

Spatial Trends in Size and Abundance of Fishery Targeted Reef Fish in the Florida Keys, USA

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ABSTRACT

Coral reef ecosystems worldwide are undergoing change due to interactive effects of anthropogenic impacts and natural stressors. Within these ecosystems, the assessment of spatial trends in coral reef resources is critical to inform and guide ecosystem management, conservation, and restoration decisions. We used a fishery-dependent data source (NOAA headboat data) and two fishery-independent data sources (NOAA reef fish surveys and Reef Environmental Education Foundation surveys) to assess spatial trends in abundance and length-frequency distributions of multiple fishery targeted species along the FL Keys, USA. Regardless of data source, results from analyses were consistent: species-specific proxies for abundance and length-frequency distributions tended to be lowest and smallest, respectively, in the northernmost FL Keys (Biscayne National Park area) adjacent to the Ft. Lauderdale / Miami metropolitan area. Results are discussed in terms of likely underlying mechanisms and implications for management.

KEY WORDS: Coral reefs, reef fish, spatial trends, fishing impacts, management implications

Tendencia Espacial de Talla y Abundancia en las Pesquerías de Peces Arrecifales en los Cayos de la Florida

Los ecosistemas arrecifales mundiales enfrentan procesos de cambio a consecuencia de interacción por efectos antropogénicos y alteraciones naturales que se suceden en el medio ambiente. La evaluación de las tendencias espaciales en estos ecosistemas y en especial los recursos del arrecife, resulta crítica para decisiones de restauración, manejo y conservación. Se utilizaron datos de una fuente directa de pesquerías (datos de embarcaciones de alquiler obtenidos por NOAA) y datos de dos fuentes indirectas (muestreos de peces arrecifales de NOAA y de muestreos de la fundación para la educación ambiental del arrecife) para la evaluación de tendencias espaciales en la abundancia y la distribución de frecuencia de tallas de los peces que son objeto de pesquería en los cayos de la Florida. A pesar de las fuentes diversas de información los resultados de los análisis resultaron consistentes. La distribución de la abundancia y frecuencia de tallas en las especies encontradas en la parte mas norte de los cayos de la Florida resulto ser mas baja y pequeña respectivamente (área del Parque Nacional de Biscayne), cercano al área metropolitana de Miami y Fort Lauderdale. Los resultados se discuten en términos del enfoque a implicaciones y estrategias para el manejo.

PALABRAS CLAVES: Ecosistemas arrecifales, tendencias espaciales, peces, pesquerías, implicaciones para el manejo

INTRODUCTION

Coral reef ecosystems worldwide are undergoing change due to interactive effects of anthropogenic impacts and natural stressors. Within these ecosystems, the assessment of spatial trends in coral reef resources is critical to inform and guide ecosystem management, conservation, and restoration decisions. Recent publications support the intuitive notion that reef ecosystems adjacent to large human populations will be characterized by considerable human impacts. For example, in studies of the Northern Line Islands, Dinsdale *et al.* (2008) and Sandin *et al.* (2008) found direct correlations between the number of people living adjacent to reef ecosystems and negative impacts to those systems, manifested in responses such as decreased live coral cover, increased virus-like particles, and reduced predator biomass. Mora (2008) found similar correlations in the Caribbean, with human populations equated with reduced coral cover, increased macroalgal cover, and reduced predator and herbivore biomass on reefs.

CONCLUSIONS

Our objective was to determine if there is evidence for increased human impacts on Miami / Biscayne National Park (BNP) reefs, given their proximity to the large human

population (> six million people) resident to southeastern Florida, USA. Because fishing reduces abundance of targeted species and results in smaller (left-shifted) length-frequency distributions over time, we hypothesized that reef fish in the Miami / BNP area would be characterized by smaller proxies for abundance and length-frequency distributions than in other areas of the Keys that are more distant from southeastern Florida's large human population. We used a fishery-dependent data source (NOAA headboat data) and two fishery-independent data sources (NOAA reef fish surveys and Reef Environmental Education Foundation surveys) to assess spatial trends in abundance and length-frequency distributions of multiple fishery-targeted species along the FL Keys. Regardless of data set utilized, results from preliminary analyses were consistent: a majority of fishery-targeted species had smaller proxies for abundance and/or length-frequency distributions in the Miami / BNP area than in any other area of the Keys. Analyses for a suite of species not targeted by fisheries provided no evidence of lower abundances or smaller size-frequency distributions for those species in the Miami / BNP area. While additional analyses are necessary to increase sample sizes, and while other mechanisms such as habitat variability may have contributed to the observed patterns, these preliminary

results support the hypothesis of greatest human impacts in the Miami / BNP area.

LITERATURE CITED

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