

The Effects of Lionfish, *Pterois volitans*, on Spiny Lobster, *Palinurus argus*, condo displacement

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Introduction

Lionfish are an invasive species from the Indo-Pacific they were first sighted in The Bahamas in 2004. Since their invasion in The Bahamas, their population has grown exponentially they now inhabit reefs throughout the entire Caribbean. Lionfish have been so successful for numerous reasons such as their ability to consume anything that fits inside of their mouths. They are habitat generalist and are able to live in depths from one to a thousand feet. Additionally, they are prolific breeders and have the potential to lay up to 2 million eggs per year, and they have few natural predators in the Caribbean, with the exception of humans (Morris et al. 2009).

The Caribbean spiny lobster is The Bahamas main marine export and lobster fisheries in The Bahamas is worth 300 million dollars (Chavez, 2009). A study by Henderson and Cote in 2011, observed that when lionfish were present in fishing condos, structures used to aggregate lobster, there were fewer lobsters. Because of the lobster fisheries, economic significance to the Caribbean, the spring 2013 Island School Lionfish Research team investigated the potential displacement of lobster by lionfish from fishing condos. This semester, the effects lionfish of lobster displacement was further examined by comparing lobster interactions to a native predator, the graysby. The graysby was chosen because it is also abundant in the area, has similar feeding and habits as the lionfish.



Lobster



Graysby



Lionfish

Aim

To investigate the potential displacement of lobster from condos by the invasive lionfish in comparison to a native species.

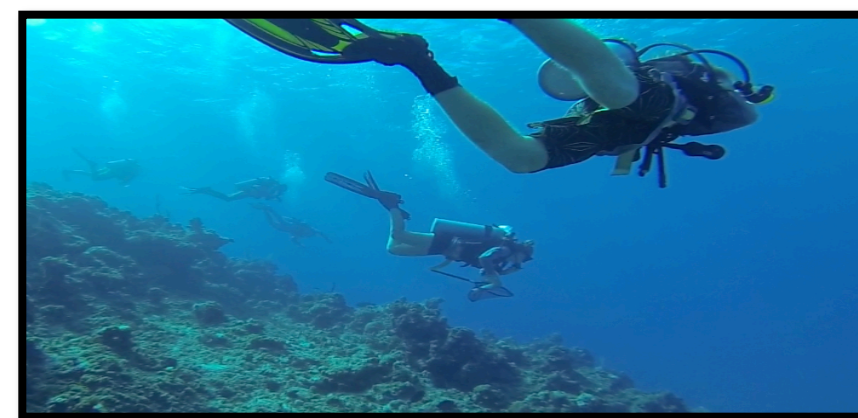
Methods

Social Science

To better understand the effects of the lionfish invasion on lobster displacement, local fisherman were interviewed, because they have a wealth of knowledge and personal experience.

Field Work

The mean abundance of lobster and lionfish on reefs were recorded on patch reefs surrounding Cape Eleuthera. (N=6). These surveys contribute to an ongoing abundance study started in 2003.



Diving in order to collect species



Using a net to catch graysby



Tickling out a lobster

Lab Work

Interactions between the lobster and lionfish/graysby were recorded. Video footage was analyzed from four hours of the day: dusk, dawn, mid-day and mid-night. The footage was then analyzed second by second noting behavior and location relative to the condo for each species.



Lobster in tank



Lobster and lionfish in tank



Research team working in lab

Results

Have you noticed a Decrease In your Lobster Catch Since the Lionfish Invasion?

