Multi-directional Cameras as Tools to Quantify Biodiversity Around Fish Aggregation Devices

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Introduction

FAD – Fish Aggregation Device

This project focuses on using FADs as a scientific platform to understand pelagic species and the potential for usage of FADs as conservation tools.

- 50% of the world's tuna is caught using FADs
- FADs can range in composition from small natural objects to large manmade systems
- FADs are any ocean-borne object that aggregate fish
- FADs have been used throughout history as effective fishing tools

Since FADs are such effective fishing tools, this study was proposed to see if they can also be used as conservation tools.

There are a few issues connected to FADs including:

Lack of Regulation

- FADs are found worldwide throughout many oceans
- Anybody can deploy them at anytime, anywhere
- They can be made out of almost anything
- 81 to 121 thousand FADs were deployed last year (Chartier 2016)

Pollution

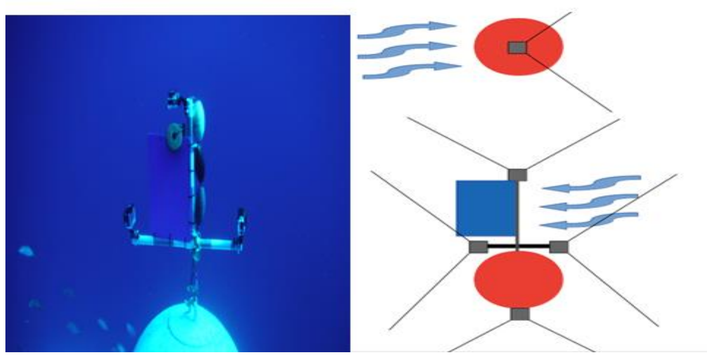
- FADs can be made out of unsustainable items, such as plastic bottles and old fishing nets
- This effects ecosystems worldwide as this introduces more plastic and other pollutants into the ocean

Bycatch

- Bycatch is when commercial fishermen pull in unwanted and untargeted species, such as turtles and sharks
- This results in physical harm of marine life, causes problems in the food chain, and decreases the population of fish (G. Moreno *et al*. 2015)

Hypothesis

It was hypothesized that a multi-directional camera system would increase the biodiversity that can be seen around Fish Aggregation Devices (FADs).

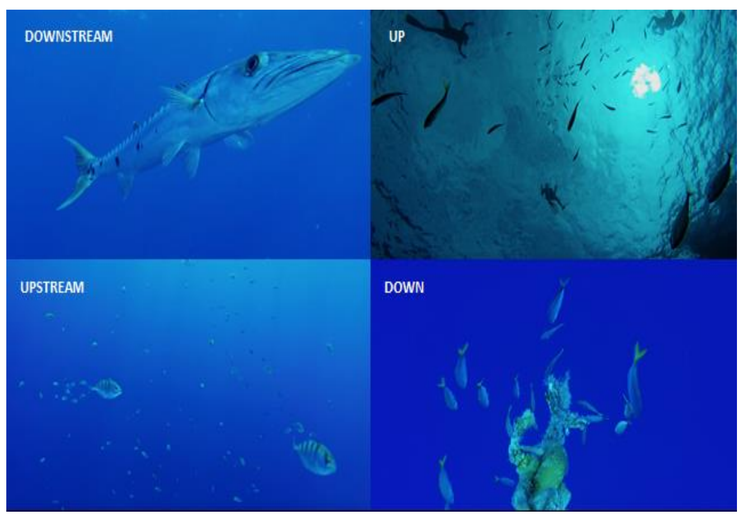


Methods

When first arriving at the FAD, a snorkel survey is conducted. Snorkelers swim over the FAD while counting the different species and individuals per species. This snorkel survey is very important because it helps us compare what the cameras record to what we physically see.

