

Assessing Trends in Targeted Marine Fishes in the Bonaire Marine Park, Netherland Antilles

Evaluación de las Tendencias en los Peces Marinos Objetivo en el Parque Marino de Bonaire, Netherland Antilles

Évaluer les Tendances Chez les Poissons Marins Ciblées dans le Parc Marin Bonaire, Netherland Antilles

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EXTENDED ABSTRACT

The Bonaire Marine Park (BMP), established in 1979 and encompassing the islands of Bonaire and Kline Bonaire, represents one of the oldest marine parks in the Caribbean. Primary human uses of the park include recreational diving and snorkeling, and subsistence fishing by local people. The BNP is comprised of a network of protected areas with differing human-use restrictions; no area in the park is currently restricted from subsistence fishing. One of the primary goals of the park is to maintain a regionally and globally significant and successful multi-use marine protected area. It remains unclear, however, to what extent high-quality opportunities for extractive and non-extractive park uses are being maintained through time.

Bonaire maintains active populations of both commercial and recreational/subsistence fishermen. Schep et al. (2012) recently carried out an assessment of the fisheries value of coral reefs around Bonaire. Approximately 20% of the population participates in recreational/subsistence fishing, with an estimated value of \$700,000 per year based on a willingness-to-pay and market value (some recreational/subsistence catch is sold). Commercial fishing net revenues result in about \$250,000 per year. A large percentage of catch for these fisheries is composed of reef-related species (70% commercial, 90% recreational/subsistence), and almost all catch is taken using hook and line.

While fishing is an important component of Bonaire's economy, dive-based tourism is the primary and dominant diver to economic revenue on the island. Dixon et al. (2000) estimated total gross revenues associated with diver-based tourism in Bonaire Marine Park at \$23.2 million dollars annually. Their study also clearly demonstrated that divers visited the island because of the perceived good conditions of the surrounding reefs. Given Bonaire's reliance on dive-based tourism, and the clear link between tourism and healthy reefs, an assessment of the trends in abundance of reef fishes is prudent.

Since 1993, volunteers with Reef Environmental Education Foundation (REEF) have conducted roving diver reef fish surveys (species-specific presence/absence and relative abundance) at sites throughout the park. To date, over 21,000 surveys have been conducted since 1994, representing 28,000 hours of collective survey effort. Using these data, we examined trends in the presence and abundance of marine fishes targeted by subsistence fishing (e.g. large-bodied reef-associated species) over the last two decades.

We found ongoing declines in large-bodied grouper (e.g. Yellowfin Grouper, *Mycteroperca venenosa*), small-bodied grouper (e.g. Red Hind, *Epinephelus guttatus*), and large-bodied parrotfish (e.g. Midnight Parrotfish, *Scarus coelestinus*). On the other hand, we found ongoing increases in grunts (e.g. Bluestriped Grunt, *Haemulon sciurus*) and small bodied parrotfish (e.g. Redband Parrotfish, *Sparisoma aurofrenatum*).

The decline in large-bodied species (presumably preferentially targeted by fisheries) suggests that extractive uses are decreasing the quality of non-extractive uses such as wildlife viewing over time. On the other hand, increases in smaller bodied species, particularly herbivores, suggests that the Bonaire fish community may confer some degree of resilience to further declines in coral cover (Lewis 1986). Given the importance of vibrant and healthy reefs to locals and tourists alike, we suggest that BMP managers assess on-going trends in reef fish communities, and take action to preserve healthy fisheries where necessary. In some instances, and for some groups of species, fishing may be responsible for ongoing declines in both reef health and the quality of diving experiences.

LITERATURE CITED

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