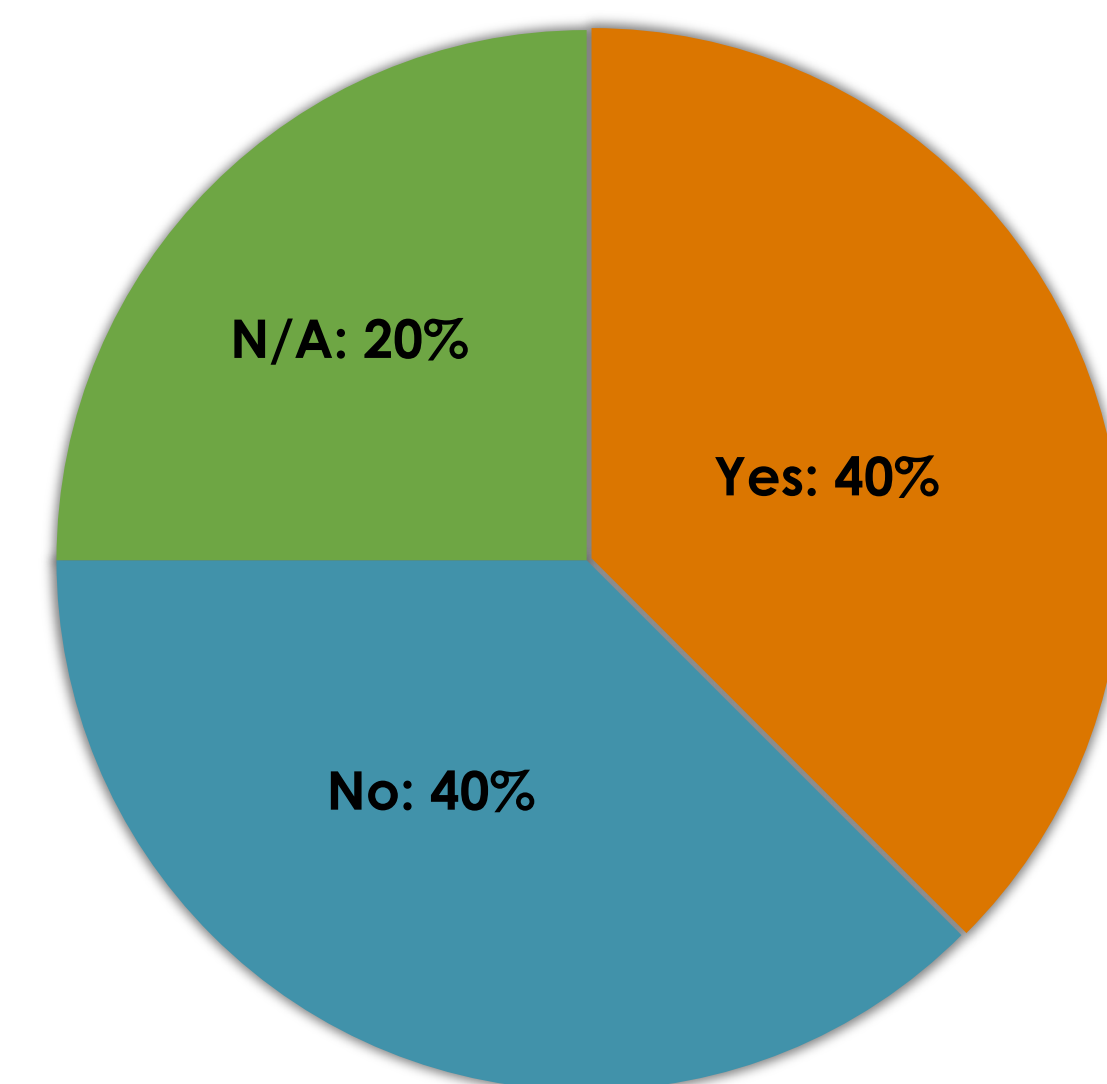


Figure 1a: The responses of fishermen when asked if they had noticed a decline in their lobster since the lionfish invasion. (N=10).

Would You Fish For Lionfish?

