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INTRODUCTION The Sarasota Bay Estuary Program (SBEP) documented the ecological use and diversity of three shallow artificial reef sites within Sarasota Bay, Florida (Fig 1). The project consists of 1) collecting side-scan sonar mapping, and 2) reef fish census data on three different reef module designs (Fig 4) deployed in the summer of 2013. The reef fish census data compares species preference, abundance, diversity, and richness between different module designs within the permit sites. Side-scan sonar mapped the seafloor and artificial reef materials within each permitted reef site. Reef fish surveys, consisting of 1) baited remote underwater video stations (BRUVS) and 2) underwater visual census (UVC) characterized and compared fish abundance, species richness, and composition at artificial reef locations. Of particular interest was the use of different reef modules (Fig 2) by juvenile gag grouper (*Mycteroperca microlepis*).

METHODS Side scan surveys were conducted to map three Sarasota Bay permitted artificial reefs and locate deployed material at each site. Three locations at each reef were selected to conduct fish surveys. Finally, reef fish surveys consisted of the following two methods:

- Underwater visual census (UVC)
 - UVC conducted at one BRUVS site
 - Rover and stationary surveys
 - Two divers per event
- Baited remote underwater video station (BRUVS)
 - 15 min stabilization period
 - 60 min recording period



Figure 1. Sarasota Bay reefs (left) and BRUVS in position in front of a deep cover reef module (right).

RESULTS

(UVC and BRUVS from Walkers Reef Only)

Table 1. Data summary from Walker Reef roving diver survey, March 22, 2017.

Roving Diver Survey [10-min / 30-ft radius]			
Date:	3/22/2017	Start Time:	9:30
Survey:	Event 1	End Time:	9:40
Artificial Reef:	Walker's	Depth:	13-ft
Sampling Location:	UVC	Visibility:	10-ft
Data Collector:	BA	Relief:	3-ft
Reef Materials:	Deep Cover Reef, Bay Reef Balls		
Fish Species			n
Scientific Name	Common Name		
<i>Archosargus probatocephalus</i>	Sheepshead		23
<i>Mycteroperca microlepis</i>	Gag Grouper		12
<i>Eucinostomus gula</i>	Silver Jenny		500
<i>Lutjanus griseus</i>	Gray (Mangrove) Snapper		3
<i>Haemulon plumieri</i>	White Grunt		1
<i>Pareque s spp.</i>	Highhat/Cubbyu		1
*Deep Cover Reef observed in 30-ft radius (not the one near bouy) appeared completely full of Gag Groupers. Others were trying to get in but inside was packed. Larger fish take up space inside and prevent smaller fish from entering.			

Table 2. UVC fish census species abundance data. Each UVC sampling event included a stationary (S) and roving (R) diver.

Scientific Name	Common Name	Event 1 (Mar 2017)				Event 2 (Feb 2018)				Event 3 (Feb 2018)				Total	
		UVC1		UVC2		UVC1		UVC2		UVC1		UVC2			
		S	R	S	R	S	R	S	R	S	R	S	R		
<i>Acanthostracion quadricornis</i>	Scrawled Cowfish														0
<i>Archosargus probatocephalus</i>	Sheepshead	4	11	12	23	4	1	6		3	4	2			70
<i>Atherinidae, Clupeidae</i>	Herring/Silversides									50	50	30			130
<i>Chaetodipterus faber</i>	Atlantic Spadefish														0
<i>Epinephelus morio</i>	Red Grouper														0
<i>Eucinostomus gula</i>	Silver Jenny	300	50	300	500	50	50			10					1260
<i>Haemulon plumieri</i>	White Grunt				1										1
<i>Haemulon spp.</i>	Juvenile Grunt	200	300												500
<i>Lutjanus griseus</i>	Gray (Mangrove) Snapper		2	1	3										7
<i>Mugil curema</i>	White Mullet														0
<i>Mycteroperca microlepis</i>	Gag Grouper		2	3	12		3		11		8	2			41
<i>Pareques umbrosus</i>	Cubbyu (juvenile)							1							1
<i>Pareques spp.</i>	Highhat/Cubbyu				1										1
Total		504	365	316	540	50	57	1	18	60	61	6	33		2011

Table 3. BRUVS fish census species abundance data.

