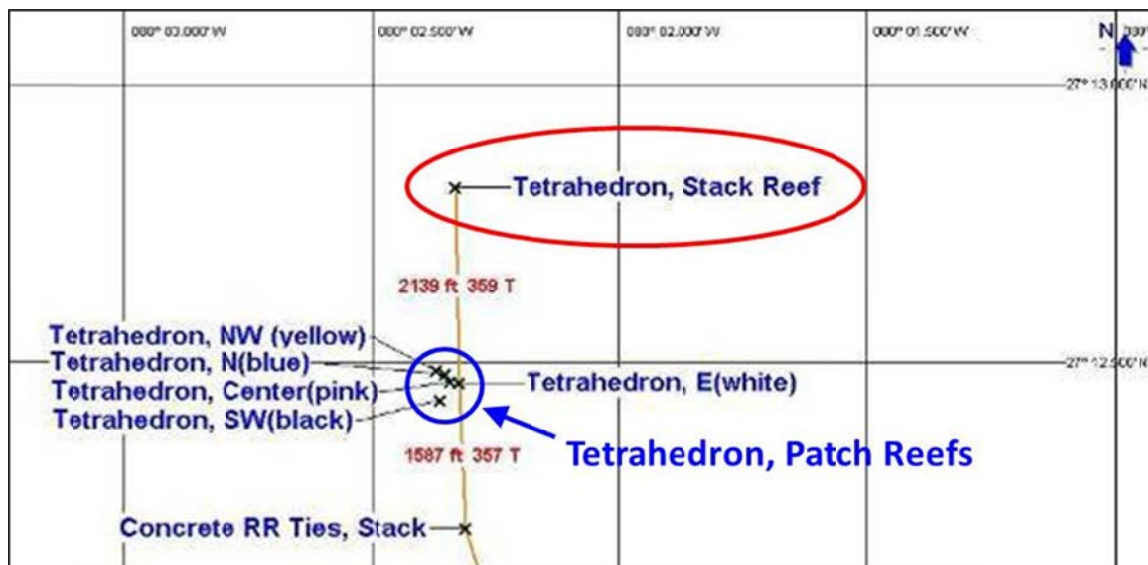


Figure 19. Chart view showing the Tetrahedron Stack and Patch reef locations.

5.7.2 Structural Summary

After initially diving this site in 2001 during the post-deployment surveys, and monitoring the site many times during the years 2001 – 2006; very little has changed as far as structural integrity and module positioning is concerned. A slight visual settling of the modules has occurred of maybe 1 foot but with depth gages and dive computers of plus/minus 1-foot accuracy it is hard to quantify. Overall assessment is that the reefs structural stability is good and little changes have occurred since deployment in 2001, despite the several hurricanes experienced in the area during 2004 and 2005. The photographs in Figure 20 are from the monitoring dive and show general conditions of the reef and some of the species observed during the dive.



Figure 20. Tetrahedron Stack Artificial Reef 2010 photographs.

Identification of species in the photographs shown above in clockwise order from the upper-left photograph are (1) no fish in this photo, (2) sea urchin, (3) variegated sea cucumber, and (4) marine benthic growth.

5.7.3 Biological Survey Results

Fish surveys found 18 fish species and indicated a generally increasing trend in fish species diversity since 2001. Vast schools of round scad, pigfish and tomtates were observed around and above the reef crest. It is obvious this reef has matured successfully in its 10 years of existence as every surface, crevice, void, cavern, overhang, and habitat created by the modules and vast

benthic attached marine growth is filled with marine species. Table 18 presents the fish species observed in 2010 and Table 19 presents the benthic species observed. Especially notable at this site is the amount of attached sargassum algae on the concrete modules. Long strands of the algae are everywhere some reaching 6 feet in length. Although the total biomass is more now than in previous years, this condition has been noted in other monitoring reports as well. For whatever reason whether depth, location, or types of modules this has been noticed mostly on the tetrahedron modules here at the Stack Reef and at the Tetrahedron Patch Reef ½ mile to the south.

Table 18. Tetrahedron Stack Artificial Reef fish species census.

Family/Common Name	Species	2010	
		Abundance	Size
Carangidae			
Amberjack	<i>Seriola dumerili</i>	M	A
Round scad	<i>Decapterus punctatus</i>	A	J & A
Centropomidae			
Common snook	<i>Centropomus undecimalis</i>	F	A
Grammistidae			
Whitespotted soapfish	<i>Rypticus maculatus</i>	F	J & A
Haemulidae			
Cottonwick	<i>Haemulon melanurum</i>	F	A
Pigfish	<i>Orthopristis chrysoptera</i>	A	A
Tomtate	<i>Haemulon aurolineatum</i>	A	J & A
Labridae			
Hogfish	<i>Lachnolaimus maximus</i>	S	J / A
Slippery dick	<i>Halichoeres bivittatus</i>	F	J / A
Ostraciidae			
Scrawled cowfish	<i>Acanthostracion quadricornis</i>	S	A
Pomacentridae			
Yellowtail reeffish	<i>Chromis enchrysurus</i>	F	J
Sciaenidae			
Cubbyu	<i>Equetus umbrosus</i>	M	J & A
Scorpaenidae			
Spotted scorpionfish	<i>Scorpaena plumeiri</i>	M	J & A
Serranidae			
Belted sandfish	<i>Serranus subligarius</i>	M	J & A
Black seabass	<i>Centropristis striata</i>	M	J & A
Snowy grouper	<i>Epinephelus niveatus</i>	S	J
Sparidae			
Sheepshead	<i>Archosargus probatocephalus</i>	M	A
Sheepshead porgy	<i>Calamus penna</i>	M	A
	Total	18	

Abundance Key: S=single, F=few (2-10), M=many (11-100), A=abundant (>100)

Size Key: A=adult, J=juvenile, A/J=intermediate

Table 19. Tetrahedron Stack Artificial Reef benthic species census.

	Common Name	Scientific Name
Echinoderms	Rock Boring Urchin	<i>Echinometra lucunter</i>
	3 Rowed Sea Cucumber	<i>Isostichopus badionotus</i>
	Conical Spined Sea Star	<i>Echinaster sentus</i>
Cnidarians	Algae Hydroid	<i>Thyroscyphus ramosus</i>
	Feather Plume Hydroid	<i>Aglaophenia latecarinata</i>
	Hydroids	Unidentified species
Ascidians	Overgrowing Tunicates	Didemnidae
	Bulb/ Painted Tunicates	<i>Clavelina sp.</i>
	Giant Tunicates	<i>Polycarpa spongiabilis</i>
Other	Sea Slug	Unidentified nudibranch
	Brown Variable Sponge	<i>Anthosigmella varians</i>
	White Lumpy Sponge	<i>Ptilocaulis sp.</i>
	Large amounts of Sargassum Algae	Unidentified species