

Title:

**Hernando County Offshore Artificial Reef Summary Report for the
Reef Ball Reef, and the Ben Dickson Tank Reef Site, Fall 2010.**

By:

**Brett Ramey Blackburn
Blue Water Environmental Consultants
4652 Alexander Pope Lane
Sarasota, FL 34241**

To:

**Hernando County
Department of Parks and Recreation**

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Introduction:

Post deployment artificial reef surveys were conducted on two of the Hernando County Artificial Reef Systems during the Fall of 2010 to fulfill US Army Corps of Engineers artificial reef permit requirements. Surveys were conducted on the Reef Ball Reef and the Ben Dickson Tank Reef. Each complex was evaluated to determine: Finfish and macro invertebrate populations, physical impacts natural substrate including: scouring surrounding submerged material, subsidence of deployed materials, and overall stability of the reef complexes.

Site Descriptions:

Survey sites were selected around the geographic center of each reef system. Sites were selected to include each type of material located within each reef system. Variances in individual sites distances from adjacent sites were a result of substrate type locations within the permitted area. Survey substrates at the Reef Ball Reef Site included multiple sizes of reef balls that were arranged independently and in aggregations of multiple units. The site also had a defined presence of exposed hard bottom located north east of the survey area. The reef units while in proximity to the hard bottom area did not appear to be directly impacting the hard bottom. Algae and other secondary growth on the system mirrored that observed on adjacent hard bottom. Survey substrates observed on the Ben Dickson Tanks reef included decommission army tanks, concrete rubble, concrete culverts of various lengths and diameters. Tank placements provided a defined border around the other materials surveyed. All concrete materials were found in approximate trail between the tanks. All of the known substrate types within both complexes were assessed during survey period.

Survey Methodology:

All survey work was conducted using scuba diver based fish and invertebrate counts. Survey transects lines were placed across area with the largest concentration of reef material located at each of the survey sites. Material concentration and transect locations were determined using a Furuno® Fathometer, and Garmin® WAAS Global Positioning System. Survey transects were conducted following a roving transect line through the substrate area. Survey dives were based on timed counts of 20-30 minutes depending on site complexity. All observations were taken from a non overlapping transects. All survey dives were restricted to linear visibility greater than 2 m.

Organisms were identified to the lowest taxonomic level (species), and all observed individuals and species were enumerated. All observations were totaled for each survey site and entire reef complex. Species diversity and evenness indices were used to provide a quantitative assessment of the survey site and complex faunal assemblage. A Simpson's *D*, species diversity index was selected based on the robust nature of the analysis. The index reduces the influence of single species observations while describing the community without weighting individual impact based on large numbers of single species. The index ranges computes values between 0.0 – 1.0 with maximum diversity at 1.0. Relatively diverse communities have a Simpson's *D* of 0.5 - 0.8.

Species diversity is directly correlated with the numeric distribution of observations. Evenness indices were used to further define the significance of the diversity index. Simpson's *S* evenness indices were calculated for each of the sites to assess how well the species observations, which defined the overall species diversity.

Low diversity scores can be explainable by low evenness index for the observations.

Low diversity measures combined with low evenness suggest that one or a small number of individual species typically dominated a community. Simpson's S , is measured from 0.0-1.0 with an evenness score of 1.0 being an evenly distributed community. Low evenness scores occur when a small number of organisms dominate the community based the total number of individuals.

Artificial reef material subsidence, scouring and weathering patterns measures were taken at each of the sites. Scouring and subsidence measures were taken using a meter stick in areas with observable scouring and subsidence. Sediment overbear measurements were taken using a metered probe. Sediment composition analysis for the site was based on observational estimates collected at the sites. Weathering processes were assessed qualitatively based on direct observation.

Results:

Reef Ball Reef

Substrate composition at the site was randomly oriented reef ball complexes and independent reef balls. Linear visibility at the time of the survey was a recorded 5.0 – 7.0 meters. Surveys were conducted between 1100 and 1345 on October 8, 2010. Observed scouring on the site was restricted to the edges of the hard bottom areas adjacent to the reef system. Scouring observations were less than 30 cm in depth. There was no observable evidence of weathering on the site. No measurable weathering or subsidence of the reef material was observed at the time of the surveys.