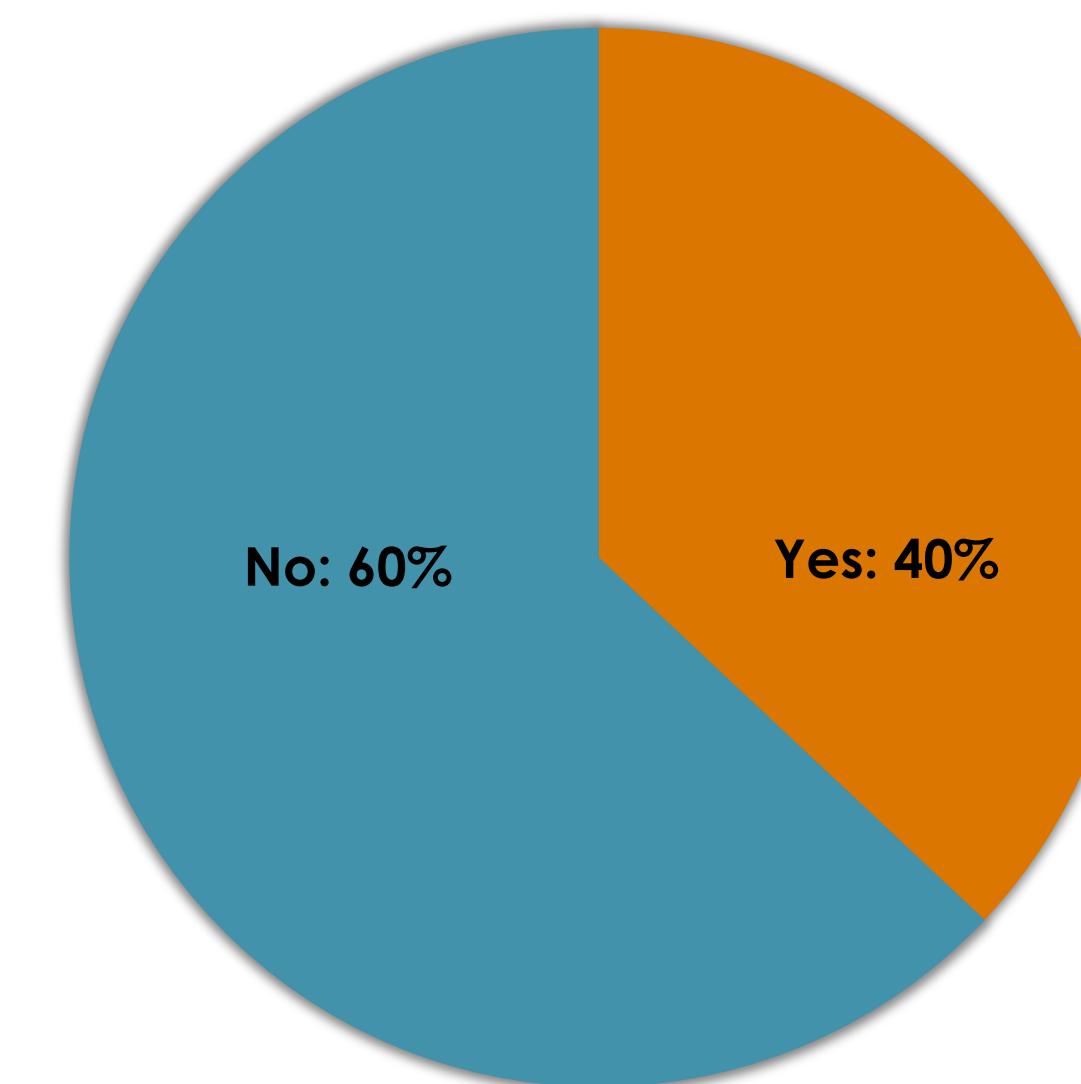


Figure 1b: The responses of fishermen when asked if they would fish for lionfish. (N=10).

