A survey of epifaunal communities on artificial reefs in Tampa Bay

Chris W. Pratt, Brett A. Ursin, Julie Christian, David J. Karlen, Thomas L. Dix, Barbara K. Goetting, Sara E. Markham, Kevin W. Campbell, Joette M. Jernigan, Anthony Chacour, Kirsti Martinez

Environmental Protection Commission of Hillsborough County
Tampa, Florida 33619-1309

Introduction

The Environmental Protection Commission of Hillsborough County's (EPCHC) Artificial Reef program was started in 1986 to promote habitat diversity and recreational fishing in Tampa Bay. The program has increased hard-bottom habitat with over 36,000 metric tons of concrete substrate in a series of artificial reefs throughout the Bay, covering approximately 0.51 km^2. In 2004 and again in 2015, EPCHC received a grant to study the epibenthic macroinvertebrate communities on three EPCHC artificial reefs. (Figure 1) The three reefs studied were located in Old Tampa Bay (Howard Frankland Reef; HFR), Middle Tampa Bay (Bahia Beach Reef; BBR) and Lower Tampa Bay (Egmont Key Reef; EKR).

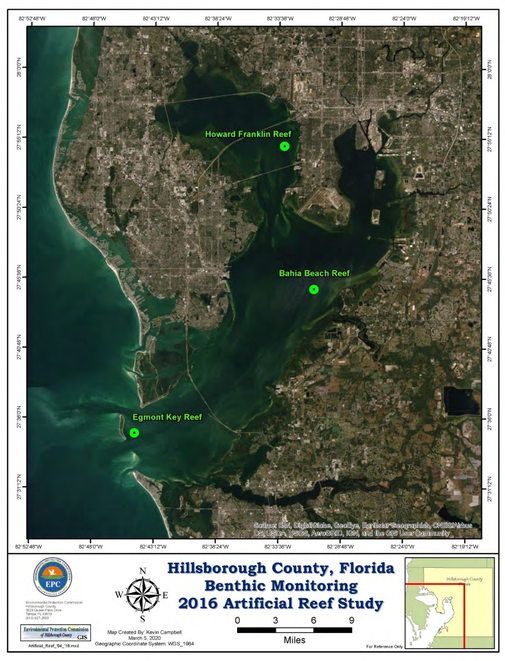

Figure 1. Artificial reef locations in Tampa Bay

Methods & Materials

To measure change in the epibenthic macroinvertebrate community of the three artificial reefs since the 2004 study, samples were collected at each reef during two seasonal sampling events in 2016: April - May representing the dry season and September representing the wet season. Ten samples were collected from each reef during each season for a total of 60 samples.

Sample sites on the reef were randomly selected from one of three different reef levels: top, middle, and bottom. and from one of three surface orientations: horizontal, inverted, or vertical.

A scraper was used to remove all attached epifauna within a 16 cm x 16 cm area for collection into a stainless steel epifaunal sampler (Figure 2).

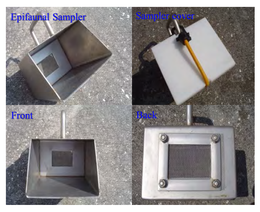

Figure 2. Epifaunal sampler.

All epifauna were identified to the lowest taxonomic level, enumerated, and weighed for wet weight biomass.

Bottom hydrographic parameters and Secchi disk measurements were also recorded at each sampling site.

Results

Species Richness

Two-way Analysis of Variance (ANOVA) indicated species richness was significantly higher in the spring than in the fall and significantly lower on the HFR than on BBR and EKR within seasons. There was no significant difference between BBR and EKR, however the mean number of taxa was higher at BBR in the spring and higher at EKR in the fall.

The species richness was significantly higher in 2016 than 2004 across all reefs and seasons (Figure 4).

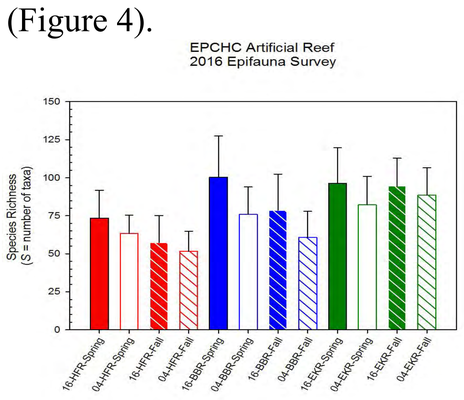

Figure 4. 2016 vs. 2004 mean epifaunal species richness by reef and season

In 2016, there was a mean of 83 taxa per sample found compared to 70 taxa per sample in 2004. Both years exhibited similar trends with higher species richness in the spring and increasing richness from HFR in the upper bay to EKR in the lower bay within each season.

Abundance

The overall epifaunal abundance in 2016 was significantly different among the three reefs. This was most notable in the fall samples where HFR had a lower abundance of epifaunal taxa compared to BBR and EKR.

