Title:

2006 Final Report of the Sarasota and Tampa Bay Artificial Reef Evaluation of the influence of reef number and artificial habitat on fish colonization

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Project Summary

In March of 2006 a multiyear project was initiated to monitor the colonization of artificial reef habitats by finfish and invertebrate populations in Sarasota Bay and Tampa Bay. Five artificial reef complexes located in southeastern Tampa Bay and central Sarasota Bay were used to evaluate the effect of artificial reef location and number on colonization. Seasonal surveys were conducted on each of the complexes to assess temporal effects on colonization. The Bulkheads (BH) and Southeast Tampa Bay (SETB) reef complexes are located in Tampa Bay, Whale Key (WK), Bayshore North (BSN), and Bayshore South (BSS) reef complexes are located in Sarasota Bay.

Each of the reef complexes had replicate reef sites containing two 4, 8, 16, and 32 reef sites. The replicate reef sites were evenly spaced throughout the complex without adjacent replicate placement. This design allowed us to evaluate the effect of reef number on colonization and retention of finfish and invertebrate populations. Geographic location of the reef complexes within 2 different bay systems allowed us to evaluate the influence of position on the colonization and retention. The ultimate goal of this project was to attempt to define the effect of these types of artificial habitats on species assemblages within Sarasota and Tampa Bays.

This report summarizes the results of 320 survey dives conducted from March 2006-March 2007. Surveys were severally restricted due to adverse weather patterns and reduced visibility on all of the complexes. The occurrence of the 2005-2006 red tide bloom helped this project by allowing us to begin assessment on relatively empty reef systems. During the 2006 sampling period we were able to document recovery of these systems following the bloom. The colonization events documented in this report give us a relatively clean look at the influence of reef structures within the bay systems.

Reef area appears to influence the amount of colonization and retention within these habitats. Increased area resulted in higher abundance of organisms and species. Smaller reef sites tended to have lower organism abundances and species, while the larger complexes had higher abundance and species numbers. Organism density declined with greater surface area. Increased reef area resulted in a general decrease in organism density across all complexes and seasons.

Reef location appears to influence species colonization and distributions. Seasonal shifts in the dominant organisms on the reef sites tended to be complex specific. Tampa Bay reef complexes tended to be sub-adult- adult habitats, while the Sarasota Bay complexes were generally juvenile finfish and invertebrate habitats. Differences in the accessibility to deep waters of the Gulf of Mexico and water flow regimes rates were dominant forces driving the colonization of these areas.

Finfish and invertebrate population compositions are defined seasonally. Winter and spring samples tended to be dominated by larval - juvenile finfish and macro invertebrates. Summer and fall sampling periods showed defined shifts in organism sizes and distributions across all of the habitats. Fall observations were dominated by invertebrate species across all of the reef complexes. Winter species assemblages tended to be dominated by larval – sub juvenile finfish at the Sarasota Bay complexes and adult finfish at the Tampa Bay complexes.

Preliminary investigations show that these systems are important parts of the bay systems. Reef area and placement appear to strongly influence species colonization and development. Total reef area also appears to define the colonization of species assemblages. Even though the larger reef sites had greater surface area for settlement the overall organism density on the sites declined. This suggests that recruitment limitation may not be habitat dependant in these two systems. Future surveys will increase our understanding of these effects of these habitats within Sarasota and Tampa Bays.

Introduction

Florida's economy relies on income derived from recreational and commercial fisheries targeting a number of finfish and invertebrate species. Greater demands on fishery resources, which are often threatened by the loss of habitat, have led to increased interest in the function and deployment of artificial reefs (Bohnsack et al., 1994). Artificial reefs are proposed mitigation tools to provide available habitat, which may enhance fish and invertebrate populations that may be otherwise habitat limited (Bortone et al., 1994; Fabi and Fiorentini, 1994; Butler and Herrnkind, 1997). For example, abundance of juvenile spiny lobster, Panulirus argus, was enhanced when a nursery area was supplemented with artificial habitat indicating that habitat limited recruitment (Butler and Herrnkind, 1997). In addition to greater habitat availability, artificial reefs should provide greater food and shelter resources (Eggleston et al., 1990; Beets and Hixon, 1994). Adult Nassau grouper, Epinephelus striatus, abundance was greater on artificial reefs with appropriately sized crevices than natural reefs of similar size indicating shelter limitation may influence population densities in some areas (Beets and Hixon, 1994). The additive benefits of habitat availability, shelter, and increased food resources should lead to increased population persistence and production.

Specific reef characteristics, in addition to available habitat, influence colonization of artificial reefs. Reef size and number, habitat complexity, vertical relief, and patch distribution influence colonization of artificial reefs by many fish and invertebrate species (Bohnsack et al., 1994; Frazer and Lindberg, 1994; Potts and Hulbert, 1994; Rilov and Benayahu, 2000). Density of fish species and total number of species were greater on several small artificial reefs than one large artificial reef of equal area and where a greater number of reefs were present (Bohnsack et al., 1994). Smaller patches have larger perimeter to area ratios increasing the probability of smaller patches intercepting colonizers, which may explain greater observed abundances in smaller patches (Bohnsack, 1991; Eggleston et al., 1999). Fish abundance was greater on reefs with more structural volume and complexity, however if patches were close to one another, fish abundance was similar to abundances found in reefs with greater complexity (Potts and Hulbert, 1994). Also, higher species richness was observed at jetties with greater vertical relief and habitat complexity than at natural reefs (Rilov and Benayahu, 2000). A myriad of interacting factors is therefore expected to influence colonization of artificial reefs by fish and invertebrate species, and often causes optimal artificial reef design and deployment difficult. Considering the evidence that a wide range of species use artificial reefs for habitat, reef characteristics should be investigated further to develop optimal reef and deployment designs to ensure increased fish production.

Another issue surrounding artificial reefs is that their function and effectiveness remains unclear. One major debate surrounding the function of artificial reefs is the "Attraction-Production" debate (Bohnsack et al., 1994; Lindberg, 1997; Wilson et al., 2001). The Attraction Hypothesis predicts that fish and invertebrate species redistribute themselves to newly available habitats without changing production (Wilson et al., 2001). Conversely, the Production Hypothesis predicts that artificial habitats provide new habitat to an environment that would otherwise be saturated, thereby allowing for further recruitment into an area and increasing production (Wilson et al., 2001). Few studies have specifically evaluated this issue, however Bohnsack et al., (1994) determined that larval recruitment was lower at artificial reef sites than natural reef sites, and older juveniles and adults colonized artificial reefs after settling elsewhere;

therefore the attraction hypothesis was partially supported. Before proceeding with further artificial reef deployments, future comparisons of existing artificial and natural reefs should quantify densities of larval fish and invertebrates, as well as sub-adults and adults to evaluate this debate further.

Project Description

Goals and Objectives

The goals of this project are to evaluate and monitor the colonization of artificial reefs by fish and invertebrate species typically found in Sarasota Bay and Tampa Bay. To achieve this goal we will address the following objectives:

1. Determine whether colonization by fish and invertebrates is influenced by the amount of available habitat.

2. Determine whether colonization of artificial reefs is influenced by the location within Sarasota Bay and Tampa Bay.

3. Determine seasonal colonization and habitat use patterns by native finfish and invertebrate populations on artificial reef structures.

Methodology

Site Selection

Five artificial reef complexes located in southeastern Tampa Bay and central Sarasota Bay were used to evaluate the effect of artificial reef location and number on fish colonization. The following sites were used in this study: Bulkhead (BH) and Southeast Tampa Bay (SETB) reef complexes located in southeast Tampa Bay, and Whale Key (WK), Bayshore North (BSN), and Bayshore South (BSS) reef complexes in Sarasota Bay. Each of the reef systems was arranged in an approximate octagonal shape with alternating patch reef habitats of 4, 8, 16, or 32 reef balls. Replicate of each patch reef sites (4, 8, 16, and 32) located within each reef complex. The reef complex design allowed us to evaluate the effect of reef number and location (site) on colonization of fish species (objectives 2 and 3).

Data collection

Due to the extreme variability of visibility within Sarasota and Tampa Bay, the entire reef complex was surveyed on each sampling date. Visibility constraints varied on a daily to weekly basis. Attempts to conduct the original survey plan resulted in losses in viable data collection, due to minimum visibility constraints. Surveys were conducted quarterly for one year to evaluate seasonal effects on colonization at our sites (27 sampling dates/year).

Sampling schedules were modified from the fall of 2005 until the spring of 2006, following the occurrence of a severe Karenia brevis bloom which covered most of Sarasota and Tampa Bays during the summer, fall, and early winter of 2005. The bloom directly impacted all of the reef systems within the study area. Anoxic conditions and diver visibility constraints slowed the completion of this project until the winter of 2007. Throughout the course of the year long evaluation, visibility constraints restricted seasonal survey efforts. Seasonal definition was further modified from a calendar year to a schedule based on water temperature, allowing the documentation of seasonal shifts in species use patterns and distributions on the reef sites. Normal calendar time scales did not accurately depict the season variation in water temperature and weather patterns, which appear to influence the species assemblages on these systems.

During this sampling period, divers from Mote Marine Laboratory conducted 40 sampling dives within Sarasota and Tampa bay. Twelve other dives were conducted throughout the sampling area, but were called due to reduced visibility, in climate weather, or Karenia brevis bloom formation, which restricted sampling efforts. Dive cancellation further blurred the seasonal distinction between the calendar and seasonal scales. In some cases, conditions were reduced to levels below the sampling parameters for several weeks due to reduced visibility on one or more of the survey complexes.

Dive Surveys

Two visual surveys over parallel line transects were conducted at one replicate of each patch reef habitat (4, 8, 16, and 32 reefs) within each site. Each patch reef habitat, regardless of reef ball number, was comprised of two rows of equidistant reef balls. Line transect surveys were conducted along the two rows of reef balls. One diver was assigned to each transect line to eliminate diver interaction during the survey. Each diver identified all finfish and macro invertebrate species, the number of each species, and the approximate size of all fish observed along each transect. All species identifications were done to the species level. The ability of divers to visually survey these reef systems was related to the water clarity on each sampling date, with a minimum visibility standard of 5 linear feet standard was used on all surveys. Visibility was quantified using a linear tape measure.

Water Quality

Surface and bottom water quality measurements were taken at each of the reef sites on survey days. Water quality measures were taken using an YSI Model 600 Multi probe meter. Water temperature (°C), Dissolved oxygen (mg/l), pH, salinity (p.p.t.), and linear visibility (ft) were recorded at each reef complex prior to initial dive operations and following the final dive within the complex. Water quality measurements were conducted to eliminate water quality parameters as factors influencing colonization by fish species at the reef sites.

Data Analysis

The effect of reef number on mean abundance, species richness, and community similarity organism density was assessed by this study. Mean abundance was defined as the mean number of individuals observed over the total number of surveys. Species richness was defined as the mean number of species observed over the total number of surveys for each reef site type. Community similarities were assessed using percent contribution of the most common species by reef number and complex. Density of species was calculated based on the total number of individuals observed over the surface area of the reef units within each site. Density measures were calculated as the total number of organisms per m3 of surface area.

Reef complexes were defined as the entire area of the reef systems. Each reef complex contained two replicate reef sites (4, 8, 16, 32 reef units). The mean number of organisms within the two sites was used for all site comparison of abundance, richness, percent composition, and species density.

This report outlines the work conducted by Mote Marine Laboratory staff during the 2006-2007 sampling season. The work reported contains the reef site, complex and systems descriptions of diver observations and analysis from Feb 2006 – March 2007. Seasonal evaluation schedules did not correspond to the normal calendar year but reflect a full 12 months of sampling effort. All data represented in this report follows the 2004 research proposal and scope of work approved by both the Sarasota Bay Estuary Program and Mote Marine Laboratory.

Results

Spring 2006

Surveys were initiated in March of 2006 approximately 4 months following the subsidence of the K. brevis bloom of 2005. Visibility constraints between January and late March were less than 5 linear feet, with the exception of 2 occasions on the Bayshore North Complex. Divers observed no finfish or invertebrate species on these preliminary dives. The earliest surveys with recorded finfish and invertebrates in residence were on March 29, 2006. Following survey initiation, all five of the reef complexes were surveyed by the 22nd of May. Observed differences between the reef complexes could possibly be attributed to the length of time required to complete the survey effort

Site Abundance

Figure 1 shows the effect of reef number on mean abundance of all finfish and invertebrate species observed on each reef site within each of the reef complexes. Mean number of observations were used to quantify abundance estimates within site observations. All observations were used to define the overall abundance of the sites. Seasonal influence and chance occurrence of organisms on the reef sites were included to reflect the resident population at the reef site during the spring surveys.

The four reef systems had the lowest number of individual observations within each reef complex. The highest abundance estimates were observed on the 32 reef sites. The Tampa Bay reef complexes held the same patterns as the Sarasota Bay systems, with the exception of the Southeast Tampa Bay Complex (SETB). Lower observations at the Southeast Tampa

Bay reef complex were likely the result of flow patterns from the Manatee River. Observation numbers within the Southeast Tampa Bay complex were 50-75% lower than at the other reef complexes. Abundance estimates across all of the complexes had a mean increase of 25.3±2.1% with each increase in area. Table 1 shows mean site observations and percent increases based on total reef area (# of reef units/site).

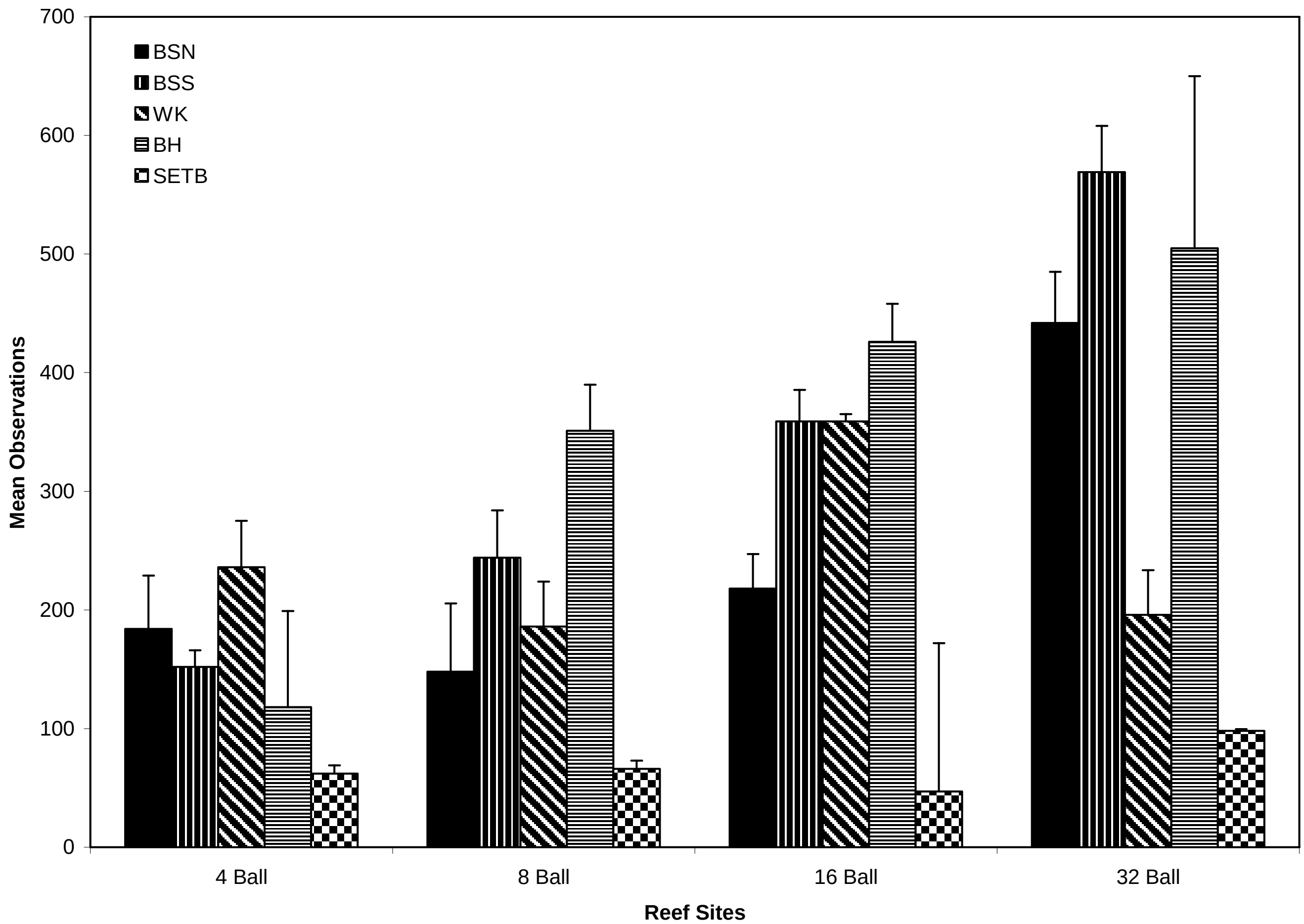

Figure 1 Mean abundance of finfish and invertebrates observed on the Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay reef complexes by reef site.

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Table 1 Mean site observation totals, Mean site totals across reef complexes mean % increase in observations by reef site for Bayshore South (BSS), Bayshore North (BSN), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes Spring 2006.

