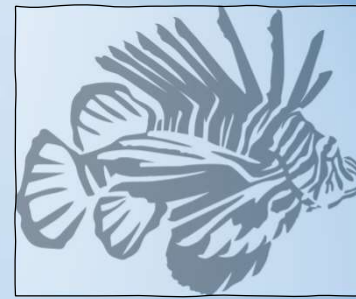



# Controlling Invasive Lionfish in the Caribbean: Can Divers be Part of the Solution?

## (They Most Certainly Can)



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### So, what's the problem?

Lionfish are predatory, reef-dwelling fish native to the Indo-Pacific region. They were introduced to the Caribbean as a result of human activity approximately 30 years ago and now range from Brazil to the East coast of the USA. Lionfish are a problematic invasive species because:

- They reproduce rapidly and in great numbers
- They consume large numbers of juvenile reef fish and crustaceans
- They face almost no threat from predation
- They are tough, adaptable and impossible to eradicate

However, they can be hunted. Typically, by divers using Hawaiian sling spears and plastic tubes for containment, as shown here. They're also delicious. Both hunting and consumption are increasingly popular.



### What did I set out to do?

Although lionfish will now remain in the Caribbean for as long as there are fish in the sea, the damage they cause can be, and is being limited by population control. I set out to quantify the effectiveness of these efforts around the Honduran island