Camera rigs are then deployed by freediving down 30 feet to the FAD. The camera rig with three GoPros (one facing up, one facing downstream, and one facing upstream) is attached to the top of the FAD and the single camera is deployed on the bottom of the FAD facing down. The cameras record for about 90 minutes.

A transect survey is conducted in which people are stationed equidistant around the boat. Each person surveys a different direction. When any species is spotted the location and number of each species is recorded. Species observed include: flying fish, *Sargassum*, birds, sharks, and marine mammals.



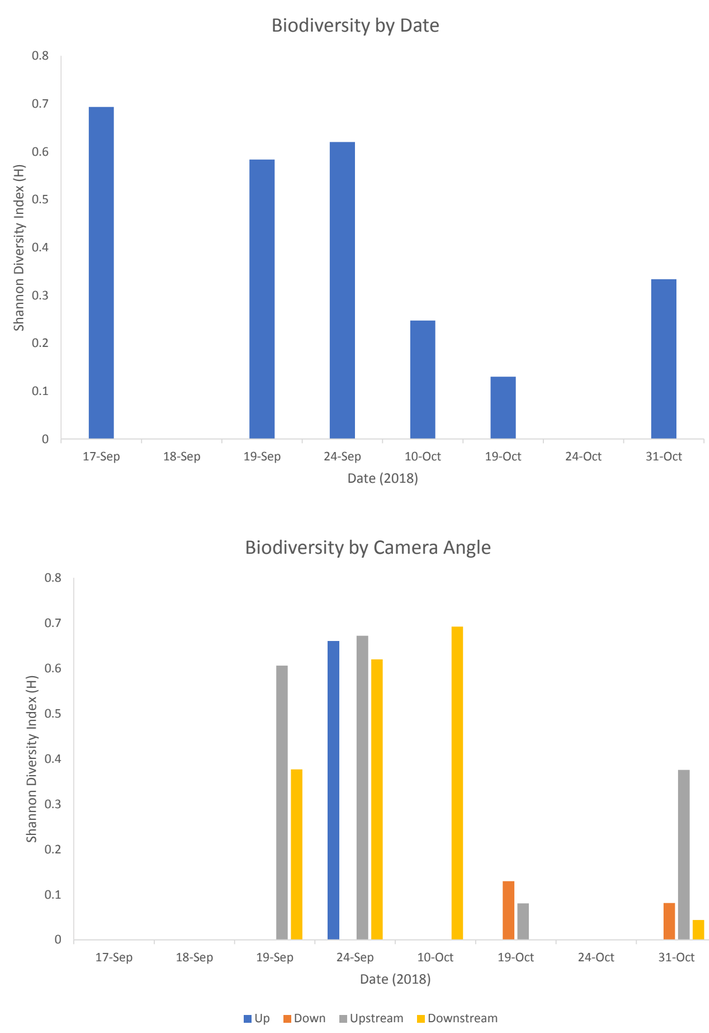
Results

By displaying the data by camera angle - as displayed in Figure 1 - it was determined that the upstream and downstream camera angles are the most effective in displaying high levels of biodiversity. Figure 2 displays the decrease in visible biodiversity due to seasonality, migration patterns, water temperature and other factors as the study progressed. On September 17th there was a large discrepancy in our data. According to Figure 1, September 17th had no biodiversity because each camera recorded only one species. Figure 2 however, states that September 17th had the highest level of biodiversity because all of the data, camera angles, and recorded species were combined.

Discussion

Camera angles with the highest biodiversity are downstream and upstream.

- FADs are 30 feet deep. Juvenile jacks typically stay level with the FAD at that depth
- Downstream and upstream camera angles look up and down the current which is used as a road for pelagic species to travel on
- As the ocean in the north gets colder, migratory species are coming south to find warmer water and some of these fish that cross through the Exuma Sound are attracted to the FAD
- This data is useful for greater EXERP research
- Data has furthered our ability to use FADs as conservation tools
- Given us insight into understanding the pelagic zone in the Exuma Sound



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