Mean Observations								
Reef #	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**	**% Increase**
4 Ball	184.00	152.00	236.00	118.00	62.00	150.40	29.43	
8 Ball	148.00	244.00	186.00	351.00	66.00	199.00	47.74	24.42
16 Ball	218.00	359.00	359.00	426.00	47.00	281.80	67.79	29.38
32 Ball	442.00	569.00	196.00	505.00	98.00	362.00	91.36	22.15
Mean								**25.32**
SE								**2.13**

Species Richness

The reef complexes within Sarasota Bay and Tampa Bay were moderately rich in observed species. The smaller reef sites tend to have a lower numbers of species. In general, increased reef numbers resulted in an increased species number. The Tampa Bay reef complexes had more species than the Sarasota Bay complexes. The Bulkheads complex had the highest number of species of all the reef complexes. Lower species numbers at Southeast Tampa Bay are likely due to the influence of the Manatee River on the species distribution at the site. Figure 2 shows the mean number of species recorded during the spring of 2006 by reef complex and site.

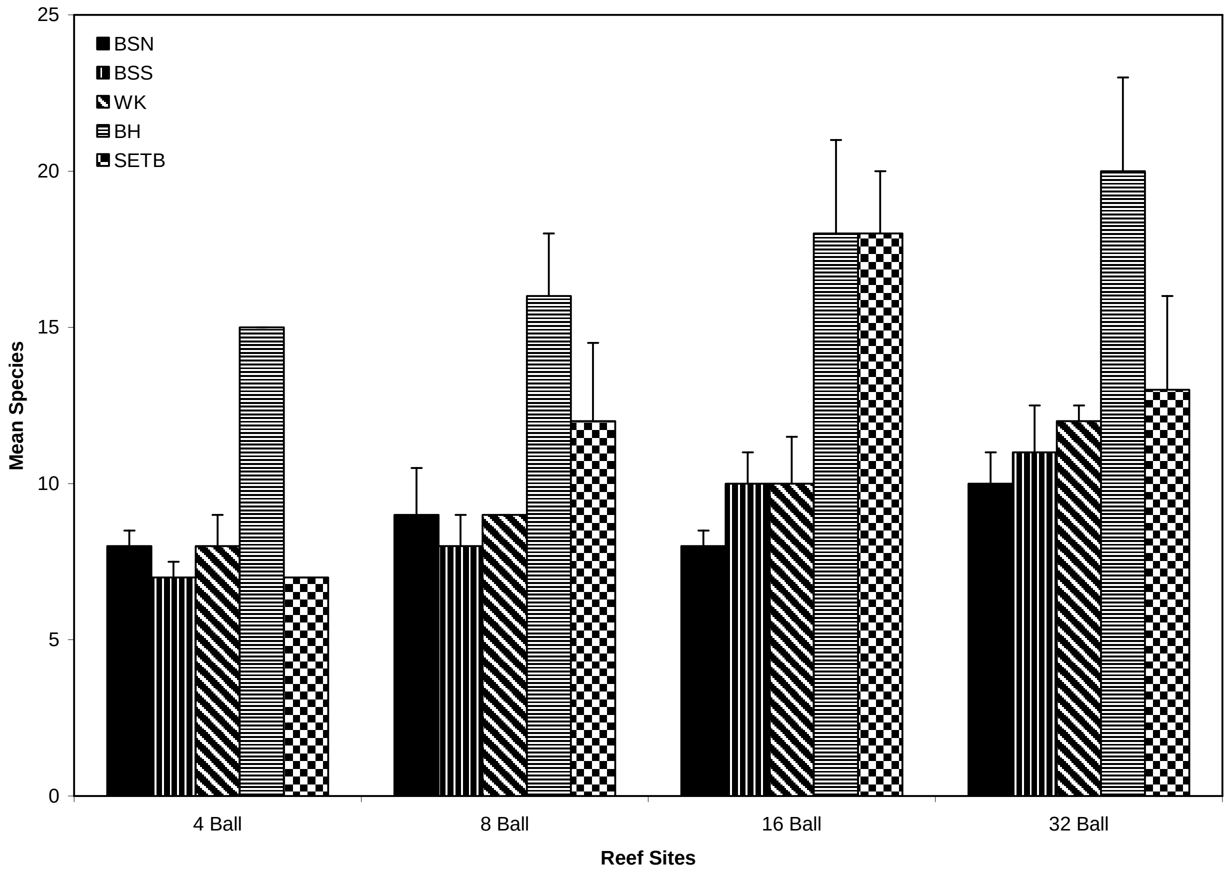

Figure 2 Mean number of species at the Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay reef complexes by reef site, Spring 2006.

Community Similarity

4 Reef Sites

Finfish and invertebrate community structure across the 4 reef sites were similar with 7 of the common species.. Mean percent contribution by the common species accounted for 82.53±12.76% of the finfish and invertebrate communities observed at the 4 reef sites. Lagadon rhomboides dominated the reef sites in Sarasota Bay, accounting for 61.1±10.5% of the total observations. Haemulon aurolinatum accounted for 12.4±4.3% total observations at the Tampa Bay 4 reef sites. Mycteroperca microlepis contributed 7.4% of the total observations at the Bulkheads complex in Tampa Bay. A large school Harrengula jaguana dominated all of the 4 reef sites within the Bulkheads complex. The overall numbers of these schools reduced the individual values of the observed species. The presence of the school could possibly explain the concentration of juvenile-subadult gag grouper observed at the 4 reef sites.

The invertebrate community was dominated by Callinectes sapidus, and Menippe mercenaria. Blue crabs and stone crabs were noted at all of the reef sites accounting for a mean contribution of 20.61% of the total observations. Leptogorgia virgulata colonies were observed at all of the reef sites. The presence of the coral structures contributed to the overall complexity of the systems. All of the corals appeared to be in good health following the extensive K. brevis blooms of 2005-2006. Table 2 lists the individual percent contributions of commonly occurring organisms observed on the 4 reef sites.

8 Reef Sites

Finfish and invertebrate community structures across the 8 reef sites had 7 species common to the survey sites. Mean percent contribution by the common species accounted for 79.89±7.03% of the finfish and invertebrate communities across the reef sites. L. rhomboides dominated the reef sites at the Sarasota Bay reef sites accounting for 73.3±3.1% of the total observations. H. aurolinatum was the dominant finfish at the Tampa Bay 8 reef sites accounting for 53.3±10.9% of the total observations. Lutjanus griseus was the dominant game fish observed across all of the 8 reef sites. M. microlepis contributed approximately 1.9% of the total observations at the Bulkheads complex.

Table 2 Reef individual percent contribution estimates for the Spring 2006 reef sites at Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes.

Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Calinectes sapidus	3.98	3.03	5.39	0.27	0
Haemulon aurolineatum	13.11	11.11	39.59	16.84	8.11
Lagodon rhomboides	71.75	69.32	42.35	1.84	32.02
Leptogorgia virgulata	1.46	7.37	3.97	2.58	21.27
Menippe mercenaria	3.92	7.01	8.15	14.08	12.50
Mycteroperca microlepis	0	0	0	7.41	0
Synodus foetens	1.06	0.56	0.56	2.04887	0
Site Total % Contribution	**95.29**	**98.39**	**100.00**	**45.05**	**73.90**
Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Calinectes sapidus	8.58	3.66	5.49	0.13	2.56
Haemulon aurolineatum	3.38	5.80	5.88	64.10	42.46
Lagodon rhomboides	76.41	81.02	62.58	2.10	2.56
Leptogorgia virgulata	5.26	1.23	0	6.58	5.20
Lutjanus griseus	0	2.16	3.94	0	0
Menippe mercenaria	1.87	0.62	10.93	7.90	5.51
Mycteroperca microlepis	0	0	0	1.93	0
Site Total % Contribution	86.92	90.84	83.33	82.62	55.73
Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Calinectes sapidus	10.72	5.91	5.20	0.17	0.16
Haemulon aurolineatum	22.67	1.49	0	7.42	4.30
Lagodon rhomboides	56.00	60.48	57.60	2.60	3.42
Leptogorgia virgulata	0.56	5.43	8.81	1.36	3.78
Lutjanus griseus	2.82	1.95	2.05	0	0
Menippe mercenaria	3.49	9.31	19.83	5.70	0.16
Mycteroperca microlepis	0	0	0	1.13	0.16
Site Total % Contribution	**96.26**	**84.56**	**93.49**	**18.40**	**11.98**
Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Calinectes sapidus	3.96	2.38	7.59	2.20	0
Haemulon aurolineatum	6.74	0.42	0.86	62.46	22.46
Lagodon rhomboides	73.42	81.12	3.62	0.28	0
Leptogorgia virgulata	1.02	0.18	13.80	9.51	40.51
Lutjanus griseus	3.59	2.86	0.76	0.61	3.62
Menippe mercenaria	5.96	4.06	38.43	7.38	4.35
Mycteroperca microlepis	0	0	0	6.83	19.50
Site Total % Contribution	**94.69**	**91.03**	**65.05**	**89.27**	**90.45**

The invertebrate community was dominated by C. sapidus, and M. mercenaria. Blue and stone crabs were noted at all of the reef sites, accounting for a mean contribution of 4.7±3.9 % of the total observations. L. virgulata, colonies were observed at all of the reef sites. The presence of the coral structures contributed to the overall complexity of the systems. All of the corals appeared to be in good health following the extensive K. brevis blooms of 2005-2006. Table 2 lists the individual percent contributions of commonly occurring organisms observed on the 8 reef sites.

16 Reef Sites

Finfish and invertebrate community structures across the 16 reef complexes had 7 common species. Mean percent contribution by the common species accounted for 60.94±35.32% of the finfish and invertebrate communities across all of the reef sites. L. rhomboides dominated the reef sites at the Sarasota Bay reef sites accounting for 58±2.0% of the total observations. Haemulon aurolinatum accounted for 5.9±1.63%of the total observations at the Tampa Bay 16 reef sites. M. microlepis contributions were limited by the strong presence of transient H. jaguana schools. These schools were noted at both the Bulkheads and Southeast Tampa Bay 16 reef sites. The dominance of these schools accounted for approximately 80% of the total observations at the sites.

The invertebrate community was dominated by C. sapidus and M. mercenaria, stone crab. Blue crabs and stone crabs were noted at all of the reef sites, accounting for a mean contribution of 18.2% of the total invertebrate observations at the Sarasota Bay sites. Blue crab and stone crab contributions accounted for 6.2% of the total site population in Tampa Bay. L. virgulata, colorful seawhips, was observed at all of the reef sites. The presence of the coral structures contributed to the overall complexity of the systems. All of the corals appeared to be in good health following the extensive K. brevis blooms of 2005-2006. Table 2 lists the individual percent contributions of commonly occurring organisms.

32 Reef Sites

Finfish and invertebrate community structures across the 32 reef sites had 7 common species. Mean percent contribution by the common species accounted for 83.7±3.6% of the finfish and invertebrate communities across all of the reef sites. L. rhomboides dominated the reef sites at the Sarasota Bay reef sites accounting for 52.7.1±28.3% of the total observations. H. aurolinatum accounted for 42.4% ±20% of the total observations at the Tampa Bay 32 reef sites. M. microlepis mean contribution was 13.2% of the total observations within the Tampa Bay reef complexes.

The invertebrate community was dominated by C. sapidus and M. mercenaria across all of the reef sites. Blue crabs and stone crabs were noted at all of the reef sites accounting for a mean contribution of 7.6±5.5% of the total observations. L. virgulata colonies were observed at the reef sites. The presence of the coral colonies contributed to the overall complexity of the systems. All of the corals appeared to be in good health following the extensive K. brevis blooms of 2005-2006. Table 2 lists the individual percent contributions of commonly occurring organisms. A complete species list by reef number and complex for the spring of 2006 is shown in Appendix 1.

Density by Reef Site and Complex

Reef number appears to influence the distribution of both finfish and invertebrate communities at both the Tampa and Sarasota Bay reef complexes. Figure 3 shows the density of organisms by reef site and complex for the spring of 2006. The 4 reef sites had the highest overall density of organisms. Organism density on the 4 reef sites ranged from 2.15 - 10.47

org/m3. Density measures on the 8 reef sites ranged from 1.48 - 5.48 org/m3. The 16 reef sites had a density ranges from 0.52 - 4.03 org/m3. The 32 reef sites had the lowest overall density range of all the reef sites from 0.55 - 3.19 org/m3. The lowest density measures were recorded at the Southeast Tampa Bay Reef Complex

Average density of organism per m3 of the reef sites for the combined reef complexes are shown in Figure 4. Overall organism density at the 4 reef sites was 6.40 ±4.25 org/m3 of surface area across the complexes. Mean 8 reef site density (4.49±3.0 org/m3) was 30% lower than the 4 reef systems. The mean 16 reef density was 3.16±2.6 org/m3 across the survey complexes was 30% lower than the 8 reef mean, and the 32 reef site organism density (2.03±1.5 org/m3) was 35% lower than the 16 reef sites.

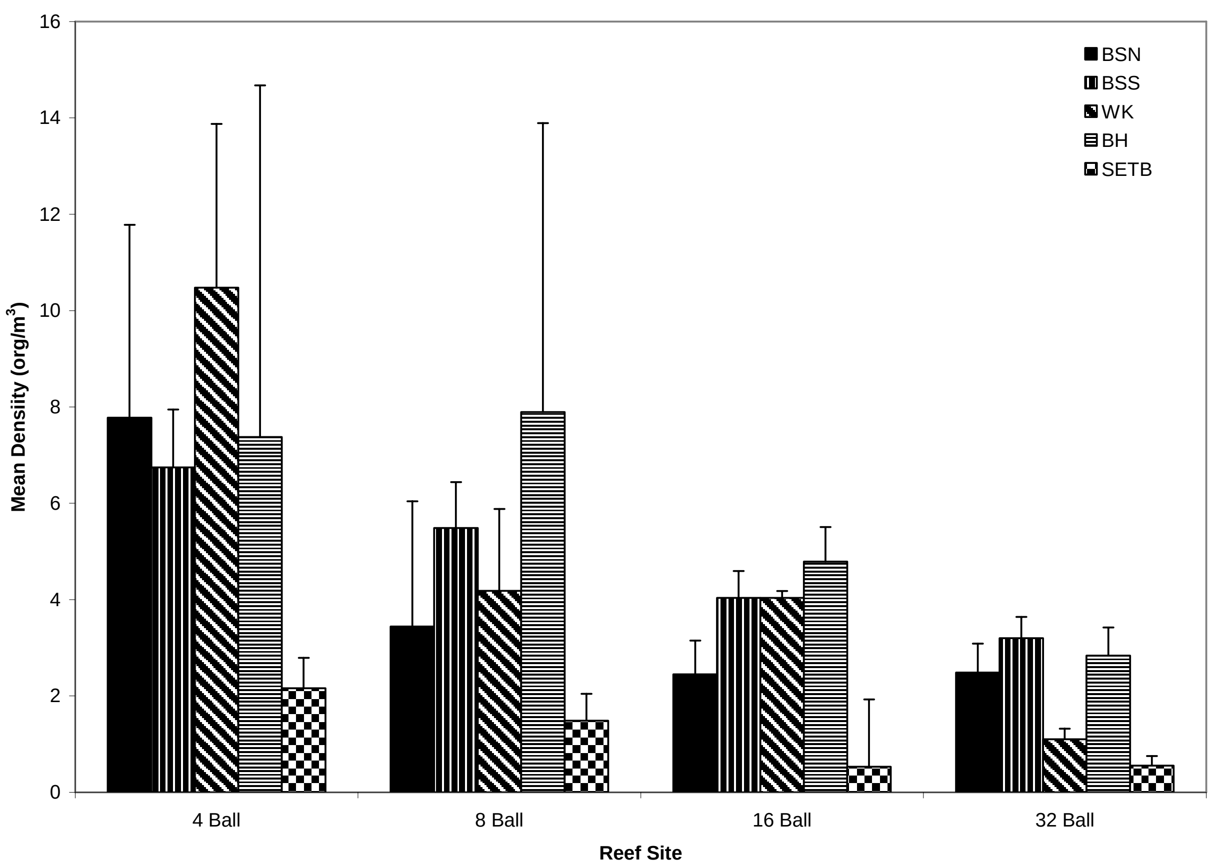

Figure 3 Mean density of macro invertebrate and finfish observed at Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes, Spring 2006.

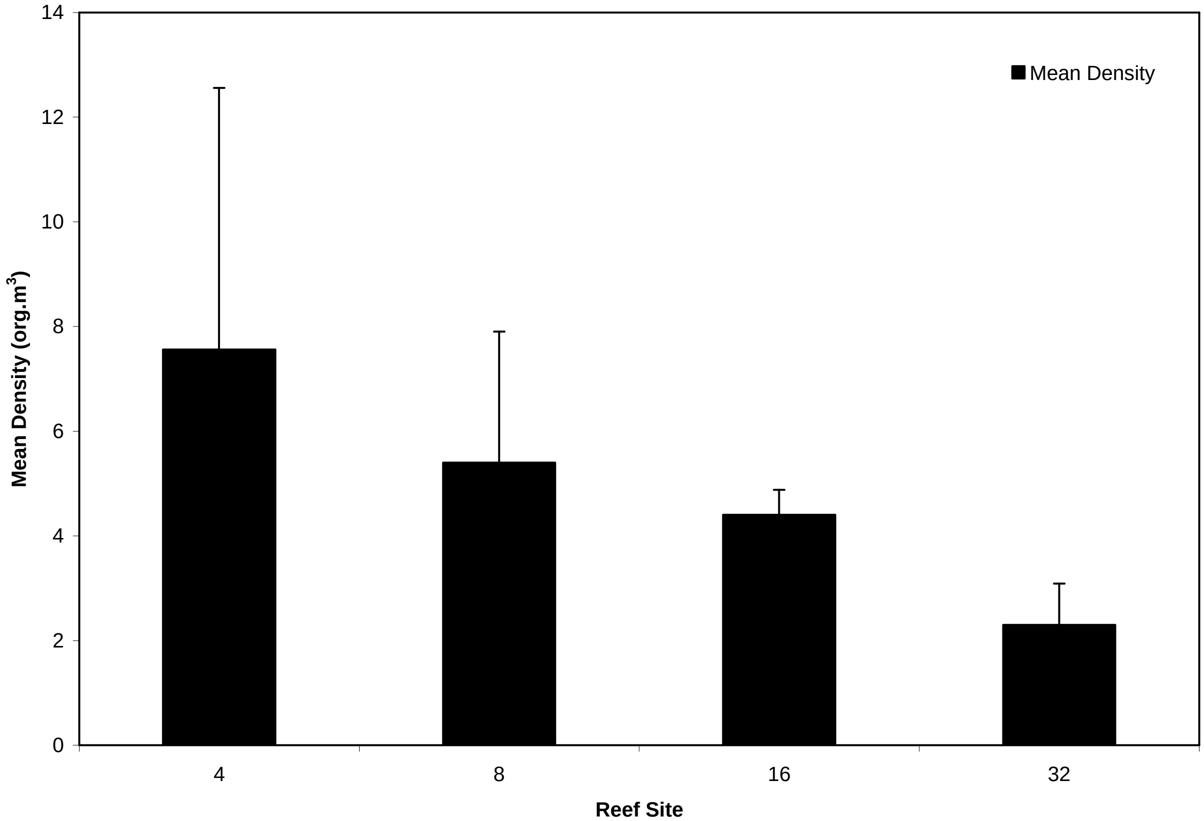

Figure 4 Mean density of organisms/m^3 by reef site across all reef complexes Spring 2006.