Transects on the survey site were set to radiate out from the center point of the reef system. Transects were oriented on the four primary directions of the compass

(N,S,E,W). Observation data from each transect was combined to characterize the finfish and macro invertebrate communities within the system.

Substrate composition at the site was primarily consisted of reef ball complexes. Divers recorded visibility ranging from 5.0 –7.0 meters. Survey operations took place at 1100 on October 8, 2010. Scouring was limited to the adjacent hard bottom areas. All of the reef substrates were in good shape with no recorded weathering or subsidence. Sediment overlay on the site ranged from 5 cm up to 15 cm. Sediment composition was largely composed of fine grained sand approximately 40%, course grained sand approximately 25% and silt approximately 15%. Shell hash on the site was restricted to approximately 20% of the total sediment overbear. Variation in the overbear depths were dependant on the relative distance of the measurement point to the hard bottom areas.

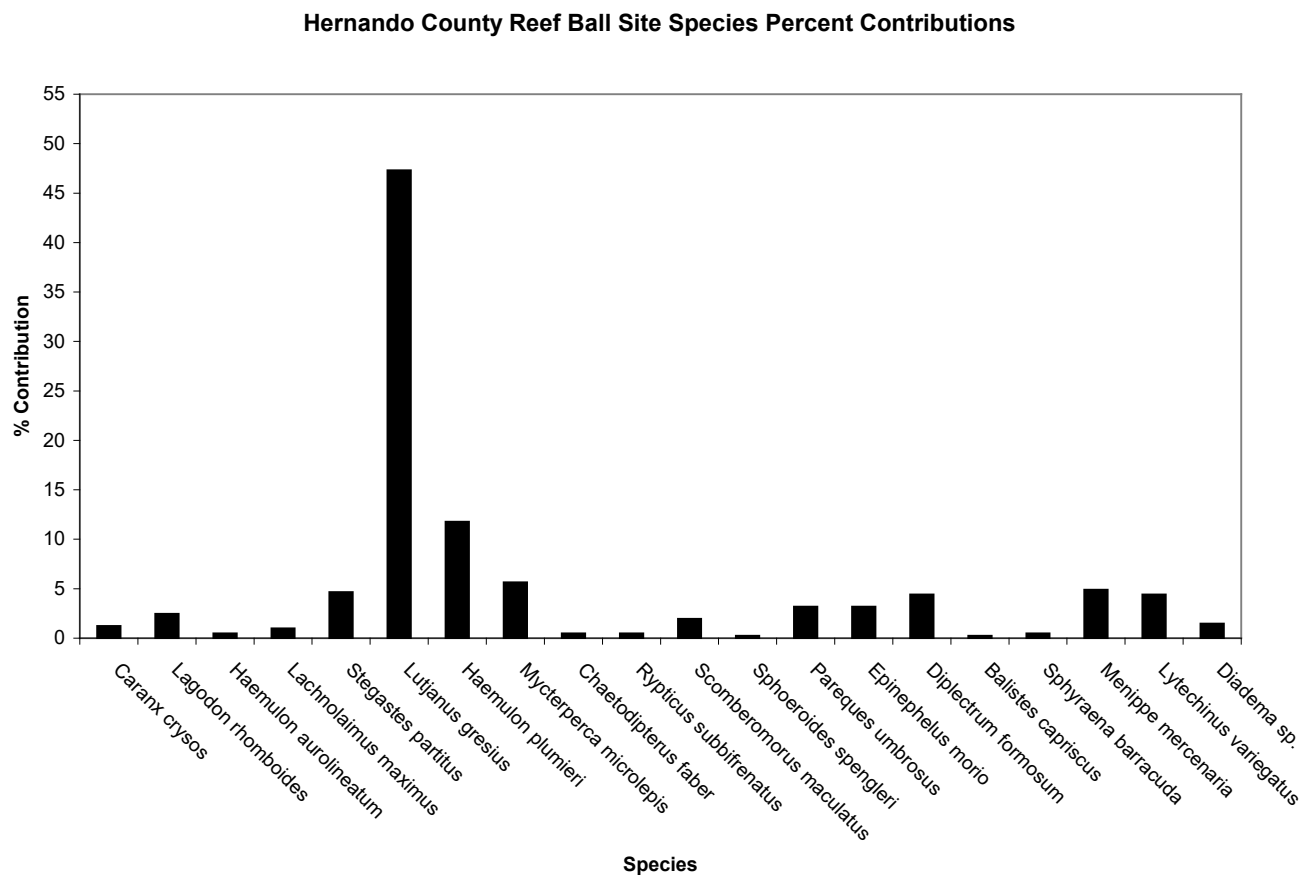
Species observations at the reef site accounted for 21 individual species of finfish and macroinvertebrates. Finfish accounted for 86% (18 sp) of the total observations species, macro invertebrate species accounted for the remaining 14% (3 sp.) in residence at the time of the survey. Table 1 lists the species and general taxonomic groups observed at the site. Grey Snapper, *Lutjanus greiseus* (47.30), White Grunt, *Haemulon plumieri* (11.76%), Gag Grouper, *Mycteroperca microlepis* (5.64%), Bicolor Dameselfish, *Stegastes partitus* (4.65%), and Red Grouper, *Epiunephelus morio* (3.19%) accounted for 72.54% of the observed population. Other finfish species accounted for 16.7% of the observed species. The invertebrate population included Stone Crab, *Menippe mercenaria* (4.90%), Variegated Urchin, *Lytechinus variegatus* (4.41%), and Long Spine Urchin, *Diadema sp.* (1.47%), and that accounted for 10.78% of the total population.

