

5.4 LEE HARRIS MEMORIAL REEF

- Location: Donaldson Reef
- Materials: concrete & steel components/debris (pilings, slabs, culverts)
- Maximum Depth: 60 feet
- Reef High Point: 46 feet
- Year Created: 2011
- Monitoring Date: 09/08/2012
- Total Cost: \$72,000 (FWC 75% & Martin County 25%)

5.4.1 History of the Lee Harris Memorial Reef

Lee Harris, PE, Ph.D., was a coastal engineer and scientist who spent decades of dedicated service to the design, construction, and monitoring of the artificial reefs of Martin County, Florida, and many Caribbean nations. Dr. Harris was known and highly respected worldwide as an expert in many aspects of the coastal engineering field, including artificial reefs, coastal structures, bathymetric surveying, Reef Ball™ breakwater designs, designed surfing reefs, and countless other ocean environment protection projects. He was an avid surfer and diver, overall advocate of everything ocean related and devoted his career to helping the ocean, teaching and mentoring others. Lee Harris received his PhD in ocean engineering from the Florida Atlantic University, and since 1980, began a long and successful career as a faculty member with the Florida Institute of Technology Ocean Engineering Department, initially at the Jensen Beach Campus and then the main campus in Melbourne, Florida. He authored more than thirty (30) publications and was engaged in at least eighty two (82) projects worldwide. He was a devoted husband and father, and teacher until his untimely passing in October of 2010. Dr. Harris was instrumental in his participation of the Martin County Artificial Reef Program. Figure 14 shows the location of the Lee Harris Memorial Reefs in the Donaldson Artificial Reef area.

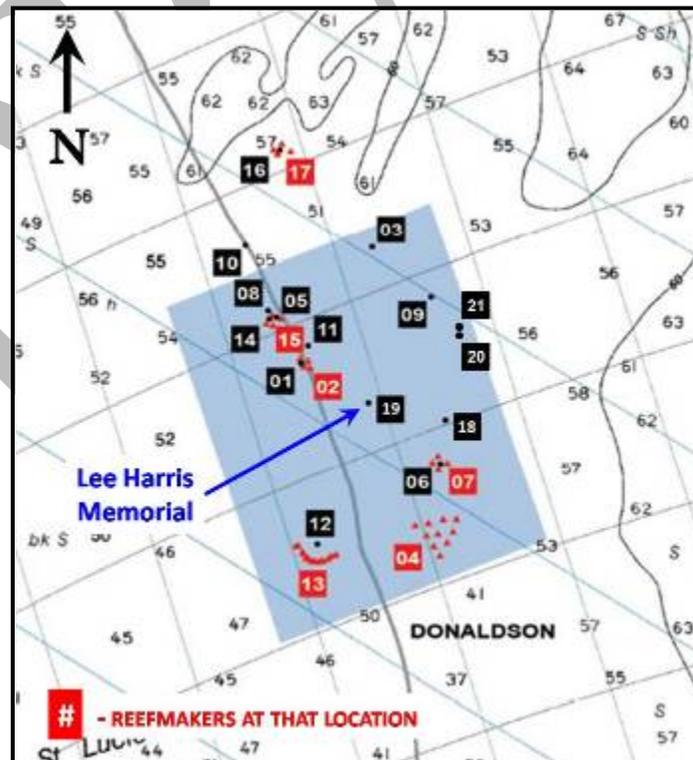


Figure 14. Chart of the Donaldson Reef site showing the Lee Harris Memorial Reef location.

The Lee Harris Reefs (Primary, South & East) are located in 59 – 62 ft. of water near the center of the Donaldson permitted area, comprised of three separate piles of concrete and steel, deployed from an anchored barge in close proximity to one another. In April 2011, four barge loads of material, approximately 400 tons each, were transported to the selected deployment site, where two barge loads of material were dropped in the same location, creating the “primary” center reef, and the remaining two barge loads (400 tons each) were deployed East and South of the center reef.

