

## 4 Evans Crary Bridge Reef

Monitoring Date: June 17, 2005

Location: Ernst permitted reef site, approximately 5 miles offshore Martin County, Florida

GPS Coordinates: N27 09.346 / W80 03.368 (center of the reef at the high section of the reef materials)

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This is the fifth annual monitoring year of a 5-year monitoring effort at this site. This report addresses four types of collected data: dive data, reef component stability, fish species & abundance, and benthic species identifications.

### 4.1 History of Evans Crary Bridge Pile

As part of the contract with the Florida Department of Transportation to construct the new Evans Crary Bridge (completed in 2000) in Stuart, Florida, the contractor was required to dismantle and dispose of the old bridge components. The contractor was required to transport the steel and concrete bridge components offshore to construct an artificial reef. Some of the smaller bridge components were used to create three shallow water mitigation reefs close to the Stuart and Jensen Beach shorelines in water depths of 10-20 feet, while the larger bridge sections and the majority of the materials were deployed in the Ernst permitted reef site in water depths of 60-70 feet.

In the summer of 2000 approximately 24 barge loads of old bridge components were deployed at the Ernst offshore site, these deployments consisted of the following:

- concrete piles from 20 – 40 ft. long each
- concrete pilecaps approx. 30 ft. x 4 ft. x 5 ft. each
- steel/concrete roadway sections approx. 40 ft. x 5 ft. x 4 ft. each
- pieces of the bascule piers various sizes up to 10 ft. x 8 ft. x 4 ft.
- sections of the steel drawbridge leafs up to 30 ft. x 12 ft. x 10 ft.
- large steel gears from the drawbridge lifting mechanisms
- cast iron & PVC water main piping
- steel & aluminum electrical conduit
- concrete handrail & sidewalk sections

Each barge load of these materials were deployed from one of two temporary mooring buoys placed approximately 100 to 200 yards west of three sunken barges previous sunk for artificial reef development in 1972. Because the contractor moored the barge each time to the same buoys, the materials settled on the bottom in a tightly grouped pile. This pile is roughly elliptical and measures approximately 280 feet long x 80 feet wide x 20 feet high, with the major axis in an east/west orientation.

The Evans Crary Bridge pile has become a thriving reef community with substantial populations of pelagic and benthic species. At the surface above the reef, baitfishes by the 1000's are often seen at this site. In five years this artificial reef site has become one of if not the most visited artificial reef site in Martin County for saltwater anglers, charter sportfishing boats, and recreational divers.

## 4.2 Dive Data

Max. depth at bottom = 77 ft. (81 ft. in scoured areas)

Underwater visibility this day = 30 ft.

Bottom water temperature = 74°F

Surface water temperature = 81°F

Current speed & direction = ½ knot to the north

Divers breathing mode & gases = open circuit scuba with nitrox 34%

GPS positioning of vessel determined by a Standard Horizon model CP150C

Shipboard fathometer used was a Furuno model LCD LS-6000 (200kHz)

## 4.3 Reef Components Stability

The deployment of such a large quantity of material with a diverse array of sizes and shapes has created a very complex reef structure. The pile has within its boundaries many kinds of underwater habitats: crevices, overhangs, long tunnels, caverns, scoured areas, upright protrusions, small cracks, lattice type areas, well shaded areas, and flat expanses of material.

This reef was deployed in the summer of 2000. As expected, the reef did settle slightly in the first few months following deployment, followed by no significant changes in the four years prior to September of 2004. The materials comprising this reef had created a stable interlocking matrix that resisted movement. In Sept. of 2004 Martin County sustained direct hits by two hurricanes within three weeks of each other. Hurricanes Frances (category 2) and Jeannie (category 3) both crossed overtop of the Evans Crary reef. As a result of these two hurricanes, the top elevations of the reef were slightly lowed, and the surrounding natural bottom was scoured, with changes summarized in Table 4 (water depths in 2004 prior to the hurricanes and those taken in the 2005 monitoring effort).

**Table 4. Evans Crary Bridge Reef Changes 2004 to 2005**

<i>Specific Location</i>	<i>2004</i>	<i>2005</i>	<i>2004 profile height</i>	<i>2005 profile height</i>
Tops of summits	44, 46, 42, 45 ft.	54, 58, 55, 49 ft.	26 ft.	20 ft.
Surrounding seafloor	69, 68, 71, 70 ft.	76, 74, 77, 75 ft.		
Seafloor in scoured areas	75, 74, 73, 77 ft.	79, 80, 81, 78 ft.		

The changes shown in Table 4 are due to the hurricane impacts on this reef. The hurricanes produced large waves that moved some of the uppermost steel beams and concrete piles. Many of these were found to the south of the main reef with scratches and gouges in them and no marine growth on the uppermost surfaces. As well as being moved off the top of the pile they were flipped over so the previous shadowed areas with no marine growth were now exposed.

The hurricanes also moved significant amounts of sand & shell around the reef site. The entire seafloor surrounding the reef is approximately 5 feet deeper than was measured annually since the year of deployment (2000); isolated areas around larger sections of materials have scoured areas up to 8 feet deeper than previously seen. Some scouring has

slowly been occurring over time since 2000, but the hurricanes seem to have accelerated that process. During a post hurricane assessment dive at this site in Nov. 2004 a diver noted that 1000's of intact shells were seen. These shells were completely clean from any marine growth and actually appeared polished. This could only be attributed to years of being buried under the sand seafloor, and the removal of 5 feet of sand has exposed them again. This same phenomenon has exposed more of the car, truck, & airplane tires that had been seen in previous monitoring years slowly being uncovered. Although some significant changes have occurred at the Evans Crary Bridge Reef in the last 5 years, it has become one of the most "alive" artificial reefs in Martin County as the fish census, benthic species abundance, photographs, and boater's popularity confirms.