Table 1. Hernando County Reef Ball Reef survey site species and group list with observed species percent contributions Fall 2010.

Species Name	Common Name	# Observed	Size Range (mm)	% Cont.
<i>Caranx crysos</i>	Blue Runner	5	130-160	1.22549
<i>Lagodon rhomboides</i>	Pinfish	10	40 - 90	2.45098
<i>Haemulon aurolineatum</i>	Tomtate	2	40-50	0.490196
<i>Lachnolaimus maximus</i>	Hogfish	4	130-240	0.980392
<i>Stegastes partitus</i>	Bicolor Damselfish	19	20-60	4.656863
<i>Lutjanus gresius</i>	Gray Snapper	193	140-240	47.30392
<i>Haemulon plumieri</i>	White Grunt	48	200-240	11.76471
<i>Mycterperca microlepis</i>	Gag Grouper	23	180-360	5.637255
<i>Chaetodipterus faber</i>	Atlantic Spadefish	2	140-160	0.490196
<i>Rypticus subbifrenatus</i>	Spotted Soapfish	2	110-130	0.490196
<i>Scomberomorus maculatus</i>	Spanish Mackerel	8	180-220	1.960784
<i>Sphoeroides spengleri</i>	Bandtail Puffer	1	100	0.245098
<i>Pareques umbrosus</i>	Cubby	13	80-120	3.186275
<i>Epinephelus morio</i>	Red Grouper	13	160-300	3.186275
<i>Diplectrum formosum</i>	Sand Perch	18	90-110	4.411765
<i>Balistes capriscus</i>	Gray Triggerfish	1	160	0.245098
<i>Sphyrna barracuda</i>	Great Barracuda	2	600	0.490196
<i>Menippe mercenaria</i>	Stone Crab	20		4.901961
<i>Lytechinus variegatus</i>	Var. Sea Urchin	18		4.411765
<i>Diadema sp.</i>	Lg. Spine Sea Urchin	6		1.470588
Total	= 21	=408		100

Individual species and group percent contributions are shown in Figure 1. Species diversity at the site was relatively good with the relative individual index contribution (Simpson's $D = 0.7354921$, Simpson's S of 0.8026203). Species dominance was low at 0.2645079.