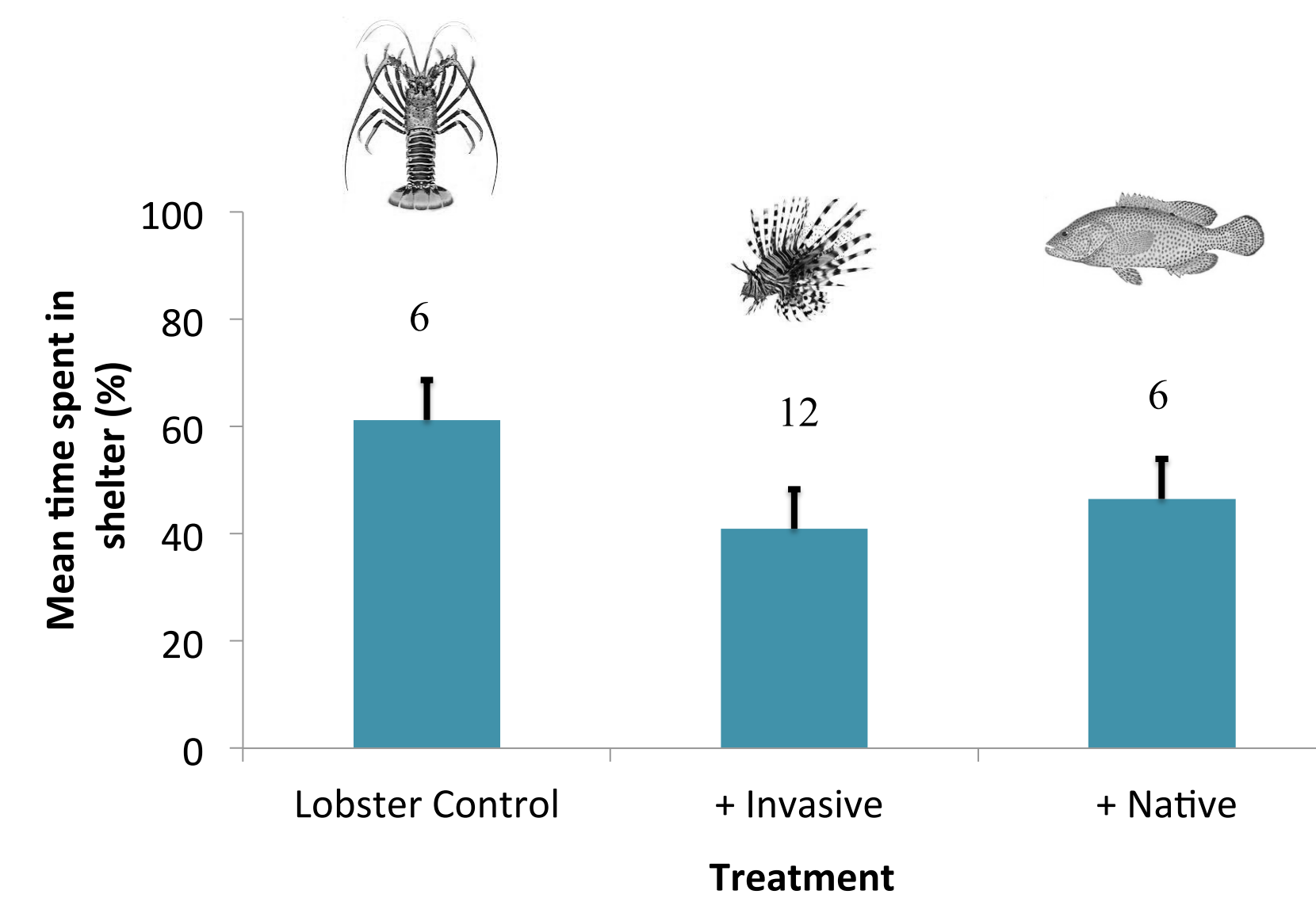


Figure 2a: Mean percentage time lobster spent in the shelter across treatments(+SE). The numbers on the bars represent the replication of trials run.

When both the invasive lionfish and the native graysby were present the lobster spent less time in the shelter.

