

## 5.1 LEE HARRIS MEMORIAL REEF

- Location: Donaldson Reef
- Materials: Concrete & steel components/debris (pilings, slabs, culverts)
- Maximum Depth: 57 feet
- Reef High Point: 44 feet
- East Site: 820 pieces, 363 tons
- Center Site: 303 pieces, 949 tons
- South Site: 115 pieces, 441 tons
- Year Created: September 2011, total 1,246 tons
- 2012 Monitoring Date: 09/08/2012
- 2013 Monitoring Date: 09/03/2013
- Total Cost: \$72,000 (FWC grant 10160 33% & Martin County 67%)

### 5.1.1 History of the Lee Harris Memorial Reef

Figure 6 shows the location of the Lee Harris Memorial Reef within the limits of the Donaldson Reef area.

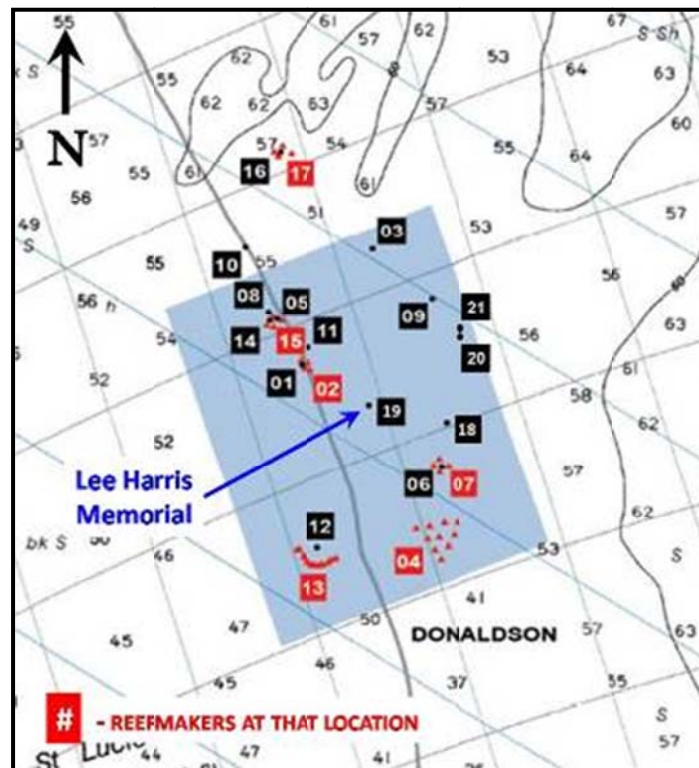


Figure 6. Chart of the Donaldson Reef site showing the Lee Harris Memorial Reef location.

The Lee Harris Memorial Reef is comprised of three separate piles of concrete and steel components/debris. In April/May 2011, four barge loads of material were transported to the selected deployment site, where two barge loads of material (949 tons) were dropped in the same location, creating the “primary” center reef, while the remaining two barge loads were deployed at sites East (363 tons) and South (441 tons) of the center reef Primary (Center). The sites are located within 59 – 61 ft of water depths 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.

The deployment of such a large quantity (1,753 tons total according to Martin County’s MPR), 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 16 ft, with an average nominal of 13 ft. Although it was recently deployed, based on our monitoring surveys, it is evident that multiple and various marine life species have already taken up residence in the new reef site.

### 5.1.2 Structural Summary

The Lee Harris Memorial Reef consists of various shapes and sizes of concrete, including pilings, culverts, catch basins, abutment wall sections, roof trusses, 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.

According to Martin County’s MPR, the 949 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 13 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 9), conversely, sands have shifted around and towards the perimeter. From a structural viewpoint, this reef appears very stable and is expected to provide many benefits to the marine environment for several decades.

**Table 9. Summary of Depth measurements at the Lee Harris Memorial Reef.**

<b>Direction</b>	<b>Distance from reef high point to the perimeter (ft)</b>	<b>Perimeter Depth (ft)</b>	<b>Depth at 25 ft from perimeter (ft)</b>
North	68	57	59
East	50	56	58
South	30	55	55
West	32	56	55

Note – Estimated reef top depth was recorded via dive computer at 44ft.

