



## PALM BEACH COUNTY REEF RESEARCH TEAM

FLORIDA FISH & WILDLIFE CONSERVATION COMMISSION GRANT NO. 11227

### EXECUTIVE SUMMARY - 2013

The Palm Beach County Reef Research Team (RRT) performed monitoring and mapping dives on 20 designated artificial and natural reefs for the monitoring period of January 2013 to December 2013 to complete the requirements for Year 2 of Florida Fish & Wildlife Conservation Commission Grant #11227 under the direction of Palm Beach County Department of Environmental Resources Management (ERM).

The objectives of this project are:

1. Assess and compare fish and benthic assemblages on artificial reefs of differing structural makeup to adjacent natural reefs;
2. Compare the effects of increasing artificial reef complexity on fish assemblages by the addition of the corridors to the 4-ship Governor's River Walk Reef; and
3. Assess and compare fish and benthic assemblages on artificial reefs consisting of different structural materials, depths, and ages.

The artificial reef sites monitored in 2013 were Limerock: Boca Corridors, Boynton Corridors, North Corridors, Jupiter Stepping Stone Reef, Ragg's Reef, Town of Palm Beach (ToPB) at Rybovich, and Boynton Stepping Stone Reef; Concrete: Jupiter Concrete, Tri-County Reef, and Royal Park Bridge; Ships and Ship/Combinations: ESSO BONAIRE, MISS JENNY, BECK'S, EIDSVAG, Tug Boat Reef, Rybovich Reef, and SEA EMPEROR. The 4 natural reef sites monitored were: Boca Artificial Reef Ledge, Delray Ledge, Julie's Reef, and Larsen's Valley. Comparison sites consisted of monitoring data collected at an artificial reef and a nearby natural reef.



Jupiter Step Reef

### FISH SUMMARY RESULTS

A total of 144 species of fish representing 40 families were recorded during the point count surveys. Three of the top 5 sites with the highest numbers of fish species (Point Counts plus Roving Diver counts) were recorded on artificial reef sites: artificial: Tri-County Reef (98), Boynton Stepping Stone Reef (86), and SEA EMPEROR (85) and natural: Boca Artificial Reef Ledge (111) and Delray Ledge (107). Although natural reefs had the highest average number of individuals (abundance) at 1,915, the 2 newer step reefs had the highest counts of individuals: Boynton Stepping Stone – 3,646 and Jupiter Stepping Stone – 3,554, both being among the 8 limerock reefs that averaged 1,634 individuals. A total of only 21 lionfish (*Pterois* spp.) were encountered on 9 sites (7 artificial); 11 were killed.



In comparing substrate types among the artificial reef sites and with natural reef sites some interesting results were noted. Of the artificial reefs, concrete reefs had the highest averages for Roving Diver species and family counts; whereas, the limerock reefs had the highest averages for species and family Point Counts. Limerock reefs had the highest average for total number of individuals, but ships had the highest average for biomass. Except for biomass averages, natural reefs had the highest averages for all other parameters.

The families represented by juveniles encountered at the majority of all sites were wrasse (Labridae) and damselfish (Pomacentridae). Bluehead wrasse were ubiquitous, and this species is abundant in the Caribbean and common to South Florida. The highest count for juveniles was on Delray Ledge in July, but ships had the highest average (41%) of

juveniles. The highest average number of individuals for juveniles (550) was from natural reefs; however, juvenile biomass average (381) was highest for ships.

Overall, it is evident that the artificial reef sites, regardless of substrate type, become heavily colonized by a very diverse fish taxa in a matter of just a few years as exemplified by the numbers from the relatively newly installed step reefs. As might be expected, the age and benthic development of the site appears to influence the community structure more so than the type of substrate or its depth. A shift to the dominance of smaller, benthic, territorial reef fish appears to occur with age, as does a more balanced mix of the relative abundance of fish families. In all sites, the damselfish (Pomacentridae), wrasse (Labridae), and grunt (Haemulidae) families were well-represented. Grunt (Haemulidae) comprised a significant portion of the biomass present, unless goliath groupers or large schools of jacks (Carangidae) were present generally on the artificial reefs. Though many variables (depth, temperature, current, silting etc.) influence the community structure of any given site, it is evident from the comparison sites that the artificial reefs host nearly as diverse and robust fish taxa as can be found on adjacent natural reefs. Though further analyses would be required to determine if there are substrate-related differences influencing the details of community structure, all types of structures placed as artificial reefs in this area were heavily utilized by broad ranges of fish taxa.

### **BENTHIC SUMMARY RESULTS**

The colonization dynamics of benthic invertebrate growth on artificial reefs are influenced by multiple factors, such as reef age, substrate composition, and proximity to existing natural reefs. Natural reefs have the highest number of benthic taxa groups among the four reef substrates evaluated as would be expected. This trend is comparable to the results from the prior 5 years of monitoring.



Vase sponges at Royal Park Bridge

Concrete reefs continued to show the second most diverse benthic assemblage (34). Concrete reefs averaged 7 hard coral taxa which was higher than the other substrate types. The highest number of hard coral taxa was found on the twenty-four year old Tri-County Reef (17) which was higher than natural reefs. Notably, except for 2007, limerock reefs have the lowest averages for benthic taxa diversity among the 4 substrate types. Of interest is the 7-year old Ragg's Reef that showed the second highest number of hard coral taxa at 11, which was comparable to 3 of the natural reef sites. We believe that generally the mined limerock boulders' surfaces are so irregular it slows colonization, thus taking much longer for the limerock to become comparable to natural reefs.



2 corals at Boynton Corridors

Average numbers of total taxa and hard coral taxa as would be expected, showed an increase over time when ages of all the artificial reefs are considered. Water depths showed an interesting trend for benthic taxa, as well as coral taxa, which was also comparable

to fish species' averages: the greatest average numbers were for the 55-75 ft. depths. We are not sure why, but more analyses and data are needed. It appears that concrete and older steel ships are comparable hosts for benthic assemblages; however, these groups' average ages differ somewhat with 25 years for ships/barge and 20 years for concrete. Within the taxa, the group showing the greatest diversity is sponge; hard coral is the second most diverse taxa group observed regardless of substrate type.

### **SEA TURTLE SUMMARY**

During this year, Team members recorded only 6 sightings of sea turtles. Of these 6 observations, 4 (loggerhead) were on artificial reefs and 2 (green and loggerhead) were on natural reefs. Activities of the observed turtles were either swimming or resting/sleeping, and all ignored the presence of the divers.

All photographs courtesy of **Linton Creel, PBCRRT**