Figure 1. Hernando County Reef Ball Reef species percent contribution estimates for the Fall of 2010.



Ben Dickson Tank Reef Site

Substrate composition at the site primarily consisted of decommission army tanks, concrete culverts, and rubble. Divers recorded visibility ranged from 5 to 7.0 meters. Survey operations took place at 1235 on October 19, 2010. Scouring was not observed at the site with no recorded subsidence. Sand over bear at the site ranged from 15 cm -18 cm. Sediment composition was largely composed of fine grained sand approximately 45%, course grained sand approximately 20% and silt approximately 10%. Shell hash on the site was restricted to approximately 25% of the total sediment overbear.

Table 2 lists the species and general taxonomic groups observed at the site. The data represented in the table is a compilation four surveys conducted on the site. Surveys were conducted on each of three tanks located within the reef system and the generalized trail of concrete culverts and rubble. The reef system had 19 observed species in residence at the time of the surveys. Finfish species accounted for 89.4% and invertebrate species account for 10.5% of the total population.

Table 2. Hernando County Ben Dickson Tank Reef site species and group list for the fall of 2010.

Scientific Name	Common Name	# Observed	Size Range (mm)
<i>Archosargus probatocephalus</i>	Sheepshead	2	190-200
<i>Balistes capriscus</i>	Gray Triggerfish	1	160
<i>Diplectrum formosum</i>	Sand Perch	18	90-110
<i>Epinephelus itajara</i>	Goliath Grouper	7	300-600
<i>Epinephelus morio</i>	Red Grouper	4	220-230
<i>Haemulon aurolineatum</i>	Tomtate	2	40-50
<i>Haemulon plumieri</i>	White Grunt	18	120-180
<i>Halichoeres bivittatus</i>	Cocco Damselfish	8	70-90
<i>Holacanthus bermudensis</i>	Blue Angelfish	1	180-240
<i>Lachnolaimus maximus</i>	Hogfish	2	140-150
<i>Lutjanus grieseus</i>	Gray Snapper	139	140-400
<i>Mycteroperca microlepis</i>	Gag	46	200-450
<i>Mycteroperca phenax</i>	Scamp	11	160-240
<i>Pareques umbrosus</i>	Cubbyu	10	70-100
<i>Serranus subligarius</i>	Belted Sandfish	11	60-80
<i>Sphyrnaena barracuda</i>	Great Barracuda	2	600
<i>Stegastes partitus</i>	Bicolor Damselfish	17	60-80
<i>Lytechinus variegatus</i>	Varigated Sea Urchin	18	
<i>Menippe mercenaria</i>	Stone Crab	20	
Total	Sp # = 19	337	

The finfish species assemblage was dominated by Gray Snapper, *Lutjanus grieseus* accounted for 41.25 % of the observed population, Gag grouper, *Mycteroperca microlepis* accounted for 13.64%. The remainder of the species assemblage was made up of 15 species with percent composition estimates that ranged from 0.59 – 5.34% of the total observations. The invertebrate

population included: Stone Crab *Menippe mercenaria* (5.93%), and Variegated Urchin, *Lytechinus variegatus* (5.34%). Individual species and group percent contributions are shown in Figure 2. Species diversity at the site was relatively good with the relative individual index contribution (Simpson's $D = 0.7939$, Simpson's S of 0.2312). Species dominance was low at 0.4672.