Spring 2006 Summary

The 5 reef complexes in Sarasota and Tampa Bay appear to be in recovery from the 2005-2006 K. brevis bloom and associated anoxic events recorded within the bay systems. Early attempts to survey the Sarasota Bay sites appear to have taken place prior to recovery initiation. Juvenile finfish populations were observed at all of the reef complexes. The presence of the juvenile finfish suggests that the finfish and macro invertebrate populations are in recovery following the event. Extensive soft coral and bryozoan colonies suggest that the attached macro invertebrate species were not completely lost during the bloom.

Organism observations, species number and size of the observed finfish suggest that these bay reef complexes provide solid juvenile finfish habitat during the late winter and early spring. Throughout the survey period the finfish and invertebrate populations recorded were what would generally be expected for these shallow water systems. The Tampa Bay complexes did show differences in total numbers of organisms, species and finfish size ranges. These differences could possibly be explained by the presence of an adjacent deepwater outlet to the Gulf of Mexico. The Tampa Bay shipping channel allows easier access to deep water systems than Sarasota Bay. This is evident in the presence of H. jaguana at both the Bulkheads and Southeast Tampa Bay reef complexes. The interchange with open gulf waters may have allowed for faster recovery of the systems, due to the tidal flushing and river outfall flushing.

Surface area for recruitment and retention of organism populations may relate to organism density. The 4 reef sites showed the highest overall density of all the reef sites within each of the complexes. The 32 reef system had more organisms and species, but lower overall density of organisms. This suggests that reef area may not be the primary limiting factor influencing recruitment. Increased reef area does provide increased area for recruitment, but likely also increases competition and predation rates at these sites. The differences could also be a result of the sampling strategies employed on the reef sites. Diver impact on the smaller reef sites would be reduced due to the amount of time each diver would be in the water over the reef sites resulting in greater avoidance. Smaller number of reef sites would have a shorter exposure to sampling efforts than the larger sites, thereby reducing diver avoidance.

Summer 2006

Surveys were initiated in mid August of 2006. Visibility constraints between August and the end of September were less than 5 liner feet restricting survey efforts. The bay waters in Sarasota Bay and Tampa Bay cleared in September, allowing the sampling operations to be completed. Sampling efforts were concluded on October 26, 2006. During the sampling run weather fronts disturbed the visibility on two occasions, resulting in loss work efforts and increased sampling time.

Site Abundance

Organism abundance during the summer sampling period reflected the same pattern observed in the spring. Increased numbers of reef units at a site resulted in increased organism observations. Figure 5 shows the effect of reef number on mean abundance of all finfish and invertebrates observed on each reef site within each of the reef complexes. Table 3 details individual site and complex observation totals and means. Increases in reef units resulted in an average increase of 56.93±4.43% observations across all of the complexes.

The Tampa Bay Reef complexes tended to have an overall higher abundance of organisms than Sarasota Bay Reef complexes. Mean total observations for the reef complexes were an average of 20% higher than at the Sarasota Bay complexes. Lower abundance at the Southeast Tampa Bay reef complex was likely due to the influence of the outfall of the Manatee River species distribution and visibility constraints. Increased reef area resulted in a mean increase of 43.07±4.5% in total recorded abundance. Table 3 shows mean site observation and observational % increase based on total reef area (# of reef units/site).

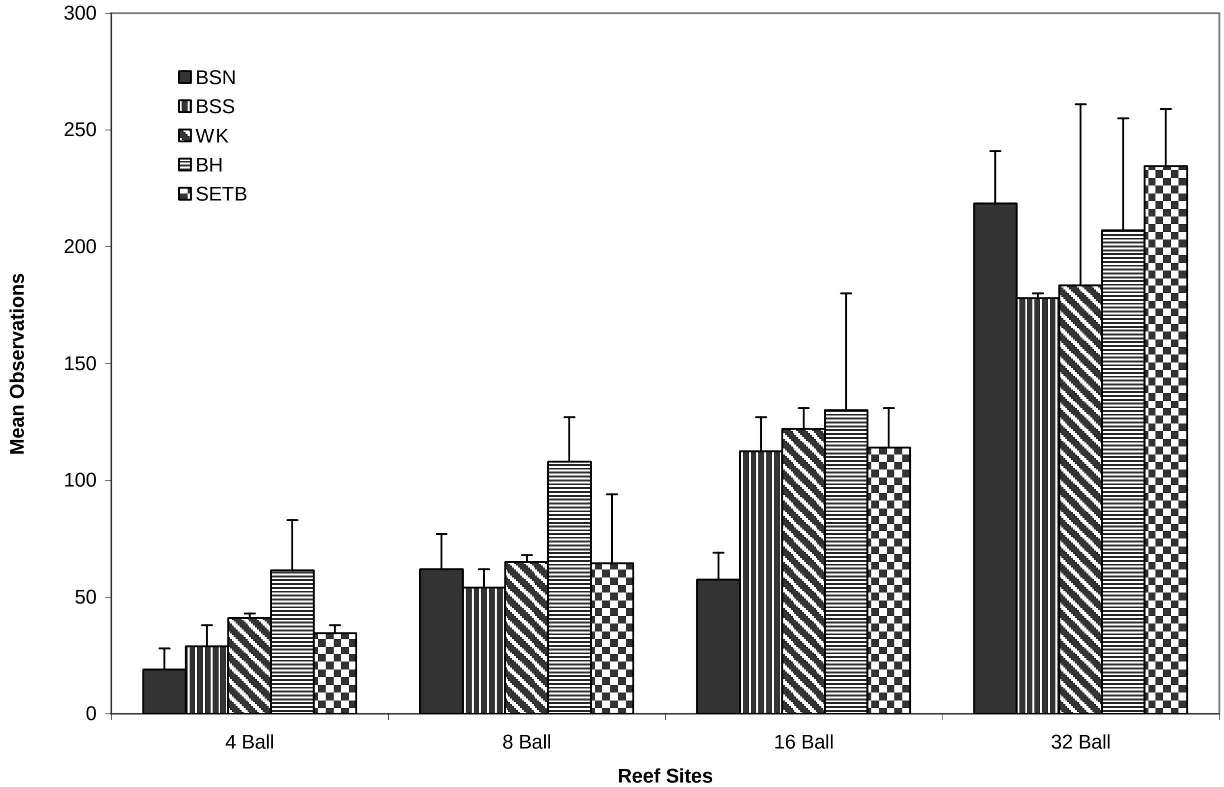

Figure 5 Mean number of finfish and invertebrates observed on the Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay reef complex and site Summer 2006.

Table 3 Mean site observation totals, Mean site totals across reef complexes mean % increase in observations by reef site for Bayshore South (BSS), Bayshore North (BSN), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes Summer 2006.

Mean Observations								
Reef #	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**Se**	**% increase**
4 Ball	19.00	29.00	41.00	61.50	34.50	37.00	2.50	
8 Ball	62.00	54.00	65.00	108.00	64.50	70.70	6.20	47.67
16 Ball	57.50	112.50	122.00	130.00	114.00	107.20	6.80	34.05
32 Ball	218.50	178.00	183.50	207.00	234.00	204.20	30.00	47.5
Mean								43.07
SE								4.51

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Species Richness

Species number species within each of the complexes declined from the spring sampling period. Species number ranged from 6.1±0.9 at the four reef sites to 9.4±0.4 at the 32 reef sites, reflecting the same general trend observed in the abundance estimates. Fish total length increase across all of the sites while species number and abundance declined. Total number of species at the Tampa Bay sites was relatively equal to the Sarasota Bay sites and complexes, suggesting that within these two systems there is a similar seasonal distribution of species. Table 4 details mean site species numbers and complex species total for summer 2006.

Table 4 Mean species totals by site and reef complex for Bayshore South (BSS), Bayshore North (BSN), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes Summer 2006.

Reef #	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**Se**
4 Ball	4.50	6.50	5.00	7.50	7.00	6.10	0.90
8 Ball	8.00	8.50	4.50	9.00	5.50	7.10	1.60
16 Ball	10.00	8.00	6.00	8.00	7.50	7.90	0.40
32 Ball	11.00	8.50	8.50	10.00	9.00	9.40	0.40
Mean	8.375	7.875	6	8.625	7.25		
SE	2.60	0.62	2.50	1.40	1.75		

Community Similarity

4 Reef Sites

Finfish and invertebrate community structures across the four reef complexes were relatively similar with 6 common species across the 4 reef sites. Mean percent contribution by the common species accounted for 45.86±2.62% of the observed finfish and invertebrates observed at the 4 reef sites. *L. rhomboides* dominated the reef sites within both Sarasota Bay and Tampa Bay 4 reef sites accounting for 9.91±5.8%, and 10.65±2.6% of the total observations. *M. microlepis* contributed 4.85±5.3% of the Sarasota Bay 4 reef sites, and 6.75±6.2 of the Tampa Bay sites. One juvenile *Epinephelus itajara,* goliath grouper, was observed at the Southeast Tampa Bay 4 reef sites. The large bait schools observed during the spring observations were not noted during the summer surveys.

The invertebrate community was dominated by *M. mercenaria* accounting for 21.3±1.3% of the recorded observation at the Sarasota Bay four reef sites, and 10.36±6.0% of the Tampa Bay. Blue crabs and stone crabs were noted at all of the reef sites accounting for a mean contribution of 16.93±4.0% of the observations. *L. virgulata* colonies were observed at all of the reef sites. The presence of the coral structures contributed to the overall complexity of the systems. Table 5 lists the individual percent contributions of commonly occurring organisms observed on the 4 reef sites.

Table 5 Reef individual percent contribution estimates for the summer 2006 reef sites at Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes.

4 Reef Sites

Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**
Epinephelus itajara	0	0	0	0	1.32		
Lagodon rhomboides	0	15.79	13.95	13.25	8.06	10.21	2.15
Leptogorgia virgulata	15.00	15.00	16.67	5.00	4.84	11.30	6.46
Lutjanus griseus	0.00	2.63	1.28	1.20	3.23	1.67	1.56
Menippe mercenaria	20.00	13.16	30.77	7.83	12.90	16.93	4.03
Mycteroperca microlepis	10.00	3.95	0.00	0.60	12.90	5.49	7.41
Total	45.00	50.53	62.67	27.89	43.25	45.87	2.62

8 Reef Sites

Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**
Archosargus probatocephalus	2.36	4.87	0	1.69	5.35	2.85	2.50
Epinephelus itajara	0.65	1.89	0.00	0.00	0.00	0.51	0.51
Lagodon rhomboides	1.95	11.40	2.94	0.00	0.00	3.26	3.26
Leptogorgia virgulata	2.13	11.57	2.21	9.22	12.63	7.55	5.08
Lutjanus griseus	11.04	7.82	5.22	0.56	0.00	4.93	4.93
Menippe mercenaria	67.93	42.74	37.50	17.71	36.96	40.57	3.61
Mycteroperca microlepis	4.55	10.52	0.00	10.28	38.12	12.69	25.42
Total	90.61	90.81	47.87	39.46	93.05	72.36	20.70

16 Reef Sites

Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**
Archosargus probatocephalus	5.07	4.56	0	2.5	6.26	3.68	2.58
Epinephelus itajara	1.09	0	0	0	0.76	0.37	0.39
Lagodon rhomboides	9.42	1.69	11.05	0.00	0.00	4.43	4.43
Leptogorgia virgulata	2.17	2.20	10.58	10.00	14.47	7.88	6.58
Lutjanus griseus	17.03	34.35	2.67	3.75	5.99	12.76	6.77
Menippe mercenaria	39.86	36.41	72.02	21.88	30.68	40.17	9.49
Mycteroperca microlepis	7.61	14.46	0.44	13.82	35.96	14.46	21.50
Total	82.25	93.67	96.76	51.94	94.12	83.75	10.37

32 Reef Sites

Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**
Archosargus probatocephalus	3.41	6.99	0	2.94	3.48	3.37	0.12
Epinephelus itajara	1.45	2.26	0.00	0.51	1.25	1.09	0.15
Haemulon plumieri	0	0	0	5.96	0	1.19	1.19
Lagodon rhomboides	3.01	6.70	10.82	0.00	0.24	4.15	3.92
Leptogorgia virgulata	0.00	1.42	13.09	10.24	27.66	10.48	17.18
Lutjanus griseus	34.62	23.07	7.07	5.81	1.58	14.43	12.86
Menippe mercenaria	39.79	42.18	64.36	17.31	34.68	39.67	4.99
Mycteroperca microlepis	11.41	9.52	1.80	38.24	26.03	17.40	8.63
Total	93.70	92.15	97.14	81.02	94.92	91.79	3.13

8 Reef Sites

Finfish and invertebrate communities at 8 reef sites had 7 common species across all of the complexes. Mean percent contributions by the common species accounted for 72.35±20.7% of the finfish and invertebrate communities. L. rhomboides, accounted for 5.43±3.5% of the observations at the Sarasota Bay sites. L. rhomboides were not observed at the Tampa Bay reef sites. H. aurolinatum populations observed in the spring surveys were absent or reduced in number from the summer surveys. L. griseus accounted for 8.02±5.1% of the Sarasota Bay sites, and 0.23% of the Tampa Bay 8 reef sites. M. microlepis accounted for 5.02±0.47% of the Sarasota Bay, and 24.2±13.9% of the Tampa Bay sites. Three juvenile E. itajara were observed on the Sarasota Bay sites (BSN 1 record, and BSS 2 records), accounting for 2.6% of the total observations.

The invertebrate community was dominated by M. mercenaria, which accounted for 40.6±3.61% of the observations. Stone crabs accounted for 49.4±18.5% of the Sarasota Bay surveys, and 27.3±9.6% of the Tampa Bay surveys. L. virgulata colonies were observed across all of the reef sites accounting for 5.0±3.2% of the total observations in Sarasota Bay, and 10.9±1.7% in Tampa Bay. The presence of these colonies contributed to the overall complexity of the complexes. Table 5 lists the individual percent contributions of commonly occurring organisms observed on the 8 reef sites.

16 Reef Sites

Finfish and invertebrate community structures across the 16 reef sites had 7 common species across all of the survey sites. Mean percent contribution by the common species accounted for 83.7±10.4% of the finfish and invertebrate communities. L. rhomboides, accounted for 7.4±3.7% of observations at the Sarasota Bay 16 reef sites. L, rhomboides were not observed at the Tampa Bay reef sites. M. microlepis contributions at the Bulkheads and Southeast Tampa Bay 16 reef sites accounted for 24.89±11.07% and 7.5±7.1% of the Sarasota Bay finfish observations. During this sampling period juvenile (140-220 mm TL) L. griseus were observed at all of the 16 reef sites. L griseus accounted for 12.7±6.77% of the observations. Three juvenile E. itajara were observed at the Bayshore North (2) and Southeast Tampa Bay (1) reef sites. Baitfish schools observed during the spring surveys were absent during the summer sampling period.

The invertebrate community was dominated by M. mercenaria accounting for 40.2±9.5% of the organisms across all of the reef complexes. Stone crabs accounted for 49.44 ±13.03% of the Sarasota Bay, and 26.3±4.4% of the Tampa Bay observations. L. virgulata colonies were observed at all of the reef sites. The coral colonies contributed overall complexity and reef surface area of the sites. Table 5 lists the individual percent contributions of commonly occurring organisms observed on the 16 reef sites.

32 Reef Sites

Finfish and invertebrate populations at the 32 reef sites had 8 common species. Mean percent contribution by the common species accounted for 91.8±3.13% of the total observations.. L. rhomboides accounted for 6.84±3.9% of the Sarasota Bay observations. L. rhomboides accounted for less than 1 % of the total observations at the Tampa Bay reef sites. M. microlepis contributions at the Bulkheads and Southeast Tampa Bay 32 reef sites accounted for 32.1±6.1% and 7.6±3.8% of the observations within Sarasota Bay. During this sampling period juvenile (140-220mm TL) L. griseus were observed at all of the 32 reef sites accounting for 14.5% of the observations. L. griseus observations at the Whale Key were lower than at the other reef complexes accounting for less than 1% of the total observations. Juvenile E. itajara were observed at all of the reef complexes except the Whale Key sites accounted for 1.1±0.2 % of the observations. Baitfish schools observed during the spring surveys were absent during the summer sampling period.

