

Demographics of Selected Reef Fish Off Southeast Florida

Demografía de los Peces de Arrecife Seleccionados en el Sureste de Florida

Démographie de Certains Poissons de Récif au Large de la Floride du Sud-Est

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EXTENDED ABSTRACT

Reef fish assemblages in southeast Florida are subject to intense fishing pressure, as their coral reef habitats are in close proximity to over 6 million residents and almost six times as many tourists annually (Ault and Franklin 2011, Page and Swanenberg 2014). Status and trends of important reef fish species were assessed from 1990 to 2008 by Ault and Franklin (2011) using fishery dependent data from southeast Florida. Findings showed many exploited reef fish populations being locally depleted, but fishery independent information, needed to support management actions, was not available for southeast Florida. Long-term, fishery-independent data collections had been conducted for reef fish in the Dry Tortugas and Florida Keys (Hallac et al. 2013). However, similar regional and sub-regional, fishery-independent information remained a data gap off the southeast Florida portion of the Florida Reef Tract (FRT) (Ault and Franklin, 2011). The analysis and findings of Ault and Franklin (2011) were reviewed by staff at the Florida Fish and Wildlife Conservation Commission (FWC), who made recommendations to assist partners in the Southeast Florida Coral Reef Initiative (SEFCRI) in addressing fishing impacts to the southeast Florida coral reef ecosystem. Recommendations included collecting fishery independent data using the Reef Visual Census (RVC) methodology in a manner consistent with how the RVC Program had been conducted in the Florida Keys, described in Brandt et al. (2009).

The objective of the SEFCRI Fishery Independent Baseline Assessment is to document reef fish assemblage composition, abundance, and size structure and establish a baseline to assess changes in these parameters over time along the southeast Florida segment of the FRT, and within specific sub-regions. The following results are preliminary findings based on four-years (2012 to 2015) of fishery-independent data collected by partner agencies off southeast Florida and compared to two years of RVC data (2012 and 2014) from the Dry Tortugas.

Field sampling was conducted between May 1 and October 31, using the RVC method. In order to efficiently sample the heterogeneous Florida coral reef tract, the RVC sampling effort is optimized using a two-stage stratified random sampling design. Before sampling occurs, the sampling domains are partitioned into 100 x 100 m grid cells, or primary units, which are each assigned to a strata designation based on habitat type, geographic sub-region, management type, and depth. The number of primary units to be sampled in each stratum type is based on a Neyman allocation scheme, which accounts for the stratum's size and the strata standard deviations for eight focal reef fish species densities. Once the optimal number of primary units per stratum is chosen, primary units to be sampled are randomly selected from a list of all possible primary units for each stratum. Within each selected primary unit, two smaller second-stage units are selected. Each second-stage unit consists of a buddy pair of divers who each perform a Reef Visual Census, which is a 15 m diameter, stationary point count (Brandt et al. 2009). Special attention is given to specific exploited reef fish species. The RVC method allows divers to simultaneously collect data on the composition, density and size distributions of the entire fish community, as well as information on benthic habitat features (Brandt et al. 2009).

Data were analyzed to look at demographics (relative abundance, size, and size class distribution (below and above the minimum legal size)) of selected reef fish species, which include *Ocyurus chrysurus* (Yellowtail Snapper), *Lutjanus griseus* (Gray Snapper), *Lutjanus analis* (Mutton Snapper), *Lachnolaimus maximus* (Hogfish), *Epinephelus morio* (Red Grouper), *Haemulon sciurus* (Bluestriped Grunt), and *Haemulon plumieri* (White Grunt). Visually estimated fork length data were binned to ranges relevant for each species. Length frequency of each species was pooled using observations from all four years. Results were graphed using a histogram. Mean length at maturity, as reported in FishBase (2016), and the minimum legal size in Florida (FWC 2016) for each species were added to the graphs.

RVC data from the 1,239 sites sampled in 2012 to 2015 were analyzed and compared to 164 sites from the Dry Tortugas sampled in 2012 and 2014. Occurrence of Gray Triggerfish was too low in the Dry Tortugas to make a meaningful comparison, so seven of the eight focal species of southeast Florida are presented in this work. Trends observed in all seven selected species include greater abundance of juvenile reef fish approaching the minimum legal size in both southeast Florida and the Dry Tortugas. Reductions of abundance are observed just below or at minimum legal size in southeast Florida, especially in Red Grouper, Hogfish, and Yellowtail Snapper. Generally, focal reef fish are larger and more abundant in the Dry Tortugas than in the southeast Florida region.