#### 4.4 Fish Species & Abundance Findings:

Fish identification and abundance were 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, recording data on underwater slates. Data is 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 photographs were also utilized to accurately document fish species and abundance. Table 5 presents the fish species observed & documented during monitoring on June 17, 2005.

**Table 5. Evans Crary Bridge Reef Fish Census**

<i>Marine Species Identified</i>	<i>Quantity Observed</i>	<i>Juvenile or Adult</i>
Spadefish	2	A
Goliath Grouper	12	A (>200 lbs).
Porkfish	10's	A
Gray snapper	9	A
Sheepshead	10's	A
Barracuda (4-6 ft.)	7	A
Common Snook	10's	A
Doctorfish	1	A
Lane Snapper	10's	A
Tomtate	100's	A
Cubera Snapper	1	A
* Blue Runners	10's	A & J
* Round Scad (Cigar Minnows)	1000's	A/J 2 ½ " long
* Belted Sandfish	1	A
* Juvenile Grunts	100's	J
* Grey Angelfish	1	A
*Fench Angelfish	1	A
* Spotted Soapfish	3	A
* Spotted Scorpionfish	4	A
* Sheepshead Porgy	1	A

\* - Species documented in 2005 but not seen in 2004 monitoring.

#### 4.5 Benthic Species Identification:

Benthic species listed in Table 6 were identified using the roving diver technique. Professionally trained divers spent 30 minutes hovering over the Evans Crary Bridge looking specifically for benthic invertebrates and macroalgae. All species were documented (to lowest recognizable taxon) on an underwater slate and verified at the surface using reference guides. Some of the most relevant guides for the Martin County area include: 1) Littler and Littler's Caribbean Reef Plants: An Identification Guide to the Reef Plants of the Caribbean, Bahamas, Florida and Gulf of Mexico, 2) Hendler, Miller, Pawson and Kier's Echinoderms of Florida and the Caribbean: Sea Stars, Sea Urchins, and Allies, and 3) Paul Humann's Reef Creature Identification: Florida Caribbean and Bahamas. For further analysis, underwater video and digital still photo documentation were also performed onsite. Individuals observed were also placed in one of the following abundance classifications for long-term analysis: 1, 2-10, 11-100 or >100. The benthic species data are shown in Table 6.

**Table 6. Evans Crary Bridge Reef Benthic Species Census**

<i>Benthic Species Identified</i>	<i>Abundance</i>	<i>Comments</i>
<b>Green Algae</b>		
<i>Codium decortcatum</i>	2-10	
<i>Thalli approx. 0.33 m.</i>		
<i>Codium spp.</i>	11-100	
<i>Caulerpa brachypus</i> (attached)	Abundant	Low relative density all over reef.
<i>Caulerpa mexicana</i>	11-100	
<i>Caulerpa racemosa</i>	11-100	
<b>Brown Algae</b>		
<i>Sargassum spp.</i>	11-100	
Unidentified <i>Dictyota</i> spp.	2-10	
<i>Spatoglossum</i> spp.	2-10	
<b>Red Algae</b>		
<i>Halymenia</i> spp.	1	
<i>Botryocladia</i> spp.	11-100	
<i>Rhodymenia</i> spp.	>100	
<i>Amphiroa</i> spp.	2-10	
<i>Dasya</i> spp.	2-10	
<i>Hypnea</i> spp.	2-10	
<i>Laurencia</i> spp.	2-10	
<b>Sponges</b>		
Orange encrusting sponge	2-10	
Unidentified encrusting sponges	11-100	
<b>Worms</b>		
Christmas tree ( <i>Spirobranchus giganteus</i> )	11-100	
Bearded fireworm ( <i>Hermodice carunculata</i> )	11-100	

**Table 6. (continued) Evans Crary Bridge Benthic Species Census**

<b>Cnidarians</b>		
Unidentified anemone	11-100	
Unidentified hydroids	>100	
Feather hydroids	>100	
Oculina spp.	1	
White telesto ( <i>Carijoa riisei</i> )	2-10	
Star coral	1	
<b>Tunicates</b>		
Clavelina spp.	11-100	
Polyandrocarpa spp.	11-100	
Unidentified tunicate # 1	2-10	Looks similar to <i>Styela</i> spp.
<b>Urchins</b>		
<i>Echinometra lucunter</i>	2-10	
<i>Arbacia punctulata</i>	2-10	
<b>Sea stars</b>		
<i>Echinaster</i> spp.	1	
<b>Sea cucumbers</b>		
<i>Isostichopus badionotus</i>	1	
Unidentified spp. # 2	1	
<b>Additional marine species</b>		
Orange telesto, branching soft coral		
Deepwater octocorals		
Branching coral (orange & yellow)		
Ameracupa, hard cup corals		
Several species of hydroids		
Oysters		
Barnacles		

#### **4.6 Evans Crary Bridge Reef Summary**

The main differences noticed in the 2005 monitoring observations as compared with the 2004 findings were the rearrangement of the uppermost portions of the reef, with increases in water depths of the reef crest and of the seafloor throughout the area. These changes were caused by the September 2004 hurricanes. However, these changes have not resulted in any indication of reduced performance of the reef. The impact of the uncovering of the tires in this area has yet to be determined.

As far as the fish census is concerned in 2004, 21 species were identified as compared to 20 in 2005. Of these, 9 species were seen in 2005 but not in 2004, the most significant being Blue Runners and baitfish. Of the species not documented in 2005 the most important was Yellowtail Snapper, Bar & Crevalle Jacks, & Greater Amberjacks. The benthic coverage and diversity seems to be increasing every year. This site continues to be one of the most successful Martin County artificial reef sites.