Scientific Name	Common Name	Event 1 (Mar 2017)			Event 2 (Feb 2018)			Event 3 (Feb 2018)			Total
		BRUVS 1	BRUVS 2	BRUVS 3	BRUVS 1	BRUVS 2	BRUVS 3	BRUVS 1	BRUVS 2	BRUVS 3	
		<i>Acanthostracion quadricornis</i>	Scrawled Cowfish		1	1					
<i>Aluterus schoepfii</i>	Orange Filefish	4	2								6
<i>Archosargus probatocephalus</i>	Sheepshead	10	2	2	3		2				19
<i>Ariopsis felis</i>	Hardhead Catfish								2		2
<i>Atherinidae, Clupeidae</i>	Herring/Silversides								30		30
<i>Chaetodipterus faber</i>	Atlantic Spadefish							7			7
<i>Dasyatis americana</i>	Southern Stingray							1			1
<i>Eucinostomus gula</i>	Silver Jenny	150	15	15	70						250
<i>Haemulon plumieri</i>	White Grunt	2									2
<i>Haemulon spp.</i>	Juvenile Grunt	150	2	10							162
<i>Lutjanus griseus</i>	Gray (Mangrove) Snapper							1			1
<i>Lutjanus/Haemulon spp.</i>	Snapper/Grunt spp.		1								1
<i>Mycteroperca microlepis</i>	Gag Grouper	5		4							9
<i>Sphaeroides sp.</i>	Puffer sp.								1		1
<i>Stephanolepis hispidus</i>	Planehead Filefish										0
Total		321	23	32	73	0	2	9	0	33	493



Figure 2. Reef modules: 3 tier cube (left), deep cover (center) and layer cake (right).

