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**Date:** November 7, 2002

**Subject:** Monitoring Report for Tetrahedron “Stack” Artificial Reef

**Location:** Sirotkin permitted reefsite. Confirmed GPS coordinates **N27 12.814 / W80 02.329**

**Crewmembers:** Project Director Lee Harris, Ph.D., Lead diver Kerry Dillon, guest biologist & diver Nicky Samuleson

**Project Date:** October 21, 2002

## **INTRODUCTION**

The following is a field report to document as found conditions on the “Stack” tetrahedron artificial reef. The report will address three types of data collected: (1) fishlife species identification and quantity, (2) benthic species identification, and (3) reef components and stability. Underwater still photographs were taken during the monitoring work, and provide additional documentation of the conditions.

## **HISTORY OF THE STACK TETRAHEDRON ARTIFICIAL REEF:**

As part of a Florida Fish & Wildlife Conservation Commission construction grant Martin County constructed a concrete tetrahedron reef in April of 2001. This is the first time such a reef has been built offshore Martin County and the first time Statewide that such a reef has been built at such a depth (98-ft.) The materials utilized were 5 ft. and 6 ft. solid concrete tetrahedrons with a cast in place lifting eye of steel to ease handling efforts.

The reef was built on April 4 & April 25, 2001 utilizing two bargeloads of concrete modules. A total of 430 units were placed from an anchored barge, approximately 215 units each load. The deployment was successful, as the reef is concentrated in a general northeast/southwest direction exhibiting an elliptical shape. When diving this site one cannot determine any separation of the first deployment's modules from the second.

Many of the modules settled on their bases in solitude although approximately 40% landed on top of others. 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. The large surface area of each module also provides habitat for benthic organisms to attach to.

## **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 roam around the reef structure and identify species and abundance and record data on underwater slates. Data was 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 digital still photodocumentation was also utilized to accurately document fish species and abundance. Below are the results of those findings:

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<b><u>Marine species identified</u></b>	<b><u>Quantity observed</u></b>	<b><u>Juvenile or Adult</u></b>
Gray triggerfish	> 10	A
Porkfish	2	A
Grey snapper	5	A
Sheepshead	12	A
Tomtate	100's	A
Common Snook	3	A
Atlantic Spadefish	> 20	A
Spanish hogfish	3	A
Gag grouper (8 – 14 inches)	10	J
Sheepshead porgy	1	A
Whitespotted soapfish	1	A
Lane snapper	> 20	A
Stingrays	3	A

**BENTHIC SPECIES IDENTIFICATION:**

The roving diver method was also used for benthic species identification. The divers roam around the reef structure and identify benthic species and record data on underwater slates. Data was also double-checked topside using field texts with color photographs. Underwater digital still photodocumentation was also utilized to accurately document benthic species. The most notable benthic species are pinshell oysters. They can be seen everywhere at this site. All around the bottom terrain surrounding the tetrahedrons they can be found.

One interesting finding is that some modules have more benthic growth than others do, even though they are adjacent. This raises the question of whether the pH of the concrete (or other material properties) or other factors have an effect on the growth patterns.

Below are the results of the benthic survey:

**Marine benthic species identified:**

- Black tunicates
- Several species of sponges
- Several species of hydroids
- Several species of green marine algae
- Several species of red marine algae
- Pinshell Oysters
- Barnacles

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**REEF COMPONENTS STABILITY:**

The individual tetrahedron concrete modules are solid units which weigh up to 3600 lbs. each in air and therefore seem to be very stable underwater. At this depth it would take a catastrophic weather event to move them any substantial distance. Since deployment no noticeable shifting has occurred nor has any measurable scouring or sinking into the bottom occurred.

Most modules have settled either in solitude or leaning upon an adjacent module. At some areas stacking has occurred. The highest profile has been achieved with the stacking of three modules for a profile of 14 feet. In these areas divers have tried to move or shake the modules with no such movement felt. It appears the units are performing as designed and have become a very stable base for marine life development.

**CONCLUSIONS:**

Although small in total area on the ocean floor it is obvious that this stack of tetrahedron modules has performed as designed. Many fish and benthic species appear to be thriving there. Although not noted during this survey, at other times schools of baitfish and feeding amberjack have been seen hovering above the site.

In the spring of 2002 another tetrahedron reef was built about ½ mile south of this stack reef. It is called the “patch” reef” and was built utilizing the same number of tetrahedrons except configured in a different array. At that site 5 smaller patches of modules were deployed to be from 80 – 100 ft. apart from each other. Next year we will begin a comparative study at both sites to determine which is the better method to build such reefs based on total biomass of fish and benthic life forms located at each.

**CERTIFICATION:**

This written field report narrative of the underwater inspection of the “Stack” tetrahedron artificial reef in the Sirotkin artificial reef site is true and accurate to the best of my knowledge and belief

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Lee E. Harris, Ph.D., P.E., On-site Observer  
Consulting Engineer, FL PE # 26252

Date: November 8, 2002