The deployment of such a large quantity (1,200 tons total), coupled with the diversity of the material, sizes and shapes have resulted in a unique and complex reef site. The new reefs have within their boundaries many types of “living spaces,” such as crevices, overhangs, caverns, scoured areas, upright protrusions; small cracks, lattice type areas, and well-shaded areas, with wide-open flat expanses. The footprints of the sites are considered oval shaped, and vary in size, ranging from 85 ft long by 52 ft wide, and up to 130 ft long by 87 ft wide. The maximum profile above seafloor is 16ft, with an average nominal of 13 ft. Although it was recently deployed, based on our monitoring surveys, it is evident many marine life species have already taken up residence in the new reefs.

5.4.2 Structural Summary

The center pile of the Lee Harris Memorial Reef was monitored during 2012, and consisted of many shapes and sizes of concrete, including pilings, culverts, catch basins, abutment wall sections, traffic light bases, roadway slabs, and other pieces of all shapes and sizes. These materials came from several sources including the demolition of several building and roadway sites in Martin County, as well as some classroom buildings from the closed Jensen Beach Campus of Florida Institute of Technology, where Dr. Harris taught during his tenure there in the late 1970’s thru 1986.

The 400 tons of concrete materials at the center pile form an elliptical shape on the seafloor that is a 98 ft long from north to south and 77 ft long east to west. The summit of the center reef has a profile of 16 ft. The use of so many various sizes and shapes of materials makes for a very stable artificial reef. The components are interlocked to create a matrix, providing a stable structural frame, which should likely withstand the powerful effect of tropical storms and hurricanes. There is ample historical data in Martin County to validate the durability and strength of this type of artificial reef structure following storm events.

During the survey, divers took measurements of the seafloor depths adjacent to and outside the perimeter of the reef footprint. Almost no settling or scouring has occurred around the reef structure (refer to Table 14). From a structural viewpoint, this reef appears very stable and is expected to provide many benefits to the marine environment for several decades.

Table 14. Summary of Depth measurements at the Lee Harris Memorial Reef.

Direction	Distance from reef high point to the perimeter (ft)	Perimeter Depth (ft)	Depth at 25 ft from perimeter (ft)
North	66	58	57
East	47	57	58
South	32	58	59
West	30	58	58

5.4.3 Biological Survey Results

Although the Lee Harris reef was 16 months old at the time of our first monitoring survey (September 2012), it has produced significant results. Thirty-three different finfish were noted, including an adult red grouper, a species rarely seen on artificial reefs in Florida, regardless of reef size, material, or depth. They are typically and readily found on natural reef ledges and hardbottom areas in Martin County.

Other important fish species observed during the monitoring include: yellowtail, mutton, and gray snapper, goliath grouper, black seabass, gulf flounder, and common snook. Large schools of silversides (baitfish), blue runners, and thousands of unidentified newly hatched fry (from 1/8" - 1/4" long), too small to positively identify without laboratory analysis were in abundance on the reef. Refer to Figure 15 for photographs of the Lee Harris Memorial Reef and some of the species observed during the monitoring dive.



Figure 15. Lee Harris Memorial Artificial Reef Photographs from 2012.

Species identified in Figure 15, clockwise from the upper-left photograph are (1) tomtates, (2) nurse shark and porkfish, (3) tomtate and juvenile beaugregory, and (4) spiny lobster. Table 15 lists the species/taxa, their relative abundance and size class (adult, intermediate, and juvenile) observed during the monitoring dive.

Because of its relatively shallow depth and clear water, sunlight easily penetrates and washes the reef with light energy. Many species of benthic marine plants and algae have attached to the materials. A listing can be found in Table 16 along with other benthic organisms.

Table 15. Lee Harris Memorial Artificial Reef Fish Species Census.

