

# Visual Surveys of Species Populations in Patch Reefs in Eleuthera, The Bahamas.

Lizzie Ayoub, Damian Bleiberg, Aidan Dempsey, Katie Johnson, Hannah Jones, Annie Morris, Matt Dawson, Elyssa Longo



## Introduction

Patch reefs are isolated coral heads found in shallow water that provide habitat and serve as transitional zones for juvenile fish. These reefs are essential to The Bahamas because they promote and support both fishing and tourism, two major parts of the Bahamian economy. Currently, patch reefs are at risk from overfishing, physical destruction, and poor water quality. In 2000, the Bahamian government proposed 20% of the Bahamian coastline to be a designated as protected areas for marine species (Broad and Sanchirico, 2008).

Since 2003, the purpose of The Island School Patch Reef Research Project has been to track the abundances of six key species: Nassau grouper (*Epinephelus striatus*), black grouper (*Mycteroperca bonaci*), yellowtail snapper (*Ocyurus chrysurus*), red lionfish (*Pterois volitans*), queen triggerfish (*Balistes vetula*), and Caribbean spiny lobster (*Panulirus argus*). These key species were chosen based on their economic and ecological importance to The Bahamas.

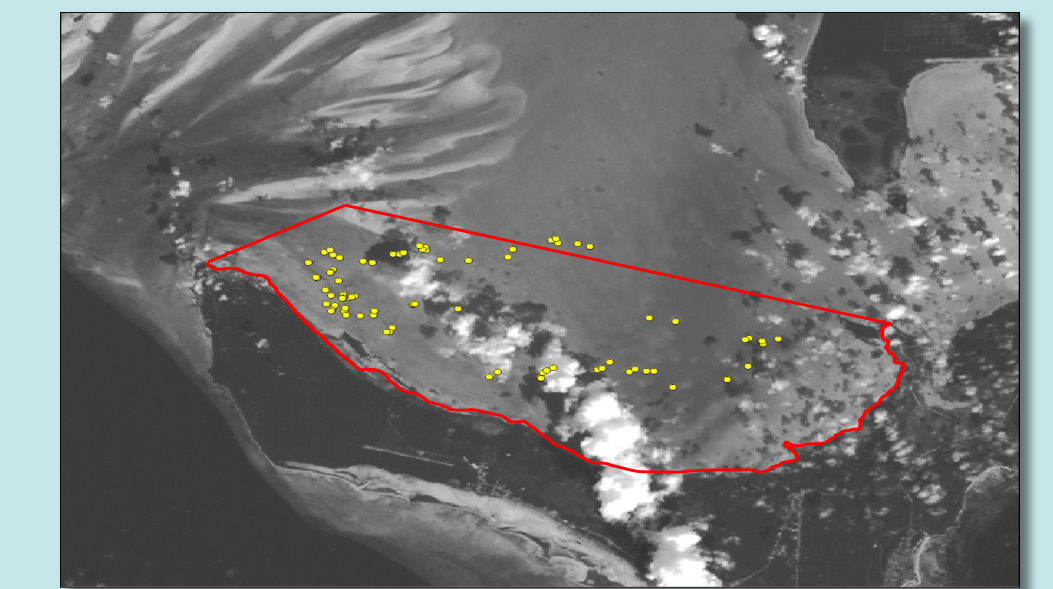


Figure 1-Dots indicate study sites within a proposed marine protected area in South Eleuthera.