The invertebrate community was dominated by M. mercenaria accounting for 39.7±5.0% of the observations. Stone crab populations accounted for 48.8 ±15.58% of the Sarasota Bay, and 26.0±8.7% of the Tampa Bay observations. L. virgulata, colonies were observed at all of the reef sites. The coral colonies contributed to the overall complexity of the systems. Table 5 lists the individual percent contributions of common species observed on the 32 reef sites. A complete species list by reef number and complex for the summer of 2006 are shown in

Appendix 2.

Density by Reef Site and Complex

Reef number appears to influence the distribution of both finfish and invertebrate assemblages across both Tampa and Sarasota Bay reef complexes. Figure 6 shows the density of organisms by reef site and complex for the summer 2006. During this sampling period, organism density was similar across the entire study area with the highest densities recorded at the smaller reef sites. Density measures at Bulkheads reef complex showed a gradual decline from high density at the 4 reef sites to low densities at the 32 reef sites. This pattern reflects the spring density calculations. Organism densities recorded at the other reef complexes where variable with a general trend of lower organism density to reef area estimates. Overall the density measures ranged from 1.29 - 3.7 org/m3. Average density/m3 of surface area for each of the reef sites is shown in Figure 4. Overall the 4 reef sites had a mean density 3.33±0.22 organism/m3 of surface area across the three complexes. Average 8 reef densities were 3.12±0.78 org/m3 approximately 6.4% lower than the 4 reef systems. The 16 reef site average density was 2.42±0.15org/m3 approximately 27% lower than the 4 reef and 22% lower than the 8 reef systems. The 32 reef sites had and mean organism density of 2.3±0.78 org/m^3 on average 31% lower than the 4 reef, 26% lower than the 8 reef, and 5% lower than the 16 reef sites.

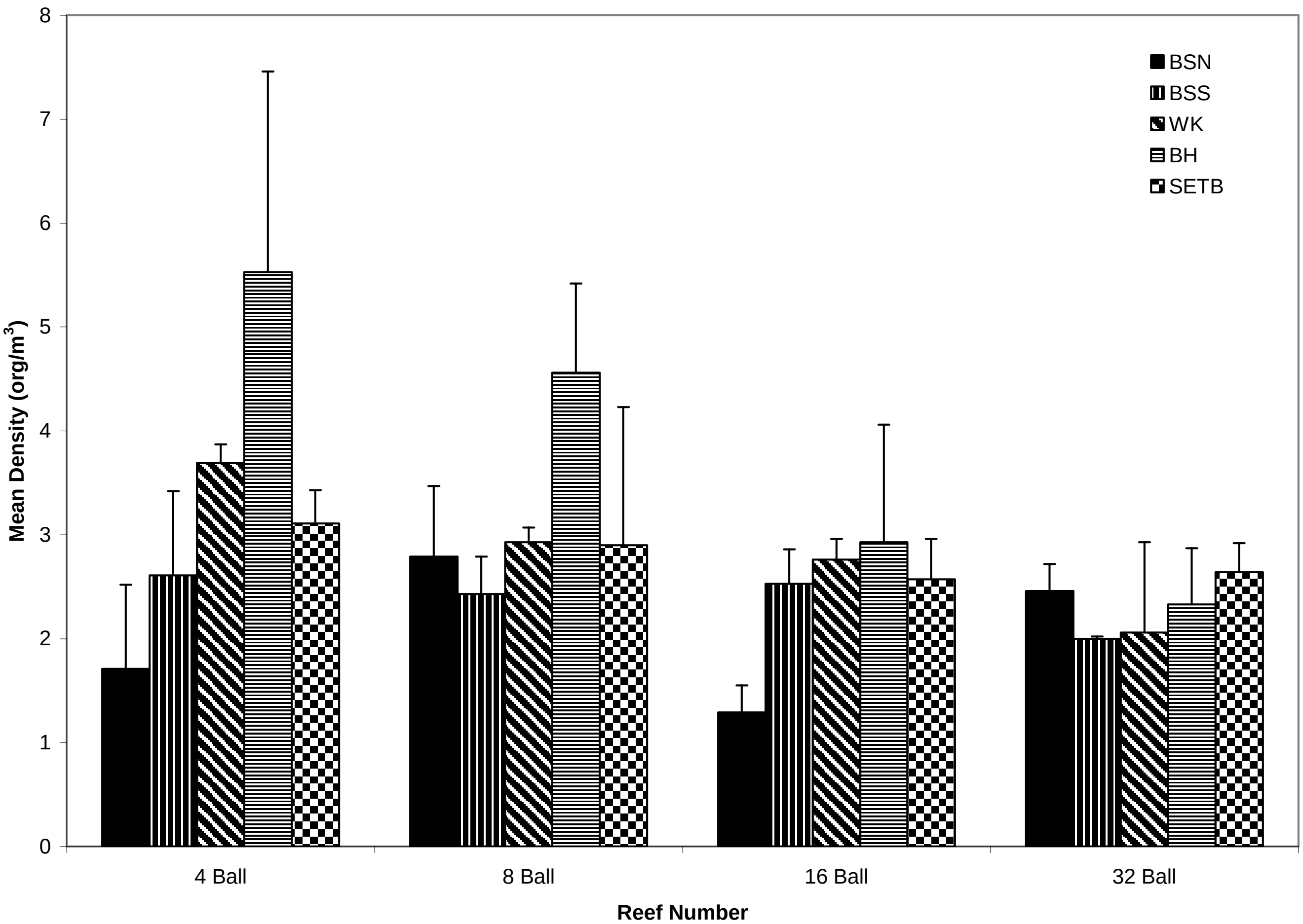

Figure 6 Mean density of macro invertebrate and finfish observed at Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes, Summer 2006.

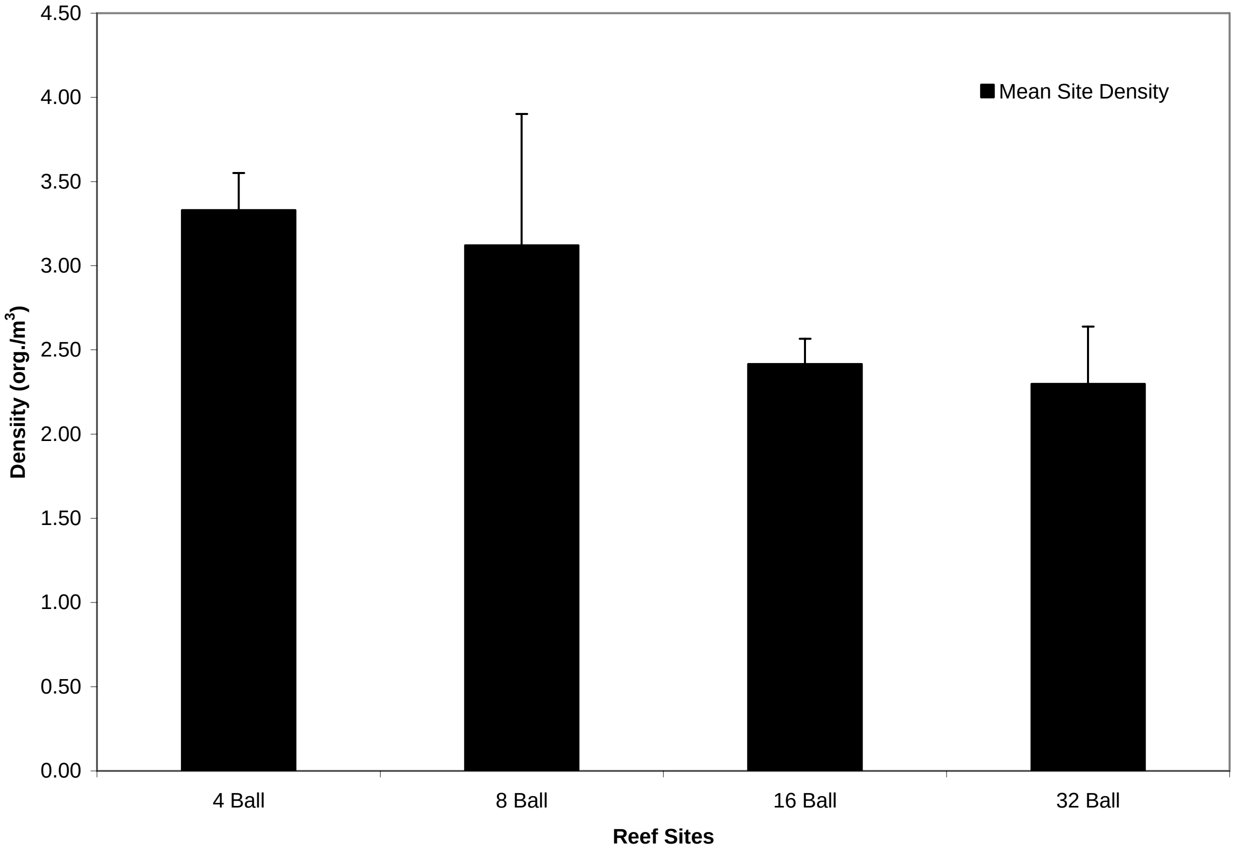

Figure 7 Mean density of organisms/m^3 by reef site summer 2006.

Summer 2006 Summary

Organism abundances declined to approximately 50% of the spring survey totals during the summer sampling period. The observed recovery Southeast Tampa Bay reef complex suggests that water movement across the reef complex could result alteration in species abundance and distribution. Seasonal water movements and visibility constraints are likely a factor in the population dynamics at the complex.

Divers noted that individual fish sizes increased at all of the sites with decreases in baitfish and juvenile finfish. Pinfish concentrations were highest at the 4 reef sites and made up to 15% of the total observed population. The smaller reef sites had defined decreases in observed gag grouper and grey snapper observations but higher numbers of prey fish. Increased reef area resulted in higher numbers of predator fish and lower abundances of *L. rhomboides*.. Goliath grouper were noted within each of the reef complexes and contributed between 3-5% of the total observations depending on the site. All of the goliath grouper were juveniles ranging between 200-300 mm TL. The reef sites maybe providing the species with good recruitment areas within the bay systems. All of the reef complexes appear to good transition habitats for finfish and invertebrate movement patterns from shallow to deep water habitats.

Invertebrate populations across all of the reef complexes were dominated by *M. mercenaria.* Stone crabs were the most frequently observed organism across all of the reef complexes, generally accounting for between 20-70% of the total observations. Blue crabs noted during the spring surveys were absent from all of the sites during the survey period. *L. virgulata* were observed within the reef complexes added to the overall complexity of the reef sites by increasing the settlement surface area of the reef sites.

Reef site density followed the same general pattern observed during the spring sampling period within the highest organism density observed at the smaller reef sites. In general the 4 reef sites had the highest overall density of organism/m^3. Summer density differences between the reef sites were lower due to the reduction in baitfish across all of the sites. Smaller reef sites tend to hold smaller numbers of organisms but higher densities. Increased surface area of the reef sites reduces the overall density. During the summer period the presence of large numbers of stone crabs on the site appeared to be habitat restricted. All of the available substrate level holes were occupied increasing the overall competition for space. The relative amount of space available for the organisms resulted in lower densities across all of the complexes.

Fall 2006

Surveys were initiated in mid December of 2006. Visibility constraints during late November restricted surveys until December 12, 2006. Sampling efforts were initiated on December 12 and were concluded on December 19, 2006. Fall samples were conducted over 7 days during the fall and reflect a better seasonal picture of the reef complexes than previous efforts.

Site Abundance

Observed organism abundance during the fall sampling period reflected the same general pattern observed during summer sampling period with declines in organism abundance and species number to approximately half of the observed summer totals. The steady declines suggests that these reef systems are a ecologically important transition zones for finfish and invertebrates species. As finfish and invertebrate species transition from inshore sea grass habitats the observational number appear to decline based on these seasonal movement patterns.

Abundance on the reef sites follows the same general patterns as noted during the previous sampling periods. Reef number appears to influence the overall number of organisms. The 4 reef sites had the lowest abundance with a mean of 21.6±6.2 observations. The 8 reef sites had similar abundances mean abundance of 26.1±12.0 of the total observations. Mean abundance on the sites increased approximately 17% over the 4 reef sites. Abundance estimates on the site were strongly skewed due to large numbers of observations at the Bulkhead reef complex. The Bulkheads reef site observations had approximately four times the number of observations as the other reef sites. The highest overall abundance measures was found on the Bulkhead reef complex 16 reef sites. The reef site had approximately 50 % more finfish and invertebrate than the other 16 reef sites, mean abundance at the sites was 51.0±17.0 organisms.

Observations at the 32 reef sites were higher at all of the reef sites with the exception of the Bulkhead s reef site. Bulkheads finfish and invertebrate observations were approximately 7% lower than at the other reef complexes. Mean observation at the 32 reef sites was 68.3±17.3 observations.

In general the Tampa Bay reef sites had the overall highest number of organisms across all of the reef complexes. Mean total observations for the reef complexes were an average of 20% higher than at the Sarasota Bay complexes. Increased reef area resulted in a mean increase of 30.39±9.7% in total recorded abundance. Increased abundances could be attributed to higher abundance of gag grouper and stone crabs within the reef complexes. Location appears to be the dominant factor in these increases. Direct access to the open gulf water allowed for an easy exchange between the reef complexes and deeper water habitats than the Sarasota Bay reef complexes. Figure 8 shows the observed abundances by reef site and complex for the fall of 2006 sampling period. Table 5 shows mean site observation and percent organism abundance increases based on total reef area (# of reef units/site).

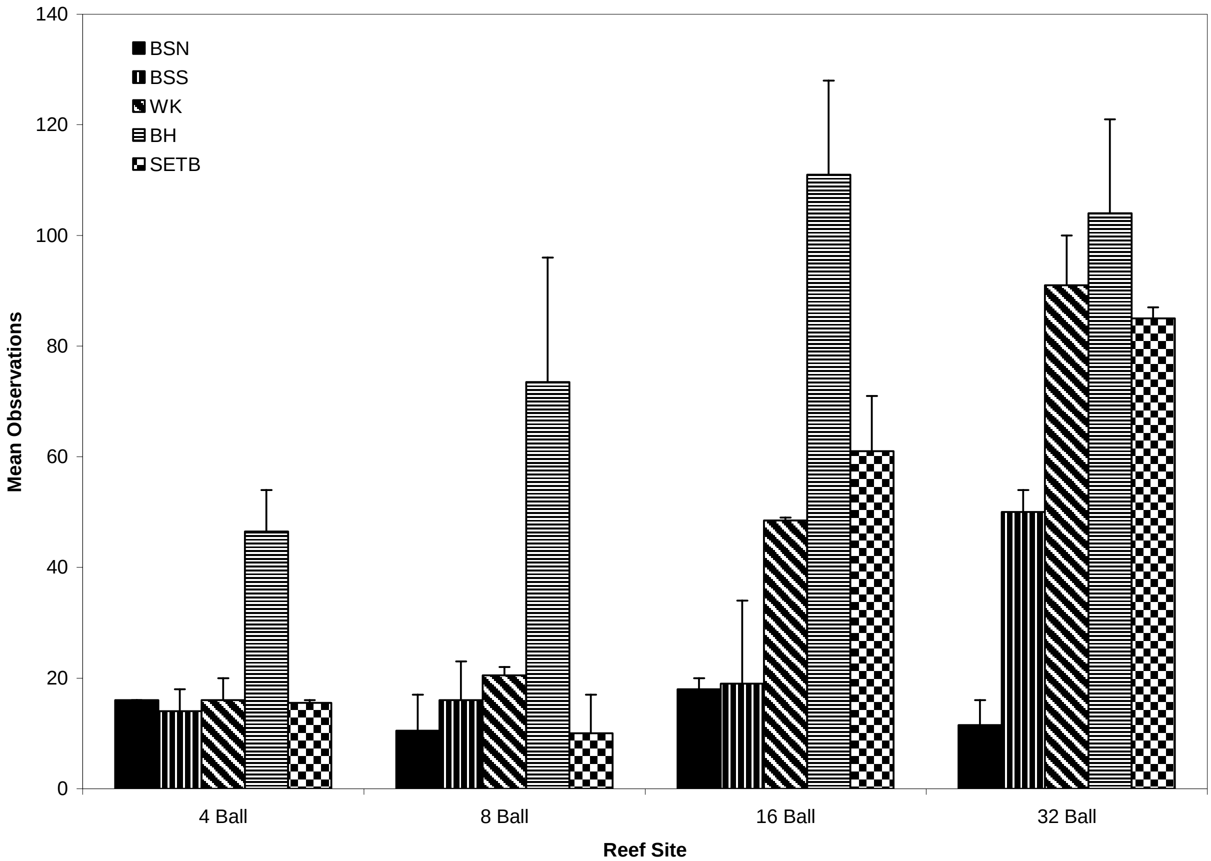

Figure 8 Mean number of finfish and invertebrate observed on the Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay reef sites for complex and reef sites fall 2006.

Table 5 Mean site observation totals, Mean site totals across reef complexes mean % increase in observations by reef site for Bayshore South (BSS), Bayshore North (BSN), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes Fall 2006.