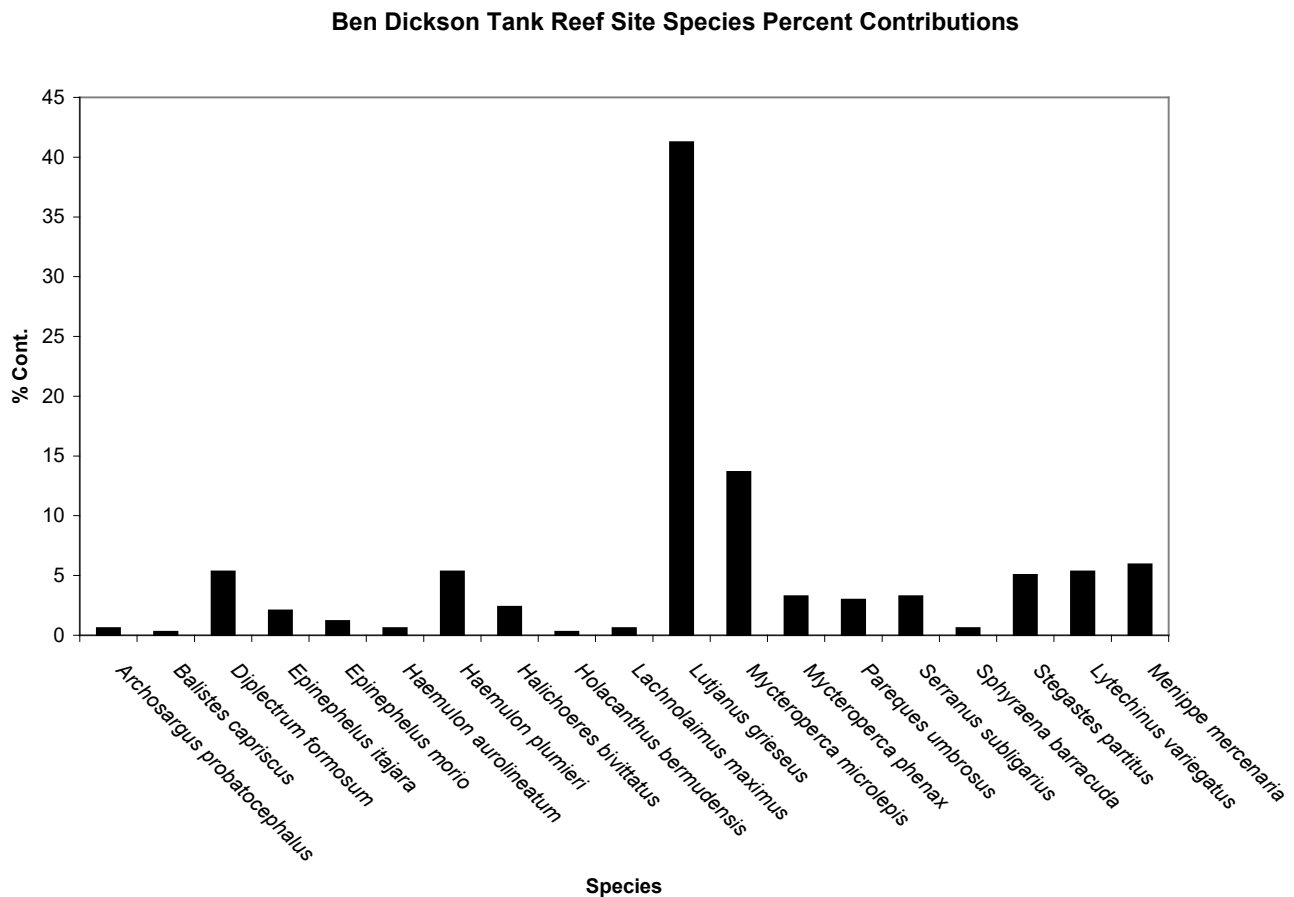


Figure 2. Hernando County Ben Dickson Tank Reef Site species percent contribution estimates for the fall of 2010.

Conclusions:

These artificial reef complexes appear to have accomplished the goals of the permit proposed by providing suitable long-term habitat for finfish. The substrates used will provide solid long-term habitat for finfish and invertebrate colonization maintaining

a solid foundation without adversely impacting the natural substrates within the permitted area. Any observed impact would only increase the overall usable habitat within the reef system. Scoured areas appear to provide increased surface area for settlement, which would not have been biologically available without the presence of the reef complex. Sand overbear at the time of the survey appeared to be sufficient in depth and composition to allow further development of both reef sites. All deployed substrates were in good condition no obvious signs of weathering. These types of materials appear to be suitable for future deployment operations.