

Tetrahedron Patch Reef	Sirotkin Artificial Reef Site	Deployed Mar&June 2002
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Project Date: May 7, 2003

Subject: Monitoring report for tetrahedron “Patch” artificial reef

Location: Sirotkin permitted reebsite.

GPS coordinates: N27 12.465 / W80 02.341

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The following field report documents conditions on the “Patch” tetrahedron artificial reef. The report addresses four types of data collected: Fish species identification, benthic species identification, patches orientation, and reef components stability.

HISTORY OF THE PATCH TETRAHEDRON ARTIFICIAL REEF:

As part of a Florida Fish & Wildlife Conservation Commission construction grant, Martin County constructed 5 patch reefs using concrete tetrahedron modules in March and June 2002. The materials utilized were 4 ft. and 5 ft. solid concrete tetrahedrons with a cast in place lifting eye of steel. This reef lies approximately ½ mile south of an existing tetrahedron Stack reef constructed in April 2001. The patch reef was built with the same total tonnage of tetrahedrons as the stack reef, and is located in similar water depth and same distance offshore of the Martin County shoreline (6.5 miles). It is planned to monitor the stack and patch reefs to compare the performance of the reefs over time. This will assist in determining if it is better to build concrete module reefs in a tightly concentrated high profile design, or a lower profile and spaced out over a larger overall footprint on the oceanfloor.

The tetrahedron patch reef was built on March 28 & 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 – 100 feet from outer edges of each cluster. Color-coded tie wraps have been 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. GPS coordinates of each patch, geographic position in relation to the central patch and color-code are listed below:

<u>Patch</u>	<u>Color Code</u>	<u>GPS Coordinates</u>
Central	Pink	27 12.465 80 02.341
Northwest	Yellow	27 12.486 80 02.369
North	Blue	27 12.479 80 02.350
Eastern	White	27 12.487 80 02.323
Southwest	Black	27 12.432 80 02.360

PATCHES ORIENTATION:

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 (central, north and northwest) have roughly elliptical patterns, with the major axis oriented generally from east to west. The east and southwest patches are 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.

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 noticeable movement or shifting of units was observed, nor was any notable scouring or sinking into the bottom.

Within each patch the tetrahedron modules are either near, leaning on, or on top of adjacent modules. The highest profile achieved was the stacking of three modules for a total profile height of 10 feet above the bottom. It appears the units are performing as designed and have become a very stable base for marine life development.

FISH SPECIES & ABUNDANCE FINDINGS:

Fish identification and abundance was determined utilizing the guidelines setup by the Reef Environmental Education Foundation, known as *REEF*. The roving diver method was used for a set time period of 30 minutes. The divers would roam around the patches and identify species and abundance and record data on underwater slates. Data would be double-checked once topside using field texts with color photographs and then transferred to the *REEF* data sheets to be added to their worldwide database. Underwater video and digital still photodocumentation also was utilized to accurately document fish species and abundance. Below are the results of those findings:

<u>Marine species identified</u>	<u>Quantity observed</u>	<u>Juvenile or Adult</u>
Gray triggerfish	3	A
Vermillion snapper	3	A
Greater Amberjack	school of 10's	A
Sheepshead	2	A
Tomtate	100's	A
Mutton Snapper (no spot)	1	A

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Sheepshead porgy	3	A
Spotfin hogfish	4	Intermediate phase
Reef Butterflyfish	1	A
Lane Snapper	1	A
Porkfish	4	A
Mackerel scad (yellow tail baitfish)	100's	A

BENTHIC SPECIES IDENTIFICATION:

The roving diver method was also used for benthic species identification. The divers would roam around the patches and identify benthic species and record data on underwater slates. Data would also be double-checked once topside using field texts with color photographs. Underwater video and digital still photodocumentation was also utilized to accurately document benthic species.

On the patch reefs, the most notable benthic species observed were pinshell oysters, as also observed on the tetrahedron stack reef ½ mile to the north. They are found everywhere at this site, lying on the bottom within and surrounding the tetrahedrons. Below are the results of the benthic survey:

Marine benthic species identified:

Black tunicates

Yellow mat tunicates

Several species of sponges in large flat mats:

Brown variable sponge, yellow boring sponge, orange boring sponge

Sea cucumber

Green sargassum algae

Several species of red marine algae

Several species of brown marine algae

Pinshell Oysters

Barnacles (Red & White)

Several species of gorgonians