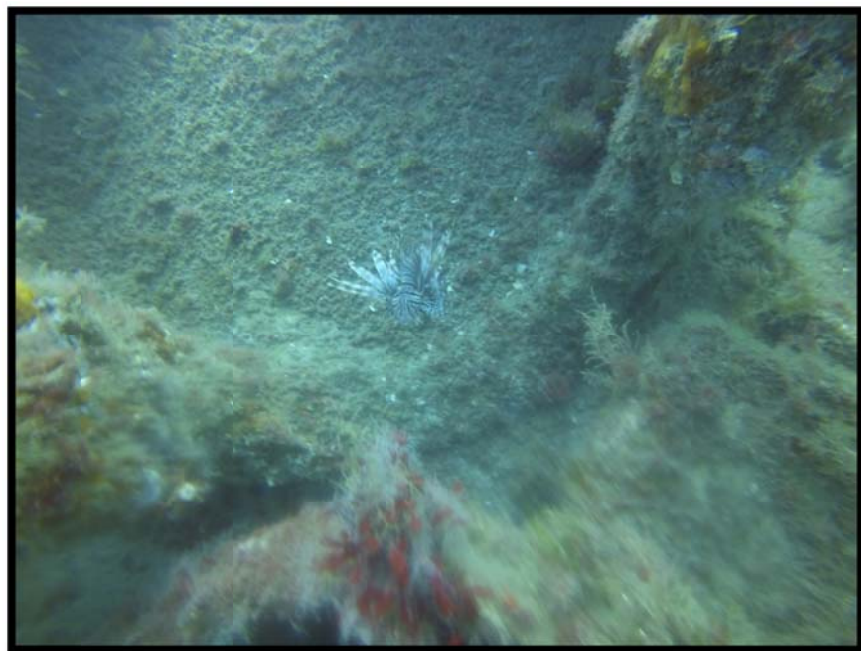
According to County records, the original deployment depth for the Lee Harris sites was recorded at 61ft to 59ft with a maximum material height of of 16ft. In comparing our 2013 structural data with County records (MPR’s), the site has experienced some minor shifting of sands. Tide could be a minor factor for this discrepancy. Regardless, the site appeared stable; no loose or isolated pieces were encountered or observed.

### 5.1.3 Biological Survey Results

The Lee Harris Memorial Reef has produced significant results since deployment. Thirty-seven (37) different finfish, including lionfish, were noted along with other taxa, such as sponges and spiny lobsters. Refer to Figure 7 and Figure 8 for photographs of the Lee Harris Memorial Reef and some of the species observed during the monitoring dive.



**Figure 7. Lee Harris Memorial Reef, Snook (2013).**



**Figure 8. Lee Harris Memorial Reef, Lionfish (2013)**

Table 10 lists the species/taxa, their relative abundance and size class (adult, intermediate, and juvenile) observed during the monitoring dive. Because of the reef's 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. Refer to Table 11 for the list of species and benthic organisms.

**Table 10. Lee Harris Memorial Reef Fish Species Census (2013)**

Family/Common Name	Species	2013	
		Abundance	Size
<b>Centropomidae</b>			
Snook	<i>Centropomus undecimalis</i>	A	A,J
<b>Serranidae</b>			
Belted sandfish	<i>Serranus subligarius</i>	M	A
Black seabass	<i>Centropristis striata</i>	F	A
Goliath grouper	<i>Epinephelus itajara</i>	F	A
Scamp	<i>Mycteroperca phenax</i>	F	J
<b>Grammistidae</b>			
Whitespotted soapfish	<i>Rypticus maculatus</i>	S	A
<b>Carangidae</b>			
Atlantic bumper	<i>Chloroscombus chrysurus</i>	A	A
Bar jack	<i>Caranx ruber</i>	F	A
Blue runner	<i>Caranx chrysos</i>	M	A
Round scad	<i>Decapterus punctatus</i>	A	A
<b>Lutjanidae</b>			
Gray snapper	<i>Lutjanus griseus</i>	M	A
Lane snapper	<i>Lutjanus synagris</i>	F	A
<b>Haemulidae</b>			
Black margate	<i>Anisotremus surinamensis</i>	F	A
Pigfish	<i>Orthopristis chrysoptera</i>	M	A
Porkfish	<i>Anisotremus virginicus</i>	M	A
Tomtate	<i>Haemulon aurolineatum</i>	A	A
White grunt	<i>Haemulon plumieri</i>	F	A
<b>Sparidae</b>			
Sheepshead	<i>Archosargus probatocephalus</i>	A	A
<b>Sciaenidae</b>			
Cubbyu	<i>Equetus umbrosus</i>	A	A
Reef Croaker	<i>Odontoscion dentex</i>	F	A
<b>Mullidae</b>			
Spotted goatfish	<i>Pseudupeneus maculatus</i>	S	A
<b>Ephippidae</b>			
Spadefish	<i>Chaetodipterus faber</i>	A	A
<b>Chaetodontidae</b>			
Reef butterflyfish	<i>Chaetodon sedentarius</i>	F	A
<b>Pomacentridae</b>			