## Discussion

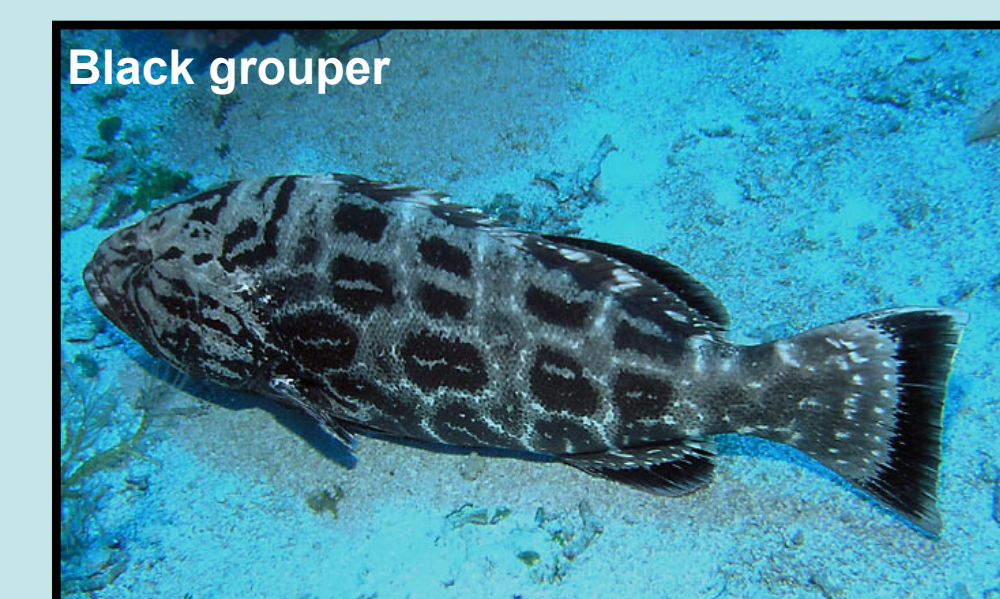
The results for yellowtail snapper, Caribbean spiny lobster and black grouper suggest that their populations fall within an expected range. The other key species showed statistical significance in data collection.

Nassau grouper have been studied since the Patch Reef Research Project began. In 2003, there was an average of 2.6 fish per site. The Nassau grouper population declined until 2006, reaching a low point of 0.7 fish per site. In 2006, the Bahamian government introduced a closed fishing season from December to February to coincide with the Nassau grouper breeding season. Since that time, the data shows that Nassau grouper populations have increased, reaching a high of 3.7 fish per site during the Spring 2011 semester. It was concluded that the fishing regulations played a role in the increase of Nassau grouper.

The data for red lionfish also showed statistical significance. In Spring 2007, there was a recorded 0.07 fish per site. This number increased until Fall 2008 when it reached a peak of 2.4 red lionfish per site. Red lionfish have since decreased, currently at about 1.1 fish per site. This decrease could be attributed to a loss of resources as well as an increase in local knowledge in recognizing that red lionfish are edible.

The last species that showed statistical significance was the queen triggerfish. Over the past seven years, less than one fish per site was found. However, in Spring 2007, their abundance level reached nearly 3.0 fish per site. This anomaly could be due to errors in data collection.

Education can lead to further preservation and the survival of marine species. Closed seasons are also important as seen with the increase in Nassau grouper populations.



## Methods

Several different techniques were used to collect accurate data. In the field, researchers completed visual surveys. Observed species were recorded in one of four categories: single (1), few (2-10), many (11-100), or abundant (100+). Specific population counts were taken for the six key species. In addition, all data was entered on Reef Environmental Education Foundation (REEF.org), an online scientific research database. The study consisted of visiting 22 of 80 pre-designated sites (Figure 1). These 22 sites were chosen based on which were most visited and researched in the past to add to data from previous semesters in order to have more accurate data collection.

An analysis of data (ANOVA) test was used to analyze collected data. This test compared the averages of data collected this semester to data collected by previous semesters. Data falling outside of an expected range was considered statistically significant.



