

# Visual Surveys of Patch Reef Species Abundance in South Eleuthera, The Bahamas

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Caribbean spiny lobster



Black grouper



Nassau grouper



Yellowtail snapper



Queen triggerfish



Red lionfish



## Introduction

Patch reefs are small coral heads in coastal waters that provide important habitats for many juvenile marine organisms during ontogenetic habitat shifts (Lecchini and Galzin 2005). Many of the most harvested and economically important species in the Bahamas are found in patch reef habitats (Danylchuk 2003). However, there are environmental risks to these reefs and the species that inhabit them (BREEF 2006). Specifically, South Eleuthera, The Bahamas has been affected by overfishing because of the species diversity in patch reefs. Since the main Bahamian fisheries contribute a total income of \$62 million, patch reefs are major contributors to the country's economy (Buchanan 2000).

The Island School has conducted past research on the ecology of local patch reefs for the past seven years (excluding 2009 when research was focused solely on lionfish). Fish populations on reefs, however, are highly variable, and The Island School concluded in 2007 that they needed more information about the species abundance in order to take action to protect the patch reefs in Eleuthera (Williams et al 2006).

The purpose of this study was to continue to monitor the change in abundance of six key fish species in local patch reefs: Queen triggerfish, Caribbean spiny lobster, Black grouper, Nassau grouper, Yellowtail snapper, Red lionfish. The hope is that a long-term set of data can be used by interested parties to make informed decisions regarding marine protected areas and additional fishing regulations. Continued vigilance of South Eleuthera patch reefs is vitally important to protect these coral habitats and keep the natural balance of marine species in the area.

## Methods

This study was performed off Powell Point in Cape Eleuthera, Bahamas during a seven-week period in Fall 2010. Twenty patch reefs, all within a proposed marine protected area, were surveyed twice during the seven-week observation period in order to maintain accurate results (Figure 5).

Extensive fish identification training was conducted before research commenced to ensure proper field identification. Visual surveys were conducted in buddy pairs while snorkeling to record population abundance of the six key species (Figure 4). Mean abundance values of each species across all survey sites over the seven-week period were calculated. This data was then analyzed and compared to data from the past seven years.



Figure 4. Snorkelers conducting abundance survey.

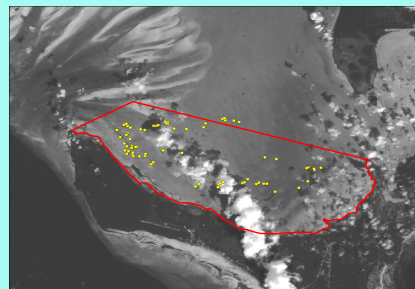


Figure 5. Study sites within proposed MPA, Cape Eleuthera.

## Literature Cited

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## Results

Analysis of variance tests compared mean abundance data across multiple semesters. Results show that only three of the key species (Nassau grouper, Red lionfish, and Queen triggerfish) had a significant change. Abundance of Nassau grouper initially decreased from Fall 2004 to Spring 2005 and since has been increasing through Fall 2010. Significant increases were seen when comparing Fall 2010 to Fall 2005, Spring 2006, and Fall 2006 ( $P=0.06$ ,  $P<0.01$ , and  $P=0.004$ ; Figure 1). Results for Red lionfish showed a significant difference in all semesters when compared to Fall 2008 ( $P=0.001$ ,  $P=0.001$ ,  $P=0.041$ , and  $P=0.043$ ; Figure 2). The mean abundance of Queen triggerfish is significantly different when comparing all semesters to spring 2007, when there was a significant rise in mean abundance ( $P<0.05$ ; Figure 3).

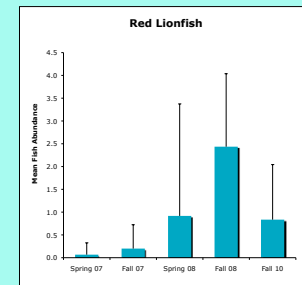


Figure 2. Mean abundance of Red lionfish.

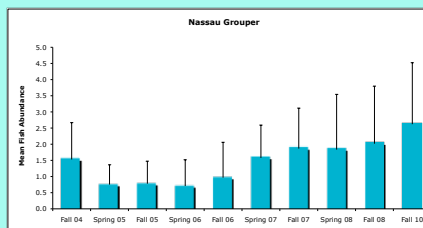


Figure 1. Mean abundance of Nassau grouper

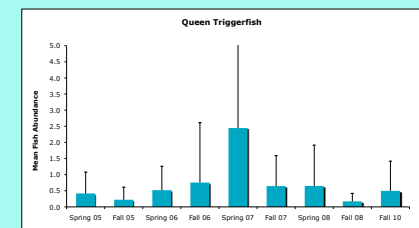


Figure 3. Mean abundance of Queen triggerfish

## Discussion

One reason for the increase in abundance of Nassau grouper may be the effectiveness of current fishing regulations. Fishing regulations are determined annually by the Bahamian government. For the year 2011, fishing is closed December 1 to February 28. Another regulation limits the size of the Nassau grouper caught to a minimum of three pounds (Department of Marine Resources 2010).

The initial increase in Red lionfish population seen from 2007 to 2008 may be due to their invasive nature and therefore lack of natural predators. Because the Red lionfish originated in the Indo-Pacific, locals had no previous knowledge of this species. However, now that handling techniques are more familiar, some local Bahamians are beginning to recognize Red lionfish as a good food source. Because Red lionfish spawn every four days and therefore have a very high reproduction rate, even the smallest catch by locals impacts their population. Despite this, the most probable reason for the decrease in Red lionfish population is that maximum carrying capacity was reached. As the Red lionfish population increased in South Eleuthera, competition for food and space may have caused the significant decrease.

The population abundance of the Queen triggerfish has proved to be fairly constant over this ongoing study, with the exception of the atypical data collected in 2007. However, their population should continue to be monitored to ensure its stability, especially since the Queen triggerfish is economically important to the Bahamas. Their vibrant colors attract many tourists to snorkel on the patch reefs and they have been used in the past as a fishing alternative to Nassau grouper when their numbers were dwindling.

The data supported the hypothesis for some of the key species, while was inconclusive for others. The increase in Nassau grouper populations is an example of how fishing regulations may have positive effects on species population abundance. However, this data is not conclusive enough to provide recommendations for future marine protected areas and/or fishing regulations in South Eleuthera, The Bahamas.