Family/Common Name	Species	2013	
		Abundance	Size
Beaugregory	<i>Stegastes leucostictus</i>	F	A
Cocoa damselfish	<i>Stegastes variabilis</i>	F	A
Sergeant major	<i>Abudefduf saxatilis</i>	F	A
Yellowtail reeffish	<i>Chromis enchrysurus</i>	M	A
<b>Labridae</b>			
Slippery dick	<i>Halichoeres bivittatus</i>	F	A
Spanish hogfish	<i>Bodianus rufus</i>	S	A
<b>Clinidae</b>			
Hairy blenny	<i>Labrisomus nuchipinnus</i>	M	A
<b>Acanthuridae</b>			
Doctorfish	<i>Acanthurus chirurgus</i>	S	A
<b>Scombridae</b>			
Little tunny	<i>Euthynnus alletteratus</i>	S	A
<b>Scorpaenidae</b>			
Lionfish	<i>Pterois sp.</i>	F	A
<b>Bothidae</b>			
Gulf flounder	<i>Paralichthys albigutta</i>	S	A
<b>Tetraodontidae</b>			
Bandtail puffer	<i>Sphoeroides spengleri</i>	F	A
Sharpnose puffer	<i>Canthigaster rostrata</i>	F	A
<b>Diodontidae</b>			
Balloonfish	<i>Diodon holocanthus</i>	F	A
<b>Total</b>		<b>37</b>	

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 11. Lee Harris Memorial Reef Benthic Species Census.**

	Common Name	Scientific Name
<b>Echinoderms</b>	Common Arbacia Urchin	<i>Arbacia punctulata</i>
	Rock Boring Urchin	<i>Echinometra lucunter</i>
	3 Rowed Sea Cucumber	<i>Isostichopus badionotus</i>
	Variegated Urchin	<i>Lytechinus variegatus</i>
<b>Cnidarians</b>	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>
<b>Crustaceans</b>	Yellowline Arrow Crab	<i>Stenorhynchus seticornis</i>
	Spiny lobster	<i>Panulirus argus</i>

	<b>Common Name</b>	<b>Scientific Name</b>
<b>Mollusca</b>	Rock snails	<i>Muricidae</i> (Unidentified species)
	Wing Oyster	<i>Pteria colymbus</i>
	Black Sea Hare	<i>Aplysia morio</i>
<b>Ectoprocta</b>	Encrusting Bryozoans	Unidentified Species
<b>Ascidians</b>	Geometric Encrusting Tunicates	<i>Botryllus sp.</i>
	Bulb Tunicates	<i>Clavelina sp.</i>
	Giant Tunicates	<i>Polycarpa spongiabilis</i>
	Black Tunicates	<i>Phylusia nigra</i>
<b>Porifera</b>	White Lumpy Encrusting Sponge	<i>Ptilocaulus sp.</i>
	N/A	<i>Scopalina ruetzleri</i>
	Star Encrusting Sponge	<i>Halisarca sp.</i>

## 5.2 RALPH EVINRUDE REEF

- Location: Donaldson Reef
- Materials: Concrete (chunks, roof trusses, roadway slabs, box culverts)
- Maximum Depth: 62 feet
- Minimum Depth: 61 feet
- Reef top Depth: 50 feet
- Year Created: 2011
- 2012 Monitoring Date: 09/09/2012
- 2013 Monitoring Date: 10/10/2013
- Total Cost: \$18,000 (FWC grant 10160 33% & Martin County 67%)

### 5.2.1 History of the Ralph Evinrude Reef

The materials utilized to build the Ralph Evinrude Reef were comprised of reinforced concrete debris primarily from the Ralph Evinrude Science Building on the former site of the Jensen Beach campus of the Florida Institute of Technology. Refer to Figure 9 for a chart showing the location of the Ralph Evinrude Reef within the Donaldson site.