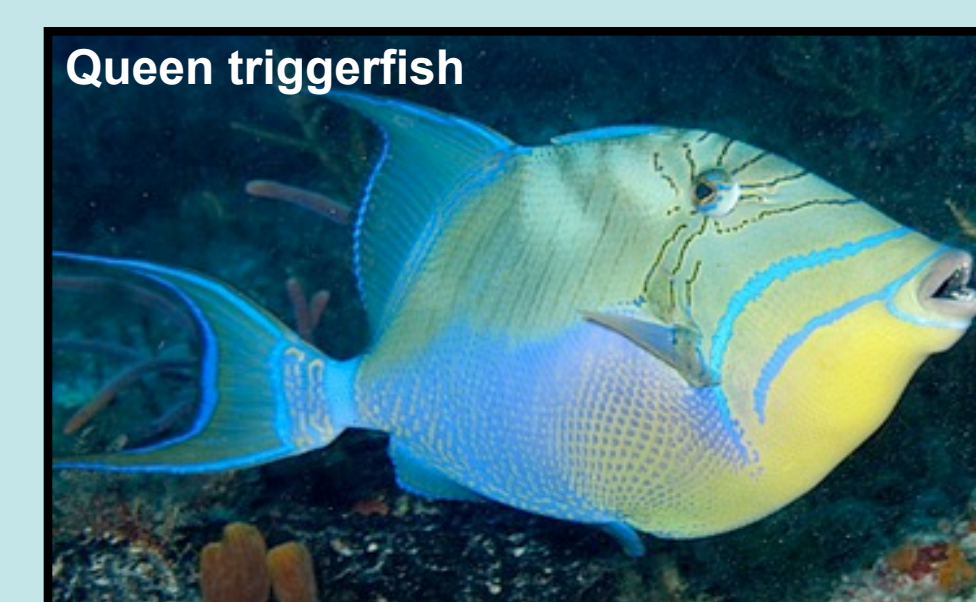
## Results

The results for the yellowtail snapper, Caribbean spiny lobster, and black grouper showed no statistical significance. The data for the other three key species showed statistical significance.

There was unexpected data for the queen triggerfish in Spring 2007. Over the last eight years the mean fish counts were below one per site, however in Spring 2007 the average was nearly three per site (Figure 2).

The Nassau grouper populations showed statistical significance in 2006. Since that time, abundance levels have increased. During the Spring 2011 semester, the increase has been statistically significant (Figure 3).

The patch reef research team has studied the red lionfish, an invasive species, beginning in 2007. In the decade since their arrival the red lionfish has become well established in the Caribbean (REEF, 2008). In the first one and a half years that red lionfish were researched, average fish counts went from zero to three per site. Although abundance levels have decreased, the peak in data in 2008 was statistically significant (Figure 4).



## Literature Cited

Broad, K., Sanchirico, J. Local perspectives on marine reserve creation in the Bahamas. July 16, 2008. *Ocean & Coastal Management*, 51-11.  
Reef Environmental Education Foundation (REEF). 2008. [www.reef.org/db/reports](http://www.reef.org/db/reports).  
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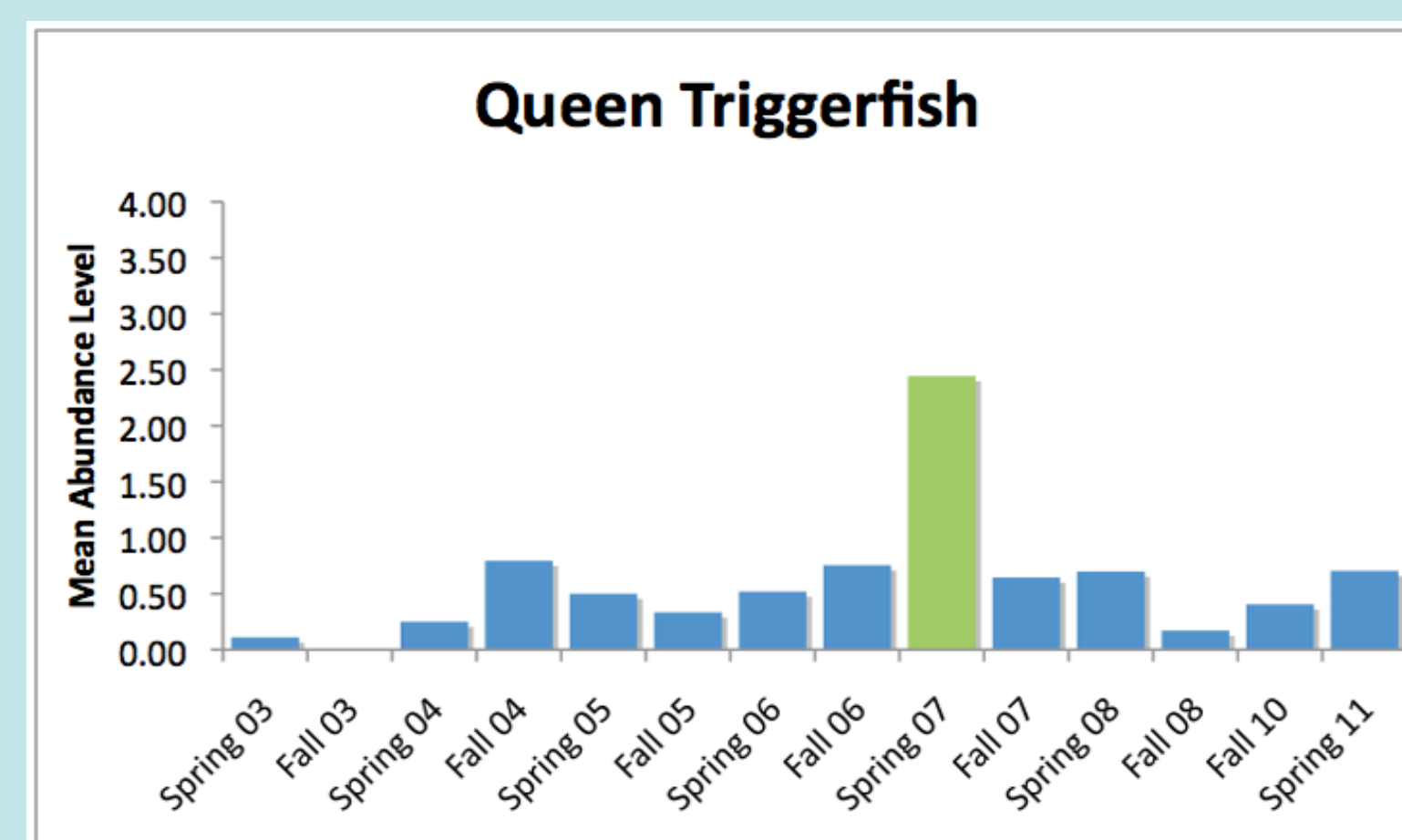