Length frequencies of red grouper decline steeply before the legal minimum size in southeast Florida, while larger size classes of these species are observed in the Dry Tortugas (Figure 1). Yellowtail Snapper, Gray Snapper and Hogfish length frequency distributions follow a similar pattern to the histogram for Red Grouper. The Florida Keys/East Coast Florida Hogfish and south Atlantic Red Grouper stocks are overfished and undergoing over-fishing (SEDAR 37 2013, SEDAR 53 2017). Current stock status of gray triggerfish, mutton snapper, and yellowtail snapper, indicate that these stocks are not overfished (SEDAR 37 2013, SEDAR 15A 2008, FWC 2012). Gray Snapper, White Grunt and Bluestriped Grunt have not had a stock assessment completed in the south Atlantic region or Florida; however, regional estimates of fishing mortality for gray snapper were over four times higher in southeast Florida, than in northeast Florida, ($F = 0.16$ per year for northeast Florida and 0.66 per year in southeast Florida) (Burton 2001). Because the assessment models for reef fish assume a unit stock, there is no basis for incorporating spatial variation (on a regional or sub-regional scale) in management regulations (SEDAR 41 2016). This inflexibility of the unit stock model can mask local depletions of the species being assessed.

- i) Fishery managers should consider managing reef fish species on smaller scales than just stock-wide to prevent local depletions and eliminations of larger-bodied, more fecund reef fish,

- ii) Management of reef fish species should incorporate consideration of the fishery ecosystem, (e.g. habitat and reef fish ecology), as well as the traditional parameters used in single-species fisheries management, and
- iii) Management approaches for red grouper, hogfish, gray snapper and mutton snapper that protect larger, more fecund fish in the southeast Florida coral reef assemblages should be considered.

KEYWORDS: Fisheries-independent, reef fish, trends, management, size class

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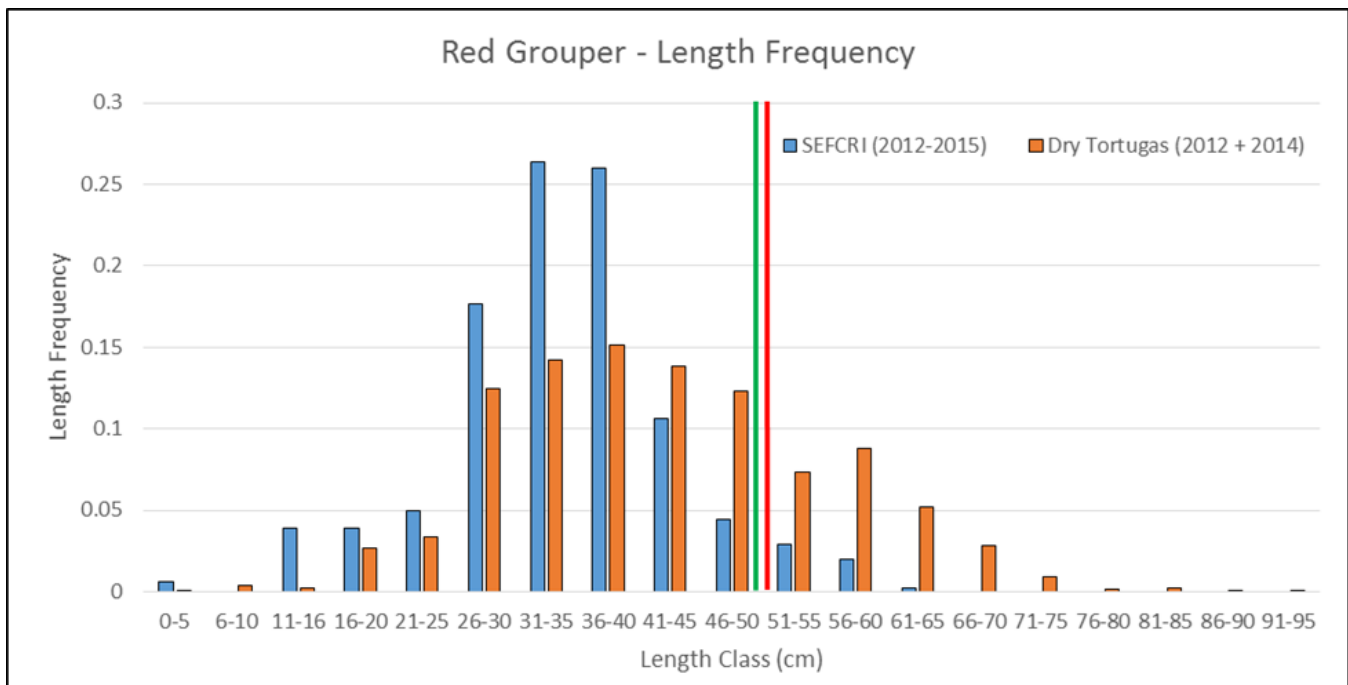


Figure1. Length frequency distribution of red grouper off southeast Florida (2012 - 2015) compared to the Dry Tortugas (2012 and 2014). This is an example of the truncated distributions of exploited species of reef fish off southeast Florida. Larger, more fecund individuals are removed from the population, potentially reducing reproduction and recruitment. Similar trends in the length frequency distributions of Mutton Snapper, Yellowtail Snapper, Gray Snapper and Hogfish are observed.

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