Family/Common Name	Species	2012	
		Abundance	Size
Acanthuridae			
Ocean Surgeonfish	<i>Acanthurus bahianus</i>	S	J
Atherinidae			
Silversides	<i>Atherinidae</i>	A	A
Bothidae			
Gulf flounder	<i>Paralichthys albigutta</i>	S	A
Carangidae			
Blue runner	<i>Caranx crysos</i>	A	A
Centropomidae			
Common snook	<i>Centropomus undecimalis</i>	M	J/A
Chaetodontidae			
Reef butterflyfish	<i>Chaetodon sedentarius</i>	F	J & A
Spotfin butterflyfish	<i>Chaetodon ocellatus</i>	S	A
Clupeidae			
Fry	<i>Jenkinsia lamprotaenia</i>	M	J
Dasyatidae			
Southern Stingray	<i>Dasyatis americana</i>	S	A
Ginglymostomatidae			
Nurse shark	<i>Ginglymostoma cirratum</i>	S	A
Haemulidae			
Tomtate	<i>Haemulon aurolineatum</i>	A	J & A
Black margate	<i>Anisotremus surinamensis</i>	F	A
Cottonwick	<i>Haemulon melanurum</i>	S	J
Porkfish	<i>Anisotremus virginicus</i>	M	J & A
Labridae			
Spanish hogfish	<i>Bodianus rufus</i>	F	J & A
Lutjanidae			
Gray snapper	<i>Lutjanus griseus</i>	M	J & A
Mutton snapper	<i>Lutjanus analis</i>	S	A
Yellowtail snapper	<i>Ocyurus chrysurus</i>	F(2)	J/A
Muraenidae			
Spotted moray eel	<i>Gymnothorax moringa</i>	F	A
Pomacanthidae			
French angelfish	<i>Pomacanthus paru</i>	S	A
Gray angelfish	<i>Pomacanthus arcuatus</i>	S	A
Pomacentridae			
Yellowtail reeffish	<i>Chromis enchrysurus</i>	F	J/A
Beaugregory	<i>Pomacentrus leucostictus</i>	F	J & A
Sergeant Major	<i>Abudefduf saxatilis</i>	M	J & A
Sciaenidae			
Cubbyu	<i>Equetus umbrosus</i>	M	J & A
Serranidae			
Belted sandfish	<i>Serranus subligarius</i>	M	J & A
Black sea bass	<i>Centropristis striata</i>	F	A
Goliath grouper	<i>Epinephelus itajara</i>	F(3)	A
Red grouper	<i>Epinephelus morio</i>	S	A
Whitespotted soapfish	<i>Rypticus maculatus</i>	F	A
Sparidae			
Sheepshead pogy	<i>Calamus penna</i>	F	A
Sheepshead	<i>Archosargus probatocephalus</i>	M	A
Tetraodontidae			
Bandtail puffer	<i>Sphoeroides spengleri</i>	F	A
	Total	33	

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 16. Lee Harris Memorial Artificial Reef Benthic Species Census.

	Common Name	Scientific Name
Echinoderms	Common Arbacia Urchin	<i>Arbacia punctulata</i>
	Rock Boring Urchin	<i>Echinometra lucunter</i>
	3 Rowed Sea Cucumber	<i>Isostichopus badionotus</i>
	Variiegated Urchin	<i>Lytechinus variegatus</i>
Cnidarians	Sea Anemones	<i>Aptasia sp.</i>
	Algae Hydroids	<i>Thyroscyphus ramosus</i>
	Hydroids	Unidentified species
	White telesto	<i>Carijoa riisei</i>
	N/A	<i>Pterogorgia citrina</i>
Crustaceans	Yellowline Arrow Crab	<i>Stenorhynchus seticornis</i>
	Spiny lobster	<i>Palnulirus argus</i>
Mollusca	Rock snails	<i>Muricidae</i> (Unidentified species)
	Wing Oyster	<i>Pteria colymbus</i>
	Black Sea Hare	<i>Aplysia morio</i>
Ectoprocta	Encrusting Bryozoans	Unidentified Species
Ascidians	Geometric Encrusting Tunicates	<i>Botryllus sp.</i>
	Bulb Tunicates	<i>Clavelina sp.</i>
	Giant Tunicates	<i>Polycarpa spongiabilis</i>
	Black Tunicate	<i>Philusia nigra</i>
Porifera	White Lumpy Encrusting Sponge	<i>Ptilocaulus sp.</i>
	N/A	<i>Scopalina ruetzleri</i>
	Star Encrusting Sponge	<i>Halisarca sp.</i>