Mean Observations								
Reef #	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**	**% Increase**
4 Ball	16.00	14.00	16.00	46.50	15.50	21.6	6.235784	
8 Ball	10.50	16.00	20.50	73.50	10.00	26.1	12.00562	17.24
16 Ball	18.00	19.00	48.50	111.00	61.00	51.5	17.05579	49.32
32 Ball	11.50	50.00	91.00	104.00	85.00	68.3	16.77766	24.60
Mean								**30.39**
SE								**9.70**

Species Richness

The number of species observed across all of the reef complexes continued to decline during the fall sampling period. Species number ranged from an average 3.8±0.85 at the four reef sites to 5.6±1.35 at the 16 reef sites. Species number at the 32 reef sites were lower at the 32 reef sites with an mean species number of 5.2±1.2. Species number at the 32 reef sites was 8 % lower than at the 16 reef sites. Mean species number at the 32 reef sites was 5.2±1.2 species. Reduced species number reflected the general trend observed in the summer surveys. The fall surveys were dominated by larger finfish and invertebrates across the reef complexes. Table 6 details mean site species numbers and complex species totals for the fall of 2006.

Table 6 Mean species totals by site and reef complex for Bayshore South (BSS), Bayshore North (BSN), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes fall 2006.

Mean Species #							
Reef #	BSN	BSS	WK	BH	SETB	Mean	SE
4 Ball	2.50	2.50	3.00	7.00	4.00	3.80	0.85
8 Ball	1.50	3.50	3.50	6.50	3.00	3.60	0.81
16 Ball	3.00	3.50	4.00	10.00	7.50	5.60	1.35
32 Ball	1.50	4.00	5.50	8.50	6.50	5.20	1.2
Total	2.13	3.38	4.00	8.00	5.25		
SE	0.38	0.31	0.54	0.79	1.10		

Species numbers were higher at the Tampa Bay sites than at any of the Sarasota Bay reef complexes. The Tampa Bay reef complexes contained the same general species as the Sarasota Bay complexes with additional species observed at the Tampa Bay complexes. Deepwater access and the size of the Tampa Bay watershed possibly allow easier access to these complexes sites by fish and invertebrates transitions from the Gulf of Mexico to Tampa Bay. Suggesting that reef location could account for the total number of organisms at these sites. Reduced species observations further suggest that the Sarasota Bay complexes are primarily transitional habitats for motile finfish and invertebrates moving out of the bay system into deeper waters of the gulf.

Community Similarity

Invertebrate species dominated the common observations across all of the reef complexes. None of the recorded finfish were common to all of the reef sites during this sampling period. The highest concentration of finfish observations were recorded at the Tampa Bay reef complexes. Low finfish observations resulted in an invertebrate based classification of the community. Table 7 shows the species percent contributions for all of the reef sites and complexes for the fall of 2006.

4 Reef Sites

L. virgulata colonies accounted for an average of 24.5±7.32% of the observations across all of the 4 reef sites. Increased colony formation on the reef sites added to the overall complexity of the reef sites resulting in increased surface area.. *M. mercenaria* accounted for an average of 46.5±12.1% of the 4 reef site observations. Stone crab observations in Sarasota Bay were on average 33% higher than in Tampa Bay four reef sites. *L. griseus* was the dominant finfish observed at the Sarasota Bay reef sites. *D. formosum* were the dominant finfish observed at the Tampa Bay sites. Common species percent contributions to the sites and individual species percent contributions are shown in Table 7.

Table 7 Species percent contribution estimates for the 4, 8, 16, and 32 unit reef sites located within the Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes Fall 2006.

							4 Reef
Species	BSN	BSS	WK	BH	SETB	Mean	SE
Diplectrum formosum	0	0	0	60.97	18.75	15.94	11.8
Leptogorgi Leptogorgia virgulata	6.25	45.00	36.67	11.40	23.33	24.5292	7.329433
Lutjanus grieseus	3.13	2.78	5.00	0.00	0.00	2.180556	0.967149
Menippe mercenaria	84.38	52.22	54.17	12.89	28.96	46.52279	12.17222
Total	93.75	100.00	95.83	85.26	71.04		
							8 Reef
Species	BSN	BSS	WK	BH	SETB	Mean	SE
Diplectrum formosum	0	0	0	20.59	14.71	7.058824	4.421558
Epinephelus itajara	0	0	2.63	0	0	0.526316	0.526316
Lagodon rhomboides	0	0	7.89	35.42	0	8.662281	6.861092
Leptogorgia virgulata	25.00	27.29	24.52	17.43	23.53	23.55565	1.650635
Menippe mercenaria	75.00	64.01	62.68	13.24	2.94	43.57311	14.73379
Mycteroperca microlepis	0	2.17	0.00	1.56	55.88	11.92375	10.99801
Total	100.00	93.48	97.73	88.24	97.06	95.30	39.19
							16 Reef
Species	BSN	BSS	WK	BH	SETB	Mean	SE
Archosargus probatocephalus	0	0	0	7.45	2.11	1.911897	1.442942
Epinephelus itajara	2.38	0.00	0	0	0	0.47619	0.47619
Leptogorgia virgulata	2.38	21.32	20.60	21.53	35.65	20.29827	5.289006
Lutjanus grieseus	0	12.50	2.04	0	0	2.908163	2.430307
Menippe mercenaria	84.97	38.24	73.21	15.43	15.29	45.4279	14.48379
Mycteroperca microlepis	0.00	0.00	0.00	12.31	41.19	10.69982	7.9866
Total	89.73	72.06	95.85	56.72	94.24		
							32 Reef
Species	BSN	BSS	WK	BH	SETB	Mean	SE
Archosargus probatocephalus	18.75	0	0	1.24	2.41	4.479862	3.595552
Diplectrum formosum	0	1.09	0	0.41	0	0.300036	0.212382
Epinephelus itajara	0	0	1.00	0.41	0	0.282645	0.196381
Lagodon rhomboides	0	0	18.50	0.83	0	3.865289	3.662176
Leptogorgia virgulata	0	5.27	10.10	28.13	32.14	15.12688	6.362045
Menippe mercenaria	81.25	76.77	66.46	23.43	15.93	52.76858	13.77093
Mycteroperca microlepis	0	0.93	0.00	33.54	31.21	13.13422	7.864481
Total	100.00	84.06	96.06	87.98	81.69	89.96	35.66

8 Reef Sites

L. virgulata colonies accounted for a mean percent contribution of 23.6±1.65% of the observed population at the 8 reef sites. Soft coral growth on all of the reef sites has resulted in a more dynamic reef sites. Increased surface area on the sites may provide greater recruitment and retention potential for the reef sites. Stone crabs were the dominant species across all of the 8 reef sites accounting for mean contributions of 43.6±14.7%of the observations. Stone crab percent contribution was 88% higher in Sarasota Bay than at the Tampa Bay sites. Two *E. itajara* were observed on the 8 reef sites of the Whale Key reef complex accounting for 2.6% of the sites total observation. Common species percent contributions to the sites and individual species percent contributions are shown in Table 7.

16 Reef Sites

Finfish observations were higher on the larger reef sites accounting a mean total 16.1% of the observations. Sub-adult to adult fish dominated the community at the larger sites. The largest concentrations of fish were observed on the Tampa Bay complexes. Sarasota finfish observations accounted for approximately 5% of the total observations, while the Tampa Bay sites accounted for approximately 11%. *E. itajara* accounted for 2.38% of the total observations at the Bayshore North 16 reef sites.

Invertebrates dominated the observations within the Sarasota and Tampa Bay reef complexes. *L. virgulata* colonies accounted for 20.2±5.3% of the total observation across the 16 reef sites. The Tampa bay reef sites had approximately 50% more colonies than the Sarasota Bay Reef sites. Increased soft coral growth could be a contributing factor in the distribution of finfish on these sites. Stone crabs dominated all of the reef sites. Stone crabs accounted for a mean percent contribution of 45.4±14.5% observed species observations. Stone crab observations were 77% higher at the Sarasota Bay sites. Common species percent contributions to the sites and individual species percent contributions are shown in Table 7.

32 Reef Sites

The largest concentrations of finfish species were recorded on the 32 reef sites. Finfish contributed a mean percent contribution of 22.0% of the total observations. Tampa Bay 32 reef sites had the highest concentration of finfish species. Finfish contributions within these systems were 43% higher than observations in Sarasota Bay. The finfish community was dominated by sub-adult to adult *M. microlepis* on the Bulkheads and Southeast Tampa Bay reef sites. *L. rhomboides* contributed 18.5% of the total observations at the Whale Key 32 Reef sites. Pinfish (adult) observations were recorded on sandy areas surrounding the reef sites but not on the actual reef sites. *Archosargus probatocephalus* accounted for 18.75% of the total observations on the Bayshore North Sites. High percent contribution estimates on the sites were a result of lower overall species observations and the dominance of stone crab assemblages on the sites. *E. itajara* accounted for 1% of the Whale Key 32 reef sites and 0.4% of the Bulkheads 32 reef site observations

Invertebrates dominated observations within the Sarasota and Tampa Bay reef 32 reef systems. *L. virgulata* colonies accounted for 15.1±6.4% of the observations on the reef sites. Soft coral colonies on the Tamps Bay reef sites accounted for 87% more observations than on the Sarasota Bay sites. Reductions in the overall site complexity on the Sarasota Bay site could contribute to the lower finfish observations on the Sarasota Bay reef sites. Stone crabs were the dominant species observed on all of the 32 reef sites accounting for a mean percent contribution of 52.7±13.8% observed species. The Sarasota Bay 32 reef sites had an average of 75% more stone crab observations than the Tampa Bay reef sites. Common species percent contributions to the sites and individual species percent contributions are shown in Table 7. A complete species list by reef number and complex for the fall of 2006 is shown in Appendix 3.

Density by Reef Site and Complex

Density followed the same general pattern of the summer sampling with higher organism density on the smaller reef sites. Reef surface appears to affect the organism density on all of the reed complexes with increased surface area resulting in overall lower organism density. Density calculations on the 4 reef site were on average 1.95±0.56 org/m^3 on average 17% higher than at the 8 reef sites. Average organism density at the 8 reef sites was 1.17±0.54 org/m^3 approximately 5 % higher than at the 16 reef sites. Average density on the 16 reef sites was 1.12±0.38 org/m^3 approximately 31% higher at the 16 reef sites than at the 32 Reef sites. Organism density on the 32 reef sites was the lowest of all the reef sites at 0.77±0.18 org/m^3 within both the bays systems. Figure 9 shows the observed density by reef site and complex for the fall of 2006 survey period. Figure 10 shows the mean observed density by site for all of the complexes.

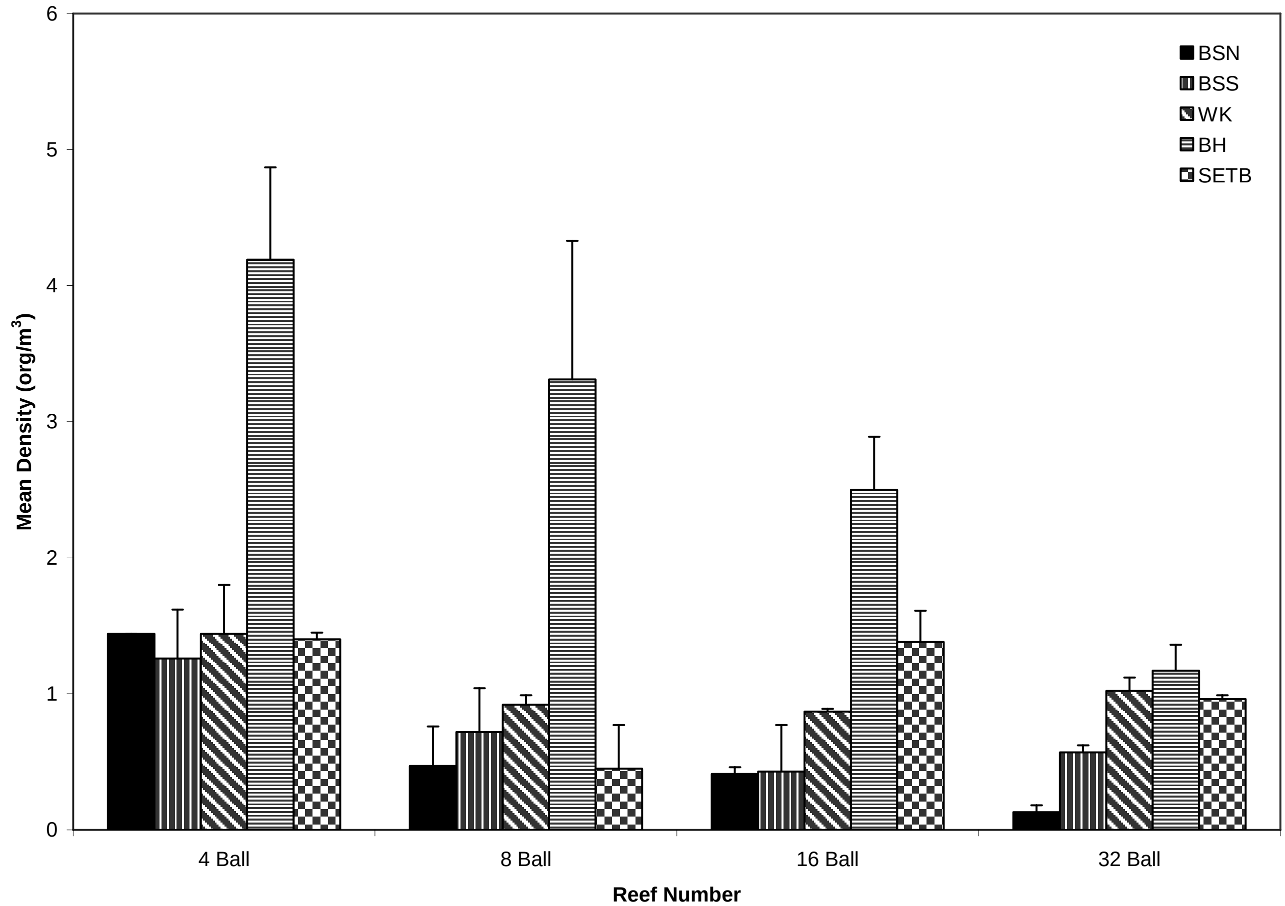

Figure 9 Mean density of macro invertebrate and finfish observed at Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes, Fall 2006.

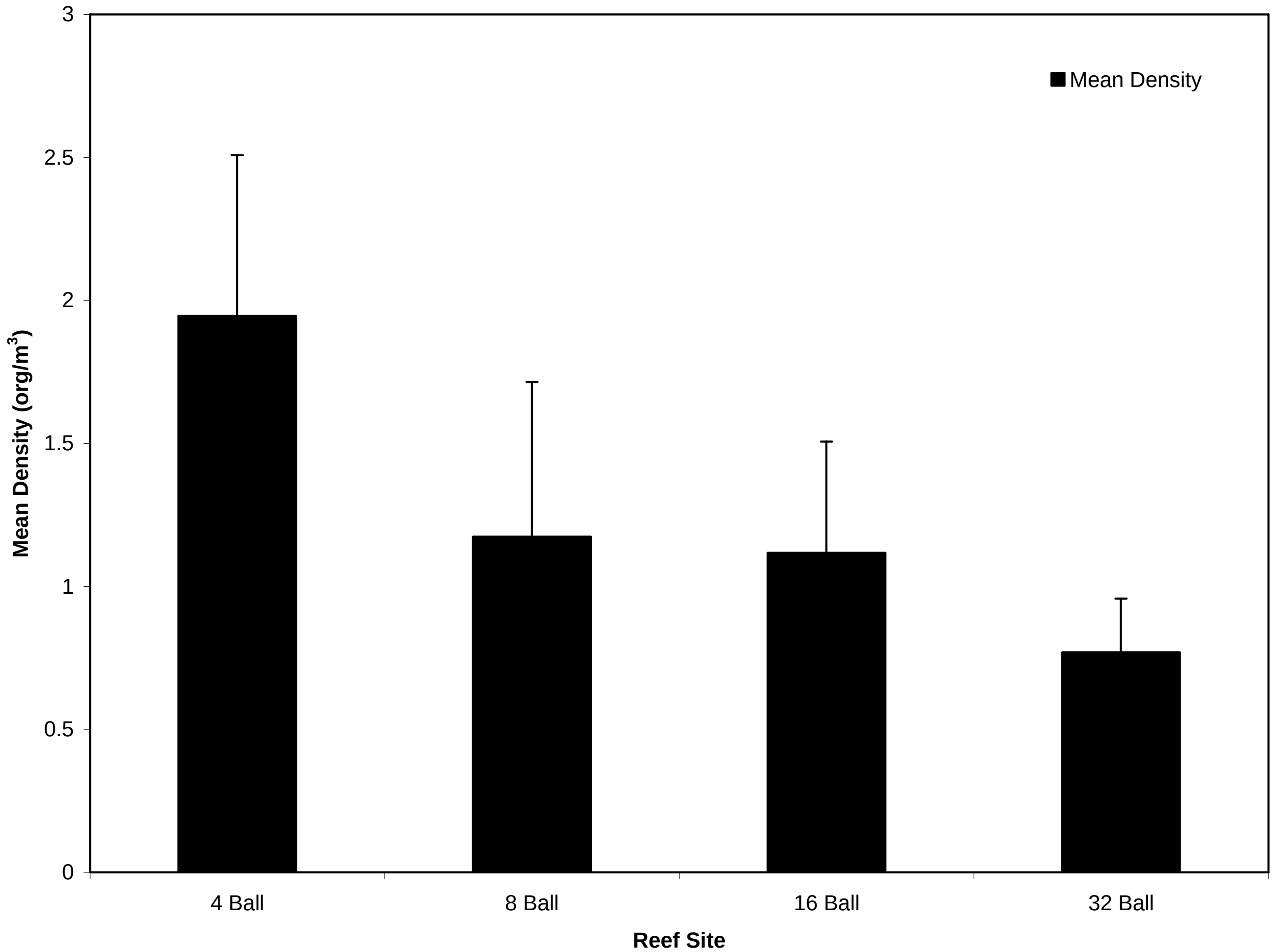

Figure 10 Mean density of organisms/m^3 by reef site Fall 2006.