However, there was no significant difference among the reefs in the spring. No significant difference between seasons were observed at HFR or BBR. Abundance was significantly higher at EKR in the fall. There was no significant difference in overall epifaunal abundance between 2016 and 2004, however seasonally the abundances were higher in fall 2016 relative to fall 2004. In 2004, the epifaunal abundance was significantly higher in the spring than in the fall across all three reefs and the spring 2004 reefs generally had higher abundances than the spring 2016 reefs (Figure 7).

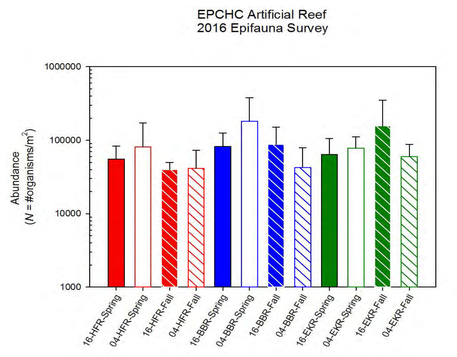

Figure 7. 2016 vs. 2004 mean epifaunal abundance by reef and season

Species Composition

In 2004, a total of 385 taxa in 14 phyla were identified over all three reefs. In 2016, a total of 490 taxa in 13 phyla were identified (Table1)*.

	2004		2016	
Phylum	Total Number Taxa	% Total	Total Number Taxa	% Total
Annelida	113*	29.35%	163*	33.27%
Arthropoda	101	26.23%	96	19.59%
Mollusca	94	24.42%	136	27.76%
Cnidaria	16	4.16%	23	4.69%
Bryozoa	15	3.90%	12	2.45%
Chordata	12	3.12%	16	3.27%
Porifera	10	2.60%	18	3.67%
Nemertea	10	2.60%	10	2.04%
Echinodermata	5	1.30%	6	1.22%
Platyhelminthes	4	1.04%	6	1.22%
Sipuncula	2	0.52%	2	0.41%
Chaetognatha	1	0.26%	1	0.20%
Echiura	1	0.26%	0	0.00%
Phoronida	0	0.00%	1	0.20%
Brachiopoda	1	0.26%	0	0.00%
TOTAL	385	100%	490	100%

* Data has been updated due to revision in taxa and re-identification

Table 1. Summary of Taxa and Abundance of Phyla for 2004 and 2016 artificial reefs

In spring 2016, the oyster *Ostrea equestris* was the most abundant species accounting for 10.3% of the total abundance and was present in all 30 samples. The fall 2016 samples were strongly dominated by juvenile barnacles (Balanidae), which represented 34.5% of the total abundance and were found in 100% of samples. In 2004, *Perna viridis* (13.95%) was the most abundant species found in the spring, while in the fall, juvenile barnacles (20.27%) dominated the epifaunal community, and were found in 96.67% of the samples.

Biomass

In 2016, the epifaunal biomass was significantly higher in the fall on all three reefs but was not significantly different between reefs within a given season. In 2004, the spring biomass was higher, due to *Perna viridis,* than in the fall. There was no significant difference between seasons in 2016. In 2004, all three reefs were significantly different with HFR having the highest and EKR having the lowest biomass. While in 2016 there was no significant difference in biomass among reefs within a given season (Figure 8).

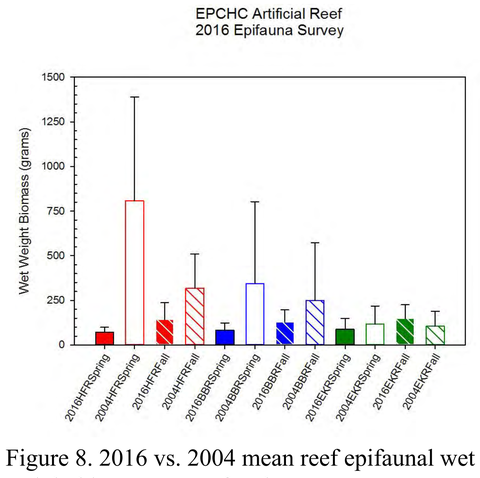

Figure 8. 2016 vs. 2004 mean reef epifaunal wet weight biomass vs reef and season

Conclusions

The epibenthic communities on the Tampa Bay artificial reefs have undergone changes since 2004. Most notably on the HFR in Old Tampa Bay and BBR in Middle Tampa Bay, while the EKR community in Lower Tampa Bay was more stable over time. The most notable change was the near absence of the Asian Green Mussel, *Perna viridis,* in 2016 which dominated the reefs in 2004. The increase in overall species richness in 2016 and the near absence of *Perna viridis* indicates that the current status of the reefs is healthy and has improved since the original survey in 2004.The results of this study suggest that the reefs are still relatively diverse and recruiting new epifauna seasonally. Reef position within Tampa Bay did influence the species composition of the epifaunal communities based largely on the estuarine salinity gradient in the Bay, with lower diversity and species richness corresponding to lower salinities. All three reefs still appear to support healthy, functioning epifaunal communities.

Acknowledgments

The authors wish to acknowledge the Florida Fish and Wildlife Conservation Commission, Division of Marine Fisheries for their funding.

For more information

Please contact: Chris Pratt *prattc@epchc.org*