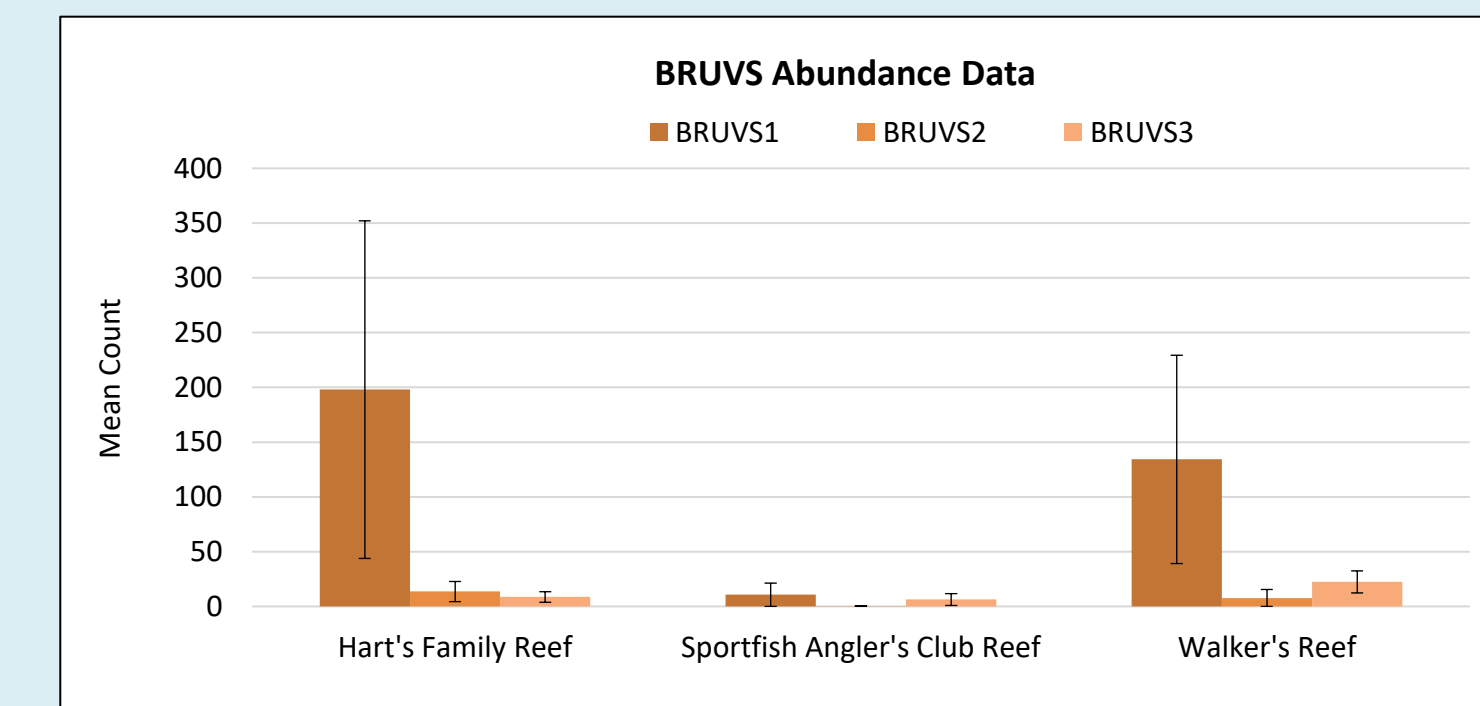
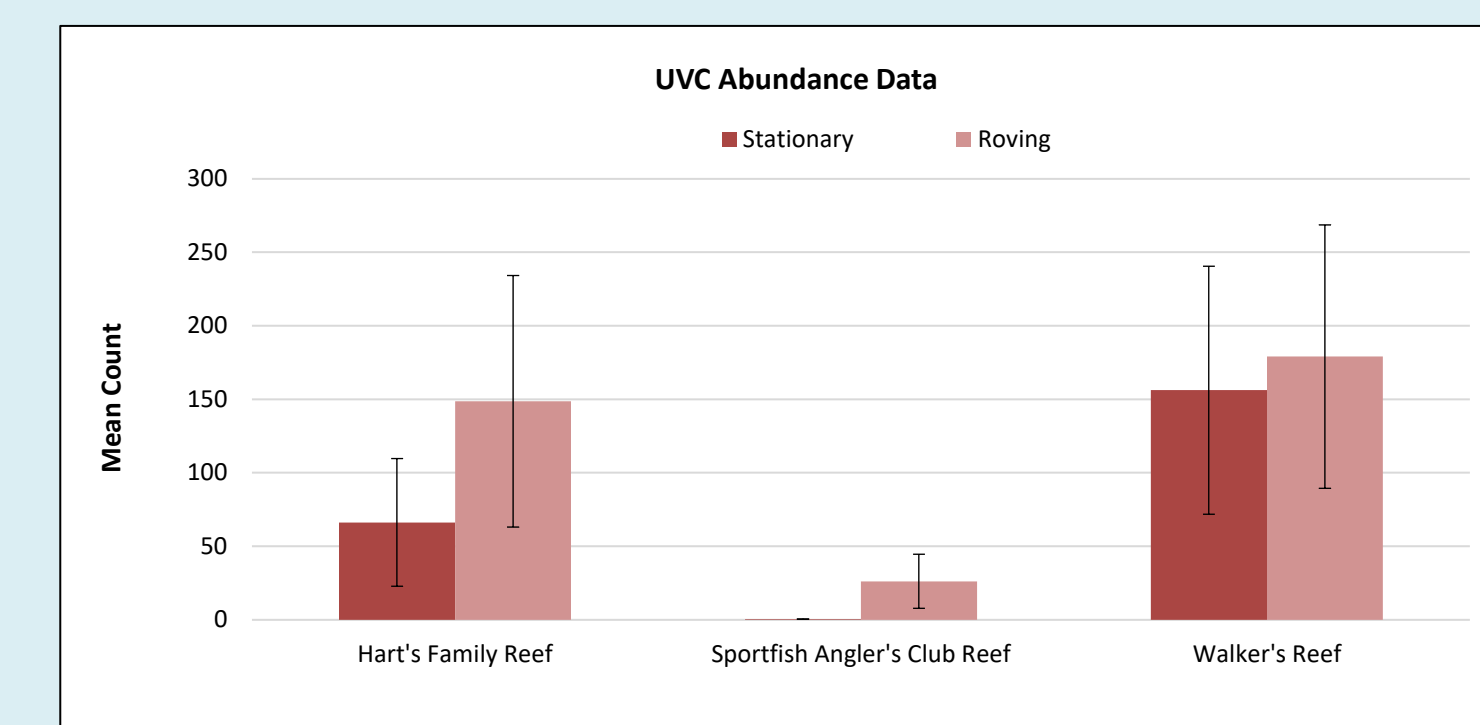


Fig 3. Comparison of fish abundance among reefs by the UVC method (above) and the BRUVS method (below).

SUMMARY The roving diving technique resulted in higher fish counts, species richness, and diversity than the stationary method. The BRUVS survey method, which included using a bait basket and excluded diver interaction, captured several species that were not observed during the UVC methods. Hart's Family and Walker's Reefs had the highest abundance and diversity of fish regardless of method. Deep cover reef modules were observed to harbor gag grouper; occasionally in large numbers. Red tide (2018-19) and COVID prevented the completion of three additional surveys.

FUTURE WORK includes continued monitoring using the same methods, improve reef module design, deploy additional reef modules and develop a tagging program to follow transition of gag grouper from these reefs to the offshore fishery