Fall 2006 Summary

Survey totals for the fall sampling period followed the same general pattern as observed in the previous seasons. Organism abundance and species number declined during this sampling period in to previous sampling efforts. In general there was approximately a 50% reduction in the total number of organisms and species observed across all of the reef complexes. Finfish population were largely replaced by with invertebrate assemblages except at the 16 and 32 reef sites within Tampa Bay..

Tampa Bay finfish populations at the16 and 32 reef sites were accounted for substantial aggregations of M. microlepis. The presence of these fish could possibly explain the reduction in baitfish and other juvenile finfish observations within the sites. Finfish observations within the other reef complexes were typically sub- adults assemblages (except E. itajara). Juvenile goliath grouper appear to be establishing a defined presence within all of the reef complexes. All of the 8, 16, and 32 reef sites had a resident E. itajara. All of the goliath grouper were oriented to the internal area of the reef ball units and not moving about the reef sites. This orientation pattern suggests that goliath grouper recruitment to these sites maybe size dependant. Once the fish exceed the size capacity of the structure they move out to deeper water habitats.

Invertebrate species dominated all of the reef complexes. Stone crabs contributed the largest single group proportion to the species percent contribution estimates. The group occupied all of the available internal reef unit habitat and most of the external reef habitats across all of the reef complexes. Stone crab populations within the Sarasota Bay reef complexes exceed the Tampa Bay reef site from by 50-75%. This could possibly be explained by the presence of nearby sea grass meadows and reduced commercial and recreational fishing pressure at the sites. Both Tampa Bay reef sites had adjacent crab trap sets and are relatively well known to commercial and recreational fishermen.

Decreased densities were noted across all of the reef complexes when compared to previous surveys. Invertebrate dominance across all of the reef complexes and a reduced finfish population suggests reef density was largely dependant on the community structure. Settlement habitat on the site appears to be a retention limiting factor within these reef complexes. Immigration to the site is limited to space availability. Finfish populations observed on the sites are largely mid-water above the reef substrates. A reduction in mid-water finfish lowers the overall density of the sites. Organism density during this sampling period appears to be dependant on stone crab settlement. Reduced density could also be a general reflection of the seasonal movement patterns by grouper and snapper species. The summer sampling period recorded the transition from the inshore juvenile habitats to offshore sub-adult to adult habitats.

Winter 2007

Surveys were initiated in early March of 2007. Visibility constraints during January and February restricted surveys. Visibility ranged from 2-3 linear feet across all of the reef complexes during this time period. Several attempts to conduct the surveys were scrubbed due to visibility. Sampling efforts were initiated on March 7 and were concluded on April 12, 2007.

Site Abundance

Organism abundance during the winter sampling period was dominated by larval finfish. Finfish size ranges were between 20-40mm and tended to be oriented to drift algal mats trapped within reef site. Organism abundances increased, following low observation totals recorded during fall surveys. Invertebrate abundances decline with a recorded increase in finfish observations on the sites.

The four reef sites had the lowest overall mean abundance with 41.13±8.72 observations. The Sarasota Bay reef complexes had on average 60% more observations than the Tampa Bay complexes. The 8 reef sites had mean abundance of 66.6±33.8 organisms. Abundance estimates at the 8 reef sites were 38% higher than the 4 reef sites. Tampa Bay organism abundances were on average 58% lower than the Sarasota Bay abundance estimates. Observation abundance at the 16 reef sites were on average 43% higher than the 8 reef sites with mean abundance estimates of 116.7±54.1 observations. Sarasota bay sites were on average 83% higher than the Tampa Bay 16 reef sites. The 32 reef sites had a mean abundance of 260±120.5 observations across all of the reef complexes. Mean abundance on the sites was 55% higher than the 16 reef sites. Observed abundance at the Sarasota Bay sites was on average 85% higher than the Tampa Bay 32 reef sites. Table 8 shows mean site observation and observational % increase based on total reef area (# of reef units/site).

Sarasota Bay reef sites had the highest abundance estimates within the study complexes. complexes. The increased number could be accounted for by high numbers of larval fish. Larval-sub-juvenile fish dominated the sites. Sub-adult and adult assemblages in Tampa Bay suggest that the species assemblages and abundance estimate are driven by geographic location of the complexes. Direct access to the open gulf water allowed for an easier exchange between the reef complexes and deeper water habitats than the Sarasota Bay reef complexes. Figure 11 shows the observed abundances by reef site and complex for the winter of 2007.

Table 8 Mean site observation totals, Mean site totals across reef complexes mean % increase in observations by reef site for Bayshore South (BSS), Bayshore North (BSN), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes Winter 2007.

Mean Observations								
Reef #	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**	**% Increase**
4 Ball	57.50	60.00	42.00	34.15	12.00	41.13	8.72	
8 Ball	37.50	199.00	55.00	31.50	10.00	66.60	33.87	38.24
16 Ball	94.50	330.00	69.00	47.50	42.50	116.70	54.11	42.93
32 Ball	678.00	383.50	119.50	65.00	54.00	260.00	120.45	55.12
Mean								**45.43**
SE								**5.03**

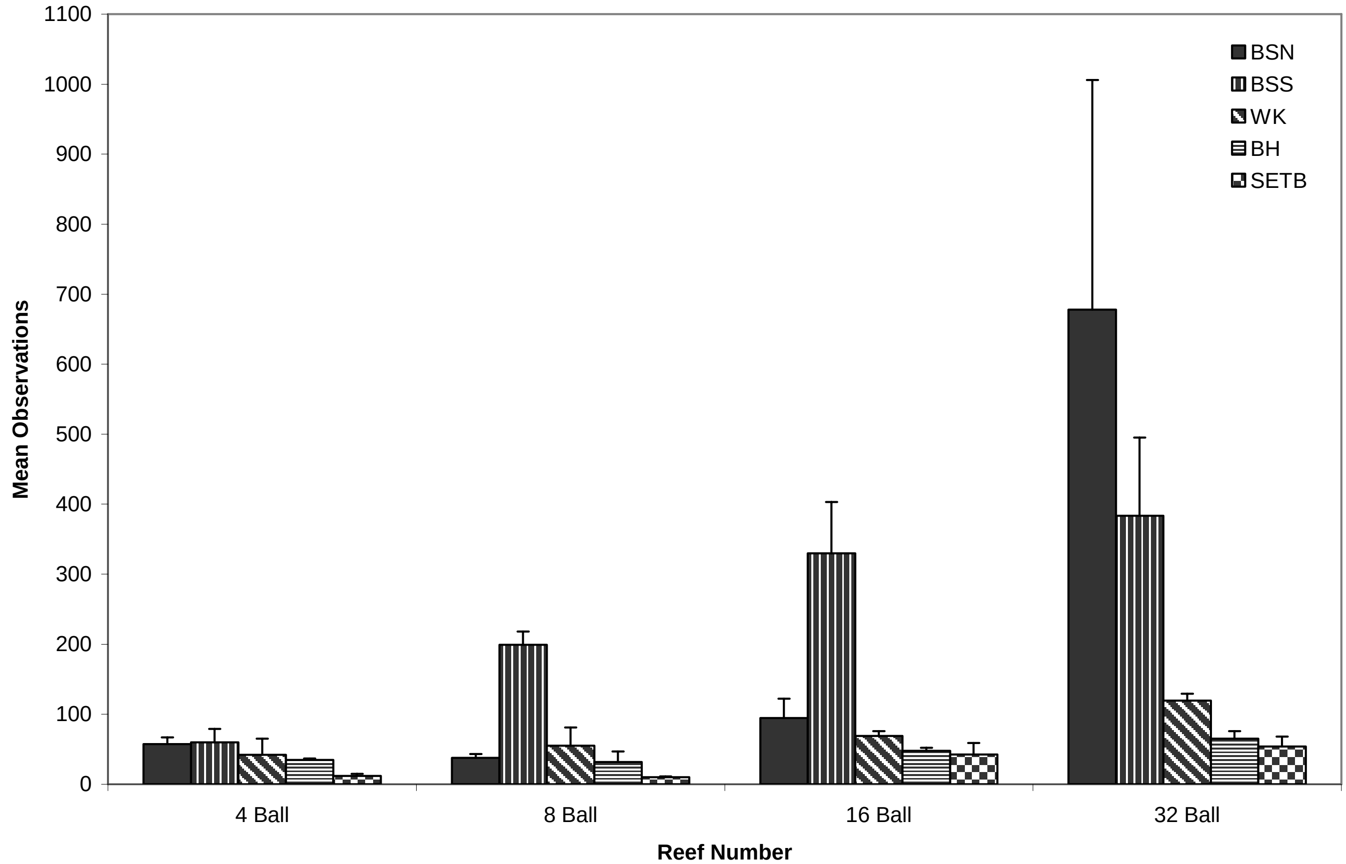

Figure 11 Mean number of finfish and invertebrate observed on the Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay Reef Sites for complex and reef sites winter 2007.

Species Richness

Species observations during the winter sampling period increased across all of the reef complexes. Species number ranged from a mean of 4.8±0.81 species to 6.2±0.60 ± at the 16 reef sites. Species numbers at the 32 reef sites were on average 6.1±0.84 species. In general the 16 and 32 reef sites had 25% more species than either the 4 or 8 reef sites across all of the reef complexes. Observed differences and mean species abundance for the sites and complexes are shown in Table 9.

Table 9 Mean species totals by site and reef complex for Bayshore South (BSS), Bayshore North (BSN), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes, winter 2007.

Mean Species #							
Reef #	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**
4 Ball	5.50	6.50	4.00	6.00	2.00	4.80	0.82
8 Ball	3.00	5.50	6.50	5.00	2.50	4.50	0.76
16 Ball	5.50	8.00	6.00	7.00	4.50	6.20	0.60
32 Ball	8.00	7.00	6.50	6.00	3.00	6.10	0.84

Community Similarity

The finfish and invertebrate communities were relatively evenly distributed across all of the reef complexes during the winter 2007. The highest concentration of finfish observations were recorded within the Sarasota Bay reef complexes. Numeric differences were largely due to the high numbers of juvenile pinfish. This pattern was not observed at the Tampa Bay sites. Invertebrate contributions declined from the fall 2006 sampling period across all of the complexes. Organism distributions resemble the spring 2006 survey reports. Table 9 shows the species percent contributions for all of the reef sites and complexes for the winter of 2007.

4 Reef Sites

Juvenile L. rhomboides accounted for a mean of 69.58±6.1 of the observations across all of the 4 reef sites within Sarasota Bay. Pinfish observed at the Tampa Bay reef complexes accounted for less than 1% of the total observations. All of the pinfish observed within the Tampa Bay reef systems were adult fish and ranged in 110-120 mm TL. Pinfish were not observed at the Southeast Tampa complex. Lutjanus griseus accounted for a mean of 1.72±0.81% observed population within the Sarasota Bay 4 reef sites. Grey snapper were not observed on the Tampa Bay reef sites. M. microlepis accounted for 16.67% of the Southeast Tampa Bay reef sites however were not observed at any of the other 4 reef sites.

Invertebrate community structure was dominated by L. virgulata across all of the 4 reef sites. Soft coral colonies accounted for an average of 16.1±7.5% of the observed species. Colony formation on the reef sites adds to the overall complexity of the reef sites resulting in increased surface area for retention of larval finfish and invertebrates. M. mercenaria accounted for an average of 6.15±2.3% of the 4 reef site observation. Stone crabs were not observed on the Southeast Tampa Bay 4 reef sites. Bulkheads stone crabs accounted for 1.35% of the total site observations. Stone crab populations in Sarasota Bay accounted for an average of 9.8±1.4%. C. sapidus accounted for an average of 5.14±2.5% of the Sarasota Bay 4 reef sites. Blue crabs were not observed on the Tampa Bay 4 reef sites. Table 10 lists the percent contribution estimates for the 4 reef site observations.

Table 10 Species percent contribution estimates for the 4, 8, 16, and 32 unit reef sites located within the Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes winter 2007.

4 Reef

Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**
Callinectes sapidus	5.21	2.53	7.69	0.00	0.00	3.086457	1.501274
Lagodon rhomboides	75.72	59.25	73.77	1.35	0.00	42.01568	17.11651
Leptogorgia virgulata	2.08	14.09	3.08	17.91	43.33	16.09857	7.466612
Lutjanus griseus	2.53	0.00	2.63	0.00	0.00	1.033157	0.632864
Menippe mercenaria	8.05	11.16	10.20	1.35	0.00	6.153623	2.302211
Mycteroperca microlepis	0.00	0.00	0.00	0.00	16.67	3.333333	3.333333
Total	93.59	87.03	97.37	20.61	60.00		

8 Reef

Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**
Callinectes sapidus	0	0.56	23.31	0	0	4.772669	4.635029
Haemulon aurolineatum	0	3.90	1.72	0	0	1.124644	0.769785
Lagodon rhomboides	57.19	85.42	44.53	0.00	0.00	37.42795	16.65181
Leptogorgia virgulata	7.78	3.95	8.88	28.39	36.36	17.07088	6.426988
Menippe mercenaria	35.03	3.61	0.00	6.25	0.00	8.978036	6.618582
Mycteroperca microlepis	0.00	0.23	0.00	0.00	37.88	7.621629	7.56442
Total	100.00	97.66	78.44	34.64	74.24		

16 Reef

Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**
Callinectes sapidus	0.75	0.64	17.34	0.00	0.00	3.744444	3.402128
Lagodon rhomboides	73.70	78.75	62.31	3.49	0.00	43.6497	17.32267
Leptogorgia virgulata	1.23	0.96	9.44	35.60	52.64	19.97376	10.33236
Lutjanus griseus	1.64	0.78	3.29	0.00	0.00	1.141406	0.616428
Menippe mercenaria	14.93	10.33	3.08	1.16	1.92	6.282851	2.706814
Mycteroperca microlepis	0.00	0.12	0.00	11.58	29.11	8.162833	5.693148
Total	92.24	91.57	95.46	51.83	83.67		

32 Reef

Species	**BSN**	**BSS**	**WK**	**BH**	**SETB**	**Mean**	**SE**
Callinectes sapidus	0.29	0.30	23.73	0.00	0.00	4.864594	4.716315
Lagodon rhomboides	94.95	76.82	56.43	13.16	0.00	48.27183	18.19816
Leptogorgia virgulata	0	0.81	9.08	46.42	63.68	23.9959	13.064
Lutjanus griseus	0.14	0.20	3.76	0.00	0.00	0.820209	0.735061
Menippe mercenaria	1.78	8.30	2.00	1.32	0.00	2.678812	1.446735
Mycteroperca microlepis	0.00	0.55	0.00	31.19	31.84	12.71576	7.675558
Synodus foetens	0.10	0.55	1.36	0.00	0.00	0.402902	0.260946
Total	97.26	87.53	96.36	92.08	95.51		

8 Reef Sites

Juvenile L. rhomboides accounted for a mean of 62.38±23.0% of the observations across all of the 8 reef sites within Sarasota Bay. Pinfish were not observed on the Tampa Bay reef sites. M. microlepis accounted for 37.88% of the Southeast Tampa Bay 8 reef sites. All gag grouper observed on the site were sub adult to adults (TL=200+mm). Gag grouper contributions at the Sarasota Reef complexes accounted for less than 1% of the total observation

Invertebrate community structure was dominated by L. virgulata across all of the reef sites. Soft coral colonies accounted for an average of 17.07±6.4% of the observed species. Colony formation on the reef sites added to the overall complexity of the sites resulting in increased surface area of the sites. M. mercenaria accounted for an average of 8.97±6.6% of the 8 reef site observations. Stone crabs were not observed on the Southeast Tampa Bay 8 reef sites. Bulkheads stone crab observations accounted for 6.25% of the observations. Stone crab populations had a mean contribution of 12.88±9.27% at the Bayshore North and South 8 reef sites, but were not observed on the Whale Key sites. C. sapidus accounted for an average of 7.95±7.39% of the Sarasota Bay 8 reef sites. Blue crabs were the dominant invertebrate at the Whale Key sites. The crabs were generally found in breeding pairs. Blue crabs were not recorded at the Tampa Bay 8 reef sites. Table 10 lists the percent contribution estimates for the 8 reef site observations.

16 Reef Sites

Juvenile L. rhomboides accounted for a mean of 71.6±4.13% of the observations across all of the 16 reef sites within Sarasota Bay. Pinfish accounted for 3.5% of the observations at the Bulkheads 16 reef sites (adult fish 100-120 mm TL), however no pinfish were observed at the Southeast Tampa Bay sites. M. microlepis accounted for an average of 20.4% of the Tampa

Bay 16 reef sites. Gag grouper accounted for a total of 29.1% of the recorded observations at the Southeast Tampa Bay reef sites. All gag grouper observed on the site were sub adult to adults (TL=200 - 450 mm). Gag grouper contributions at the Sarasota Reef complexes accounted for less than 1% of the total observation.

Invertebrate community structure was dominated by L. virgulata within the Tampa Bay 16 reef sites. Soft coral colonies accounted for an average of 32.38±3.9% of the observed species within the sites. Coral colonies at the Sarasota Bay sites accounted for less than 2 % of the total observations. Soft coral formation on the reef sites adds to the overall complexity of the reef sites, resulting in increased surface area for retention of larval finfish and invertebrates.

M. mercenaria accounted for an average of 9.45±5.5% of the Sarasota Bay 16 reef site observations. Stone crabs accounted for approximately 3% of the total Whale Key observations. C. sapidus was the dominant invertebrate at the Whale Key 16 reef sites, accounting for 17.3% of the total observations. Blue crabs were not recorded at the Tampa Bay 16, reef sites, and contributed less than 1% of the total observations at the Bayshore North and South reef sites. All observed crabs were found in breeding pairs. Table 9 lists the percent contribution estimates for the 16 reef site observations.

32 Reef Sites

Juvenile L. rhomboides accounted for a mean of 76.1±18.8% of the observations at the Sarasota Bay 32 reef sites. Pinfish accounted for 13.1% of the observations of the Bulkheads 32 reef sites; no pinfish were observed at the Southeast Tampa Bay sites.   Bulkheads pinfish observations were adult fish, ranging from 100-120 mm TL. L. griseus accounted for 3.76% of the Whale Key observations and less than 1% of the total observations at the Bayshore North and South reef sites. Grey snapper were not recorded at the Bulkheads or Southeast Tampa Bay reef sites. M. microlepis accounted for an average of 31.5% of the Tampa Bay reef sites. All gag grouper observed on the site were sub adult to adults (TL=200 - 450 mm). Gag grouper contributions at the Sarasota Reef complexes accounted for less than 1% of the total observations.

The invertebrate community structure was dominated by L. virgulata at the Tampa Bay 32 reef sites. Soft coral colonies accounted for an average of 55.05±8.6% of the observed species. Soft coral colonies accounted for 3.3 % of the total observations on the Sarasota Bay sites adding to the complexity of the reef sites, resulting in increased surface area for retention of larval finfish and invertebrates. M. mercenaria accounted for a mean percent contribution of 2.67±1.44% of the observations across all of the reef sites. All of the sites had stone crabs in residence except Southeast Tampa Bay. C. sapidus was the dominant invertebrate at the Whale key 16 reef sites accounting for 23.7% of the total observations. Blue crabs were not recorded at the Tampa Bay 16 reef sites and contributed less than 1% of the total observations at the Bayshore North and South reef sites. All observed crabs were in breeding pairs. Table 9 lists the percent contribution estimates for the 32 reef site observations. A complete species list by reef number and complex for the winter of 2006 is shown in Appendix 4.

Density by Reef Site and Complex

Observed density followed the same general pattern as the fall surveys. In general, organism density declined as reef number surface area increased, with the exception of the 32 reef sites. Density measures during the winter sampling period were higher than the fall densities. Higher density measures are likely a result of species shifts from an invertebrate dominated community to a finfish based community. Mean organism density on the 4 reef site density was 3.71±0.78 org/m3 approximately 20% higher than at the 8 reef sites. Mean organism density at the 8 reef sites was 3.0±1.52 org/m3 on average the 8 reef sites had 12.4 % higher density than the 16 reef sites. Average density on the 16 reef sites was 2.62±1.2 org/m3, on average 10.3% lower than at the 32 reef sites. Average 32 reef density was 2.92±1.35 org/m3. Figure 12 shows the observed density by reef site and complex for the fall of 2006 survey period. Figure 13 shows the mean observed density by site for all of the complexes.

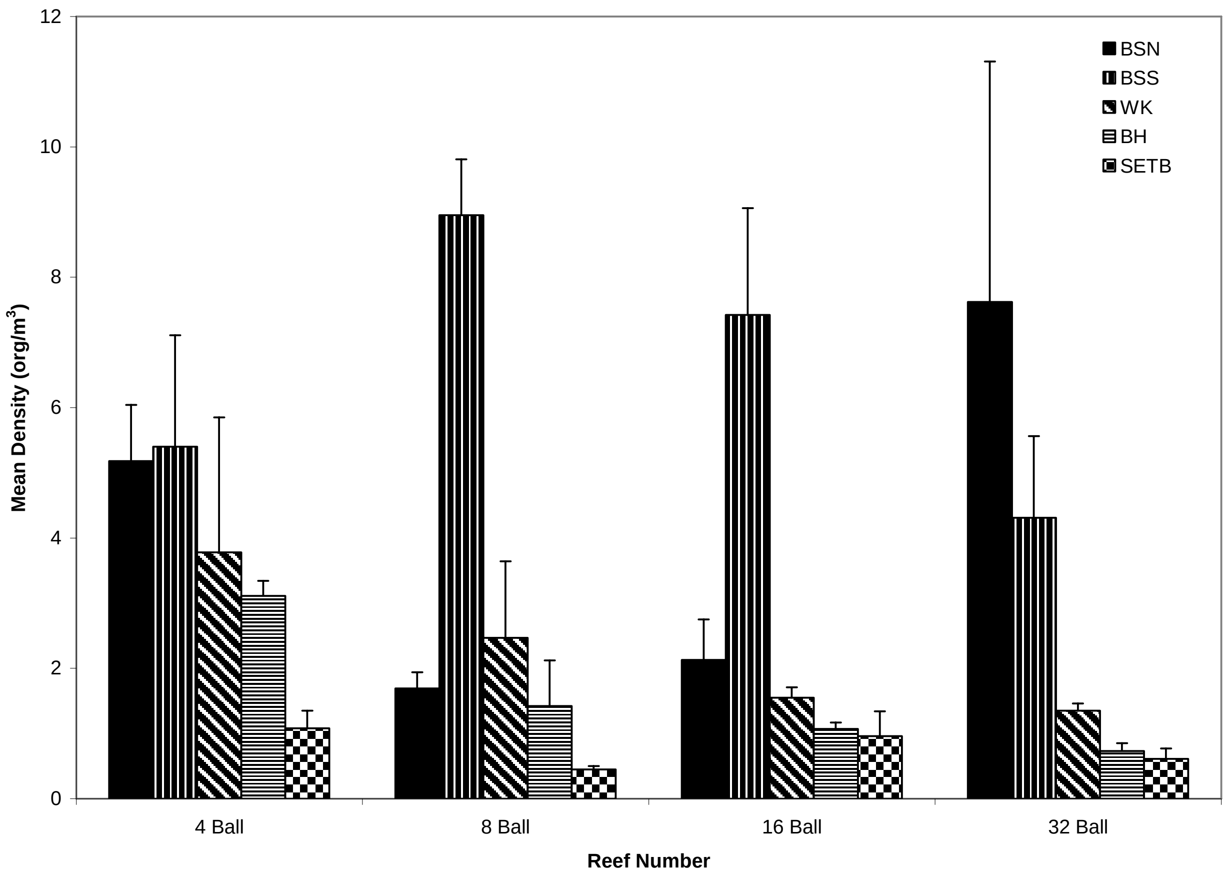

Figure 12 Mean density of macro invertebrate and finfish observed at Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) reef complexes, winter 2007.

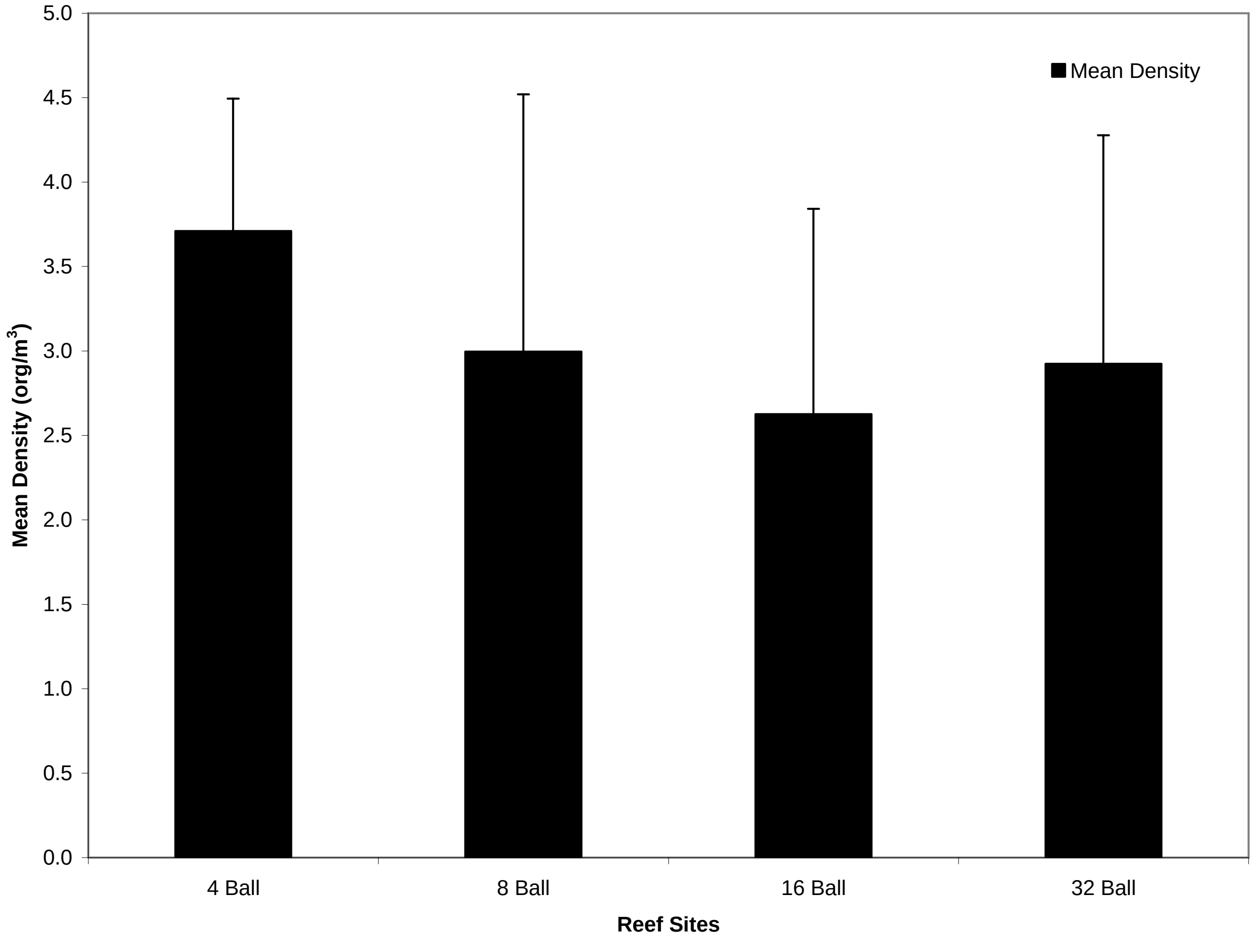

Figure 13 Mean density of organisms/m^3 by reef site winter 2007.

Winter 2007 Summary

Winter surveys showed a defined increase in organism abundance and species assemblage over the fall sampling period across all of the reef complexes. Finfish abundance at all of the sites showed steady improvement from the invertebrate dominated fall survey periods. Juvenile finfish dominated the Sarasota Bay complexes suggesting the importance of these habitats on juvenile recruitment and maturation. L. rhomboides concentrations exceeded 600 observations on the larger reef sites (32 reef sites). Pinfish concentrations at the Tampa Bay reef sites were largely adult populations. Finfish observations on the complexes were dominated by adult gag grouper. The differences suggest that the reef sites in Tampa Bay provide good seasonal habitats for the fish. Gag grouper observations at the Sarasota Bay sites accounted for less than 1 % of the total observations.

Invertebrate concentrations across all of the sites were lower than in the fall observations including soft coral colonies. Soft coral reductions are likely a result of seasonal water temperatures. Seawhip concentration at the Tampa Bay reef sites showed a small overall increase during the sampling period. Stone crab populations within the Sarasota Bay systems were not as dominant during the late winter sampling efforts, but populations did not show the declines observed within the Tampa Bay complexes.

Blue crabs were noted at all of the Sarasota Bay sites. All of the blue crab observations were of breeding pairs. Breeding pairs of blue crabs on the sites suggest that these areas are good spawning areas for the species. The large number of blue crabs at the Whale Key sites resulted in an overall lower observation of stone crabs. Blue crab pairs occupied the holes inside the reef structures suggest space limitations. Sediment level holes on the reef units appear to be a limiting factor in adult crab retention across all of the sites within Sarasota Bay. Blue crabs were not noted at any of the Tampa Bay reef sites.

Species observations across all of the survey sites increased during the winter sampling period. The winter species observations were similar to the spring 2006 observations. Species observations increased as the size of the reef increased. Species observations and organism abundance decreased at the Southeast Tampa Bay reef sites. Reef sites within the complex tended to be dominated by adult gag groupers.

Seasonal shifts in the total number of organisms and the distribution of the observations suggest that Sarasota Bay reef sites are largely be juvenile –sub adult habitats during spring and summer. Winter observations showed an apparent recolonization of the finfish population. Large groups of larval finfish were observed at all of the sites. These fish were less than 10-20 mm TL, and could not be identified. The fish were likely pinfish or some other baitfish noted in the spring 2006 survey periods.

Drift algae mats were noted on all of the reef sites. The algae covered between 80-90% of the reef materials. The reef structures appear to concentrate and protect the algal mats for dispersal. Seasonal addition of this material appears to increase the overall surface area within the reef complexes. Seasonal increases in the surface area of the reef sites could possibly explain the recruitment of the large numbers of larval-juvenile finfish.

The density of organisms on the Sarasota Bay sites follows the same general patterns as noted in the previous seasons. In general, the smaller reef sites had a higher overall density of organisms when compared to the larger reef sites. Density increases on the Sarasota Bay sites further support the influence of these systems on juvenile recruitment within Sarasota Bay. Absence of these populations at the Tampa bay sites, and the dominance of the adult gag grouper populations not observed at the Sarasota Bay sites, also that geographic location could contribute to organism density on the sites.

2006-2007 Summary

The goals of this project were to determine the overall effect of these types of reef systems on the local finfish and invertebrate communities in Sarasota and Tampa Bays. The 2005-2006 red tide bloom helped this project by allowing us to begin assessment on barren reef systems, which allowed us to record the recovery of these systems following a catastrophic event. During the 2006 sampling we were able to document a steady succession of species across these systems. Seasonal organism shifts from larval finfish colonization to invertebrate succession following seasonal species dominance shifts across all of the sites. Seasonal shifts in species dominance and size changes suggest that these systems are beneficial habitats for the recruitment and retention of finfish and invertebrate communities.

Reef size appears to influence of colonization species colonization and retention on the habitats. Increased habitat area resulted in larger numbers of organisms, and showed in net increases in the species numbers across all four seasons. Smaller reef sites tended to have reduced abundances of organisms and species. Organism densities are inversely related to increased surface area. The larger reef sites tended to have general decreases in organism density across all of the complexes and seasons. Variations within this theme were accounted for within complex organism abundances and distributions.

Geographic Reef location of the reef complexes appears to influence colonization rates and species distributions. Seasonal shifts in organism dominance on the reef sites tended to be complex and bay specific. The Tampa Bay reef complexes were dominated by sub-adult to adult predator finfish where as the Sarasota Bay complexes tended to be juvenile habitats. Water movement from adjacent watersheds likely influences distributions of both finfish and invertebrate populations. Southeast Tampa Bay sites appeared to be influenced by the flow patterns of the Manatee River. The Southeast Tampa Bay complex finfish and invertebrate populations tended to diverged from the other reef complexes. The reef sites within the complex tended to be dominated by sub-adult – adult gag grouper habitats. Accessibility to deeper waters of the Gulf of Mexico and the higher flow across these systems are a dominant force driving the colonization the Tampa Bay reef sites by adult populations..

The protected shallow water area of Sarasota Bay appears to drive the recruitment of juvenile finfish and invertebrate populations. The shallow water areas and relative protection from weather fronts could also explain the occurrence of the large algal mats observed in the winter sampling period. Seasonal surface area additions to the sites could be a significant factor promoting larval finfish settlement and retention on within the complexes.

Finfish and invertebrate populations showed defined seasonal shifts. Winter and spring samples tended to be dominated by larval - juvenile finfish assemblages. Winter and spring concentrations of blue crabs suggest that the Sarasota Bay complexes are important habitats for blue crab reproduction. Summer and fall sampling periods showed a defined shift in species size and distribution across all of the habitats. Sub-adult finfish dominated all of the Sarasota bay sites showing definitive shifts from the juvenile baitfish communities during the spring. Stone crab populations increased during this sampling period resulting in lower overall abundance of blue crab populations on all of the complexes. Fall sampling showed a defined dominance of invertebrates across all of the reef sites. Stone crab and soft coral colonies dominated all of the systems. Winter species assemblages tended to be dominated by larval – sub juvenile finfish at the Sarasota Bay systems.

Preliminary investigations show that these systems are important parts of the bay systems. Reef area and placement appear to strongly influence species colonization and development. Total reef area also appears to define the colonization of species assemblages. Even though the larger reef sites had greater surface area for settlement the overall organism density on the sites declined. This suggests that recruitment limitation may not be habitat dependant in these two systems. Future surveys will increase our understanding of these effects of these habitats within Sarasota and Tampa Bays.

Appendix 1

Complete list of observed species by reef site (4, 8, 16, 32 units) and reef complex Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) for the Spring of 2006 sampling period.

4 Reef Sites

Species	**Common Name**	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Archosargus probatocephalus	Sheepshead					x
Blenniidae sp.	Blenny			x		
Callinectes sapidus	Blue Crab	x	x	x		
Chaetodipterus faber	Atlantic Spadefish					x
Chaetodon ocellatus	Spotfin Butterflyfish					
Cliona sp.	Boring Sponge	x	x			
Diadema antillarum	Long Spine Sea Urchin					
Diplectrum formosum	Sand Perch					
Haemulon aurolineatum	Tomtate	x	x	x	x	x
Harrengula jaguana	Scaled Sardine				x	
Hippocampus erectus	Seahorse					
Lagodon rhomboides	Pinfish	x	x	x	x	x
Leptogorgia virgulata	Colorful Sea Whip	x	x	x	x	x
Libinia emarginata	Feather Blenny	x	x	x		
Lutjanus synagris	Lane Snapper					
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper				x	
Orthopristis chrysoptera	Pigfish				x	
Prionotus scitulus	Leopard Searobin				x	
Serranus subligarius	Belted Sandfish				x	
Stephanolepis hispidus	Planehead Filefish					
Synodus foetens	Inshore Lizardfish				x	
Upeneus parvus	Dwarf Goatfish	x	x			x

8 Reef Sites

Species	Common Name	BSN	BSS	WK	BH	SETB
Archosargus probatocephalus	Sheepshead					
Blenniidae sp.	Blenny					
Calinectes sapidus	Blue Crab	x	x	x	x	x
Centropristis striata	Black Sea Bass					x
Chaetodipterus faber	Atlantic Spadefish			x	x	x
Chaetodon ocellatus	Spotfin Butterflyfish				x	
Cliona sp.	Boring Sponge	x	x		x	
Diadema antillarum	Long Spine Urchin				x	
Diplectrum formosum	Sand Perch				x	
Haemulon aurolineatum	Tomtate	x	x	x	x	x
Haemulon plumieri	White Grunt					x
Halichoeres bivittatus	Slippery Dick					x
Harrengula jaguana	Scaled Sardine				x	
Hippocanthus erectus	Lined Seahorse				x	
Lagodon rhomboides	Pinfish	x	x	x	x	x
Leptogorgia virgulata	Colorful Sea Whip	x	x		x	x
Libinia emarginata	Feather Blenny	x				x
Lutjanus synagris	Lane Snapper	x		x		
Lutjanus griseus	Gray Snapper		x	x		
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper				x	x
Orthopristis chrysoptera	Pigfish					x
Pleuroplaca gigantea	Florida Horse Conch				x	x
Prionotus scitulus	Leopard Sea Robin				x	
Serranus subligarius	Belted Sandfish				x	x
Stephanolepis hispidus	Planehead Filefish			x		
Synodus foetens	Inshore Lizardfish	x	x	x	x	x
Upeneus pavus	Dwarf Goatfish					x

16 Reef Sites

Species	Common Name	BSN	BSS	WK	BH	SETB
Archosargus probatocephalus	Sheepshead				x	x
Calinectes sapidus	Blue Crab		x	x	x	x
Chaetodipterus faber	Atlantic Spadefish				x	
Chaetodon ocellatus	Spotfin Butterflyfish				x	
Cliona sp.	Boring Sponge	x	x	x	x	x
Diplectrum formosum	Sand Perch		x			
Diplodus holbrooki	Spottail Pinfish				x	x
Epinephelus itajara	Goliath Grouper			x		
Gobiosoma oceanops	Neon Goby					x
Haemulon aurolineatum	Tomtate	x	x		x	x
Haemulon plumieri	White Grunt				x	x
Harrengula jaguana	Scaled Sardine				x	
Hyposblennius hentzi	Feather Blenny				x	
Lagodon rhomboides	Pinfish	x	x	x	x	x
Leptogorgia virgulata	Colorful Sea Whip	x		x	x	x
Libinia emarginata	Feather Blenny	x				
Lutjanus griseus	Gray Snapper	x	x	x		
Lutjanus synagris	Lane Snapper			x		x
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper				x	x
Oligoplites saurus	Leatherjacket					x
Opsamus tau	Oyster Toadfish				x	
Orthopristis chrysoptera	Pigfish				x	
Pareques acumintus	Highhat				x	
Serranus subligarius	Belted Sandfish				x	x
Stephanolepis hispidus	Planehead Filefish		x	x		x
Synodus foetens	Inshore Lizardfish		x	x		
Upeneus parvus	Dwarf Goatfish					x

32 Reef Sites

Species	Common Name	BSN	BSS	WK	BH	SETB
Archosargus probatocephalus	Sheepshead		x		x	
Blenniidae sp.	Blenny			x		
Callinectes sapidus	Blue Crab	x	x	x	x	
Caranx hippos	Crevalle Jack	x				
Centropristis striata	Black Sea Bass				x	
Chaetodipterus faber	Atlantic Spadefish				x	
Cliona sp.	Boring Sponge	x	x		x	x
Diadema antillarum	Long Spine Sea Urchin				x	x
Diplectrum formosum	Sand Perch		x			
Gobiosoma oceanops	Neon Goby					x
Haemulon aurolineatum	Tomtate	x	x	x	x	x
Haemulon plumieri	White Grunt				x	
Hippocanthus erectus	Lined Seahorse			x		
Lagodon rhomboides	Pinfish	x	x	x	x	x
Leptogorgia virgulata	Colorful Sea Whip		x	x	x	x
Libinia emarginata	Feather Blenny	x	x			
Lutjanus griseus	Gray Snapper	x	x	x	x	x
Lutjanus synagris	Lane Snapper			x	x	
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper				x	x
Mycteroperca phenax	Scamp					x
Opsamus tau	Oyster Toadfish	x	x	x	x	
Orthopristis chrysoptera	Pigfish				x	
Panulirus argus	Spiny Lobster					x
Pareques acumintus	Highhat				x	
Pleuroplaca gigantea	Florida Horse Conch			x		
Serranus subligarius	Belted Sandfish				x	x
Sphoeroides spengleri	Bandtail Puffer		x			x
Stephanolepis hispidus	Planehead Filefish			x		
Synodus foetens	Inshore Lizardfish	x		x	x	
Upeneus parvus	Dwarf Goatfish					

Appendix 2

Complete list of observed species by reef site (4, 8, 16, 32 units) and reef complex Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) for the summer of 2006 sampling period.

4 Reef Sites

Species	**Common Name**	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Archosargus probatocephalus	Sheepshead	x	x			x
Callinectes sapidus	Blue Crab			x		
Cliona sp.	Sponge	x	x	x	x	x
Dasyatis americana	Southern Stingray					x
Diadema antillarum	Long Spine Urchin				x	
Epinephelus itajara	Goliath Grouper					x
Haemulon plumieri	White Grunt				x	
Lagodon rhomboides	Pinfish		x			
Leptogorgia virgulata	Colorful Sea Whip	x	x	x	x	x
Lutjanus griseus	Gray Snapper		x	x	x	x
Lutjanus synagris	Lane Snapper	x			x	x
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper	x	x		x	x
Opsanus tau	Oyster Toadfish		x		x	
Stephanolepis hispidus	Planehead Filefish	x				

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8 Reef Sites

Species	**Common Name**	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Alcyonacea	Soft Coral			x		
Archosargus probatocephalus	Sheepshead	x	x		x	x
Calamus calamus	Saucereye Porgy	x				
Callinectes sapidus	Blue Crab		x	x		
Chaetodipterus faber	Atlantic Spadefish				x	
Cliona sp.	Sponge	x	x	x	x	x
Dasyatis americana	Southern Stingray				x	
Diadema antillarum	Long Spine Urchin				x	
Epinephelus itajara	Goliath Grouper	x	x			
Haemulon plumieri	White Grunt				x	x
Lagodon rhomboides	Pinfish	x	x	x		
Leptogorgia virgulata	Colorful Sea Whip	x	x	x	x	x
Lutjanus griseus	Gray Snapper	x	x	x	x	
Lutjanus synagris	Lane Snapper				x	
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper	x	x		x	
Opsanus tau	Oyster Toadfish	x			x	x
Pomacanthus paru	French Angelfish	x				
Stephanolepis hispidus	Planehead Filefish	x				

16 Reef Sites

Species	**Common Name**	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Archosargus probatocephalus	Sheepshead	x	x		x	x
Calamus calamus	Saucereye Porgy	x				
Callinectes sapidus	Blue Crab	x		x		
Chaetodipterus faber	Atlantic Spadefish				x	
Cliona sp.	Sponge	x	x	x	x	x
Diadema antillarum	Long Spine Urchin				x	
Epinephelus itajara	Goliath Grouper	x				x
Haemulon plumieri	White Grunt				x	
Lagodon rhomboides	Pinfish	x	x	x		
Leptogorgia virgulata	Colorful Sea Whip	x	x	x	x	x
Lutjanus griseus	Gray Snapper	x	x	x	x	x
Lutjanus synagris	Lane Snapper	x			x	x
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper	x	x	x	x	x
Opsanus tau	Oyster Toadfish	x	x	x	x	x
Synodus foetens	Inshore Lizardfish	x				

32 Reef Sites

Species	Common Name	BSN	BSS	WK	BH	SETB
Archosargus probatocephalus	Sheepshead	x	x		x	x
Calamus calamus	Saucereye Porgy	x		x		
Callinectes sapidus	Blue Crab	x	x	x		
Chaetodipterus faber	Atlantic Spadefish				x	
Cliona sp.	Sponge	x	x	x	x	x
Dasyatis americana	Southern Stingray					x
Diplectrum formosum	Sand Perch	x				
Diplodus holbrookii	Spottail Pinfish				x	
Epinephelus itajara	Goliath Grouper	x	x		x	x
Haemulon plumieri	White Grunt				x	
Lagodon rhomboides	Pinfish	x	x	x		x
Leptogorgia virgulata	Colorful Sea Whip	x		x	x	x
Libinia emarginata	Spider Crab			x		
Lutjanus griseus	Gray Snapper	x	x	x	x	x
Lutjanus synagris	Lane Snapper	x			x	
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper	x	x	x	x	x
Opsanus tau	Oyster Toadfish	x	x	x		x
Sphoeroides spengleri	Bandtail Puffer				x	x
Stephanolepis hispidus	Planehead Filefish			x		
Synodus foetens	Inshore Lizardfish	x				

Appendix 3

Complete list of observed species by reef site (4, 8, 16, 32 units) and reef complex Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) for the summer of 2006 sampling period.

4 Reef Sites

Species	**Common Name**	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Centropristis striata	Black Sea Bass				x	x
Cliona sp.	Sponge	x		x		
Diadema antillarum	Long Spine Urchin				x	
Diplectrum formosum	Sand Perch				x	x
Epinephelus itajara	Goliath Grouper					x
Leptogorgia virgulata	Colorful Sea Whip	x	x	x	x	x
Lutjanus griseus	Gray Snapper	x	x			
Lutjanus synagris	Lane Snapper				x	
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper					x
Opsanus tau	Oyster Toadfish				x	
Prionotus scitulus	Leopard Searobin					x
Serranus subligarius	Belted Sandfish				x	

8 Reef Sites

Species	**Common Name**	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Acanthostracion quadricomis	Scrawled Cowfish					x
Bispira variegata	Variegated Feather Duster				x	
Callinectes sapidus	Blue Crab		x			
Centropristis striata	Black Sea Bass				x	
Cliona sp.	Sponge		x		x	
Diadema antillarum	Long Spine Urchin				x	
Diplectrum formosum	Sand Perch				x	x
Epinephelus itajara	Goliath Grouper			x		
Hyposblennius hentzi	Feather Blenny			x		
Lagodon rhomboides	Pinfish			x	x	
Leptogorgia virgulata	Colorful Sea Whip	x	x	x	x	x
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper		x		x	x
Opsanus tau	Oyster Toadfish				x	
Pleuroplaca gigantea	Florida Horse Conch				x	

16 Reef Sites

Species	Common Name	BSN	BSS	WK	BH	SETB
Acanthostracion quadricomis	Scrawled Cowfish				x	
Archosargus probatocephalus	Sheepshead				x	x
Bispira variegata	Variegated Feather Duster		x		x	
Callinectes sapidus	Blue Crab	x				
Chaetodipterus faber	Atlantic Spadefish				x	
Cliona sp.	Sponge		x	x	x	x
Diadema antillarum	Long Spine Urchin				x	
Epinephelus itajara	Goliath Grouper	x				
Lagodon rhomboides	Pinfish				x	
Leptogorgia virgulata	Colorful Sea Whip	x	x	x	x	x
Lutjanus griseus	Gray Snapper		x	x		
Lytechinus variegatus	Variegated Urchin				x	
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper				x	x
Opsanus tau	Oyster Toadfish					x
Paralichthys albigutta	Gulf Flounder					x
Sphoeroides spengleri	Bandtail Puffer				x	
Synodus foetens	Inshore Lizardfish			x		

32 Reef Sites

Species	Common Name	BSN	BSS	WK	BH	SETB
Acanthostracion quadricomis	Scrawled Cowfish					x
Archosargus probatocephalus	Sheepshead	x			x	
Bispira variegata	Variegated Feather Duster				x	x
Calamus calamus	Saucereye Porgy				x	
Cliona sp.	Sponge		x	x	x	x
Diadema antillarum	Long Spine Urchin					x
Diplectrum formosum	Sand Perch		x		x	
Epinephelus itajara	Goliath Grouper			x	x	
Harrengula jaguana	Scaled Sardines			x		
Hyposblennius hentzi	Feather Blenny			x		
Lagodon rhomboides	Pinfish			x	x	
Leptogorgia virgulata	Colorful Sea Whip		x	x	x	x
Lutjanus griseus	Gray Snapper			x		
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper		x		x	x
Opsanus tau	Oyster Toadfish				x	x
Sphoeroides spengleri	Bandtail Puffer				x	

Appendix 4

Complete list of observed species by reef site (4, 8, 16, 32 units) and reef complex Bayshore North (BSN), Bayshore South (BSS), Whale Key (WK), Bulkheads (BH), and Southeast Tampa Bay (SETB) for the winter of 2007 sampling period.

4 Reef Sites

Species	**Common Name**	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Bispira variegata	Variegated Feather Duster		x		x	
Callinectes sapidus	Blue Crab	x	x	x		
Centropristis striata	Black Sea Bass				x	
Cliona sp.	Sponge	x	x	x		
Diadema antillarum	Long Spine Urchin				x	
Diplectrum formosum	Sand Perch				x	x
Haemulon aurolineatum	Tomtate		x			
Haemulon plumieri	White Grunt				x	
Lagodon rhomboides	Pinfish	x	x	x	x	
Leptogorgia virgulata	Colorful Sea Whip	x	x	x	x	x
Lutjanus griseus	Gray Snapper	x		x		
Menippe mercenaria	Stone Crab	x	x	x	x	
Mycteroperca microlepis	Gag Grouper					x
Opsanus tau	Oyster Toadfish		x			
Serranus subligarius	Belted Sandfish				x	
Synodus foetens	Inshore Lizardfish	x	x			

8 Reef Sites

Species	**Common Name**	**BSN**	**BSS**	**WK**	**BH**	**SETB**
Archosargus probatocephalus	Sheepshead					x
Callinectes sapidus	Blue Crab		x	x		
Centropristis striata	Black Sea Bass				x	
Cliona sp.	Sponge	x	x	x		
Diadema antillarum	Long Spine Urchin				x	
Diplectrum formosum	Sand Perch				x	x
Haemulon aurolineatum	Tomtate		x	x		
Haemulon plumieri	White Grunt				x	
Hippocampus erectus	Seahorse			x		
Lagodon rhomboides	Pinfish	x	x	x		
Leptogorgia virgulata	Colorful Sea Whip	x	x	x	x	x
Lutjanus griseus	Gray Snapper		x			
Menippe mercenaria	Stone Crab	x	x		x	
Mycteroperca microlepis	Gag Grouper		x			x
Serranus subligarius	Belted Sandfish				x	
Stephanolepis hispidus	Planehead Filefish			x		
Synodus foetens	Inshore Lizardfish			x		

16 Reef Sites

Species	Common Name	BSN	BSS	WK	BH	SETB
Acanthostracion quadricomis	Scrawled Cowfish				x	
Archosargus probatocephalus	Sheepshead				x	x
Bispira variegata	Variegated Feather Duster				x	
Calamus calamus	Saucereye Porgy				x	
Callinectes sapidus	Blue Crab	x	x	x		
Cliona sp.	Sponge	x	x	x	x	x
Diadema antillarum	Long Spine Urchin				x	x
Diplodus holbrookii	Spottail Pinfish		x			
Haemulon aurolineatum	Tomtate	x	x			
Lagodon rhomboides	Pinfish	x	x	x	x	
Leptogorgia virgulata	Colorful Sea Whip	x	x	x	x	x
Lutjanus griseus	Gray Snapper	x	x	x		
Lytechinus variegatus	Variegated Urchin				x	
Menippe mercenaria	Stone Crab	x	x	x	x	x
Mycteroperca microlepis	Gag Grouper		x		x	x
Opsanus tau	Oyster Toadfish	x				
Scartella cristata	Molly Miller		x			
Synodus foetens	Inshore Lizardfish	x		x		

32 Reef Sites

Species	Common Name	BSN	BSS	WK	BH	SETB
Acanthostracion quadricomis	Scrawled Cowfish				x	
Archosargus probatocephalus	Sheepshead	x			x	
Calamus calamus	Saucereye Porgy				x	
Callinectes sapidus	Blue Crab	x	x	x		
Cliona sp.	Sponge	x	x	x	x	x
Diplectrum formosum	Sand Perch				x	
Epinephelus morio	Red Grouper					x
Haemulon aurolineatum	Tomtate	x	x			
Lagodon rhomboides	Pinfish	x	x	x	x	
Leptogorgia virgulata	Colorful Sea Whip		x	x	x	x
Libinia emarginata	Spider Crab			x		
Lutjanus griseus	Gray Snapper	x	x	x		
Lutjanus synagris	Lane Snapper	x				
Menippe mercenaria	Stone Crab	x	x	x	x	
Mycteroperca microlepis	Gag Grouper		x		x	x
Opsanus tau	Oyster Toadfish	x				
Scartella cristata	Molly Miller	x				
Synodus foetens	Inshore Lizardfish	x	x	x		

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