Figure 2-Average abundance of queen triggerfish.

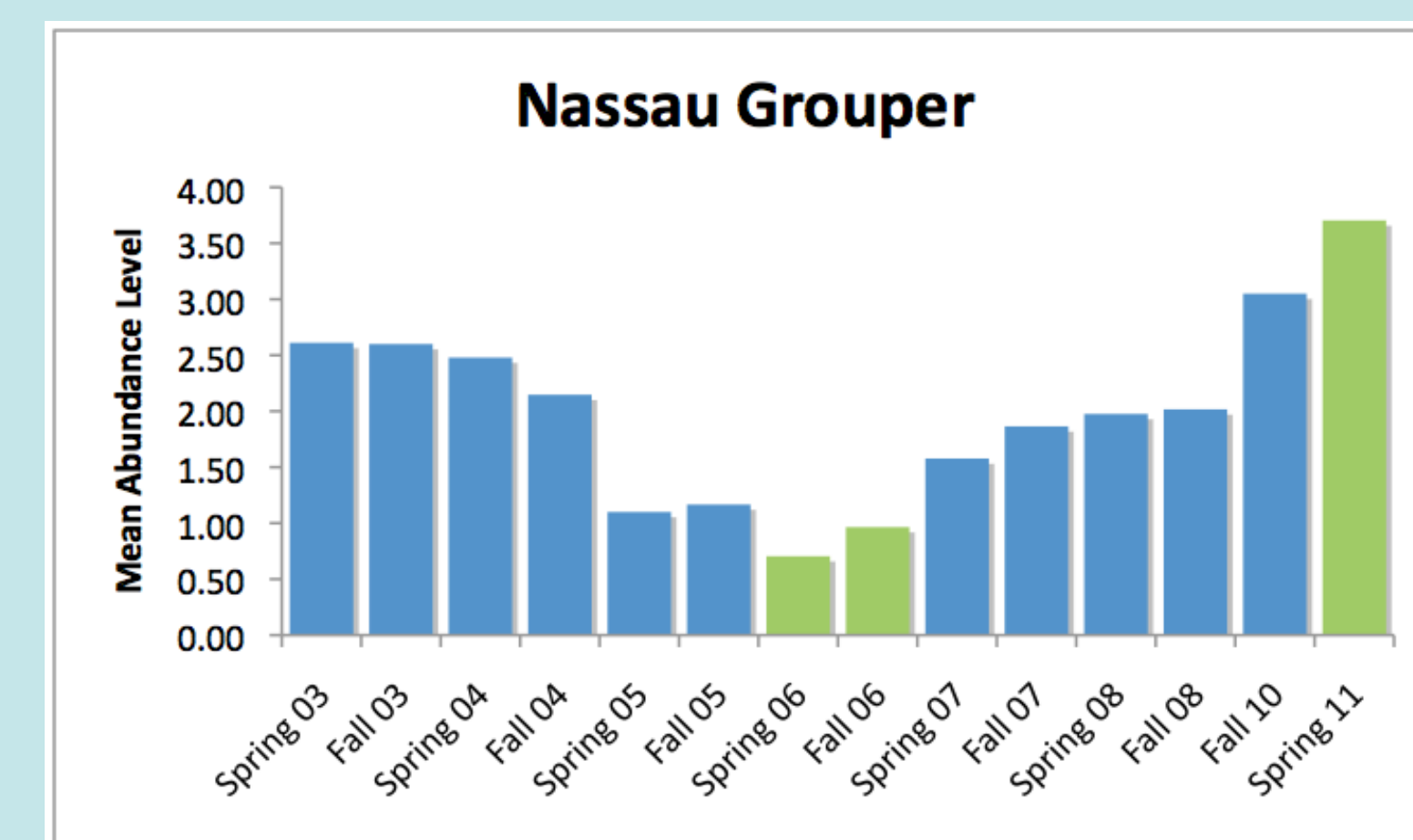


Figure 3-Average abundance of Nassau grouper.

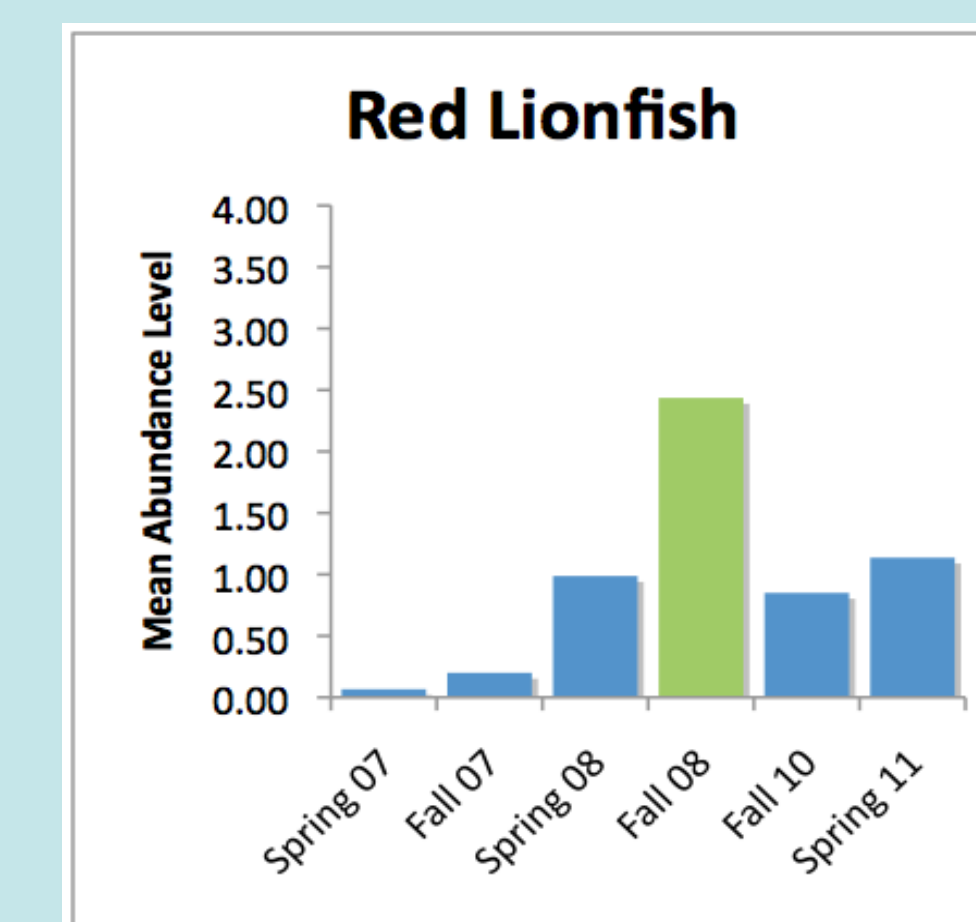


Figure 4-Average abundance of red lionfish.



■ Data outside an expected range  
■ Data within an expected range



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