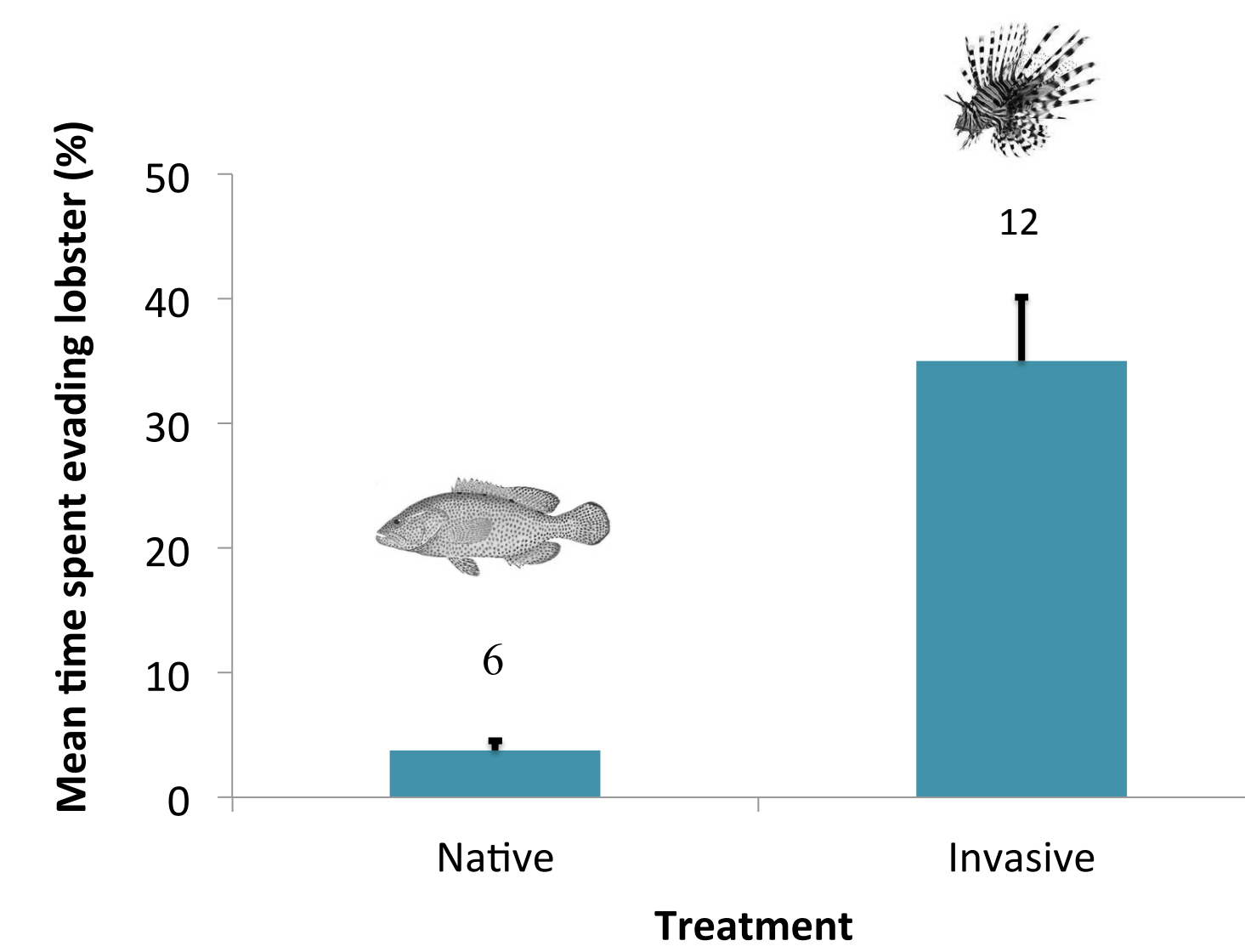


Figure 2b: Mean percentage time spent evading by lionfish and graysby after interacting with lobster (+SE). The numbers on the bars represent the replication of trials run.

Lionfish were much more reactive to lobster interactions than the graysby.

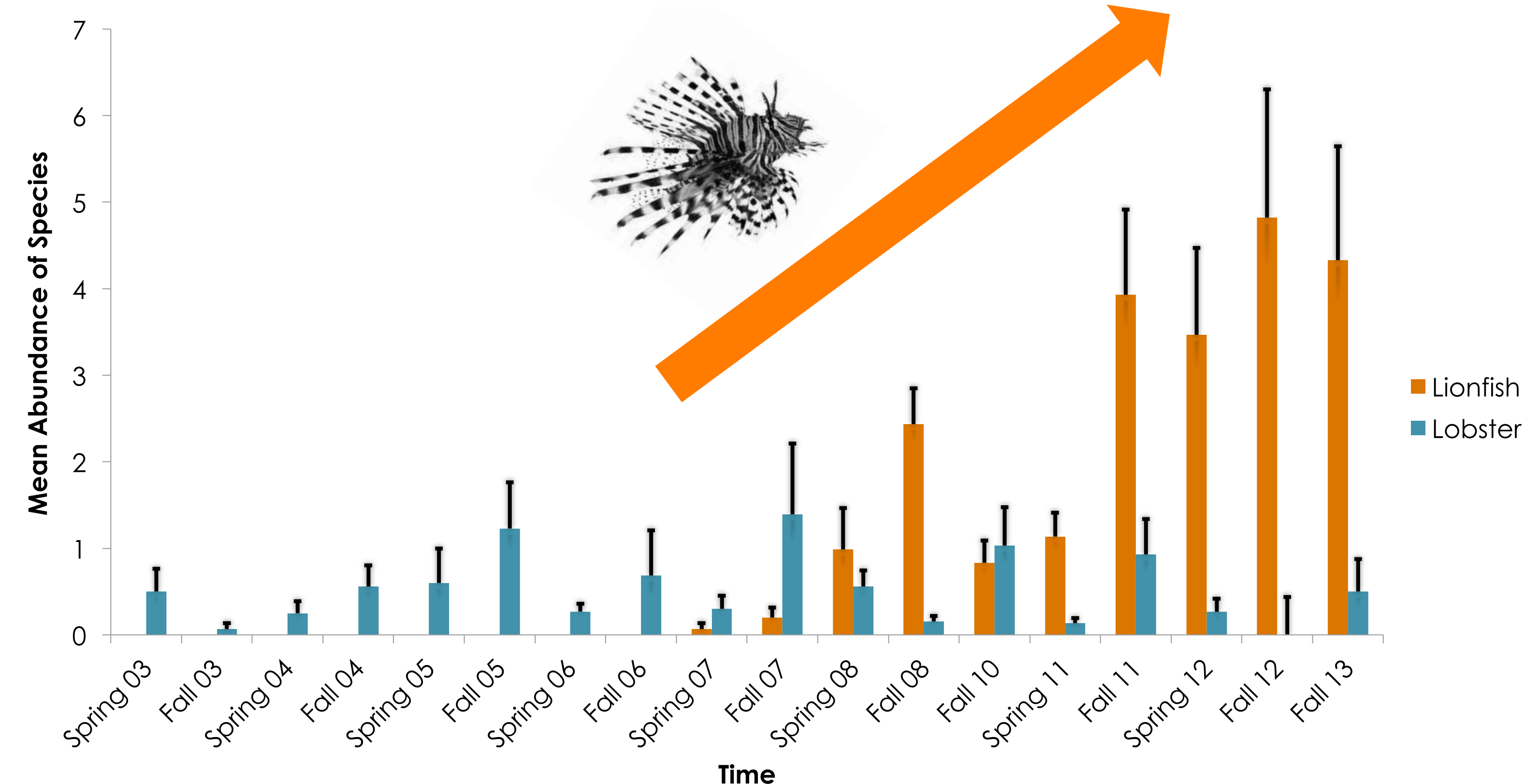


Figure 3: Long-term patch reef survey of the mean abundance of lobster and lionfish on patch reefs (+SE) (N=290).

The patch reef surveys of the past ten years shows that lobster abundance has stayed relatively stable and lionfish abundance has increased.

Discussion

In answer to the aim of this study, the invasive lionfish did cause lobster displacement from condos. However, similar results were observed in the graysby trials. Interestingly, graysby spent very little time evading the lobster post interaction in comparison to the lionfish. These results suggest a more discordant relationship between lobster and lionfish than between lobster and graysby. Patch reef surveys indicate that population decline is not responsible for lower lobster abundance in condos. Increasing lionfish abundance and dissonant behavior between lionfish and lobster suggest that lionfish are causing lobster displacement from condos.

The findings of this study have significant implications for the socioeconomics of countries dependent on the lobster industry, particularly The Bahamas. Thus, future studies should explore lobster displacement from condos further perhaps through shelter choice experiments and in-water observations. The development of the lionfish market should be a propriety as it would help negate the environmental and economic impacts of the invasive fish. The results from social science interviews suggest fishermen are still unwilling to fish for lionfish. Perhaps with more education and outreach these opinions can be changed.



Lobster on top of the shelter during a lab trial.



Lionfish entering a fishing condo

Citations

Chavéz A., E. 2009. Potential Production of the Caribbean Spiny Lobster (*Decapoda palinura*) Fisheries Crustaceana 82(11): 1393- 1412.
Henderson, E. B., I. M. Côté. 2011. Potential Effects of the Indo-Pacific Lionfish Invasion on the Bahamian Lobster Fishery. Caribbean Fisheries Institute 1-2.
Morris, J.A., Akins, J.L., Barse, A., Cerino, D., Freshwater, D.W., Green, S.J., Muñoz, R.C., Paris, C., and Whitfield, P.E. 2008. *Biology and Ecology of the Invasive Lionfishes, Pterois miles and Pterois volitans*. Gulf and Caribbean Fisheries Institute 61: 1-6.

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Research team heading out to collect data



Lobster caught in net, for use in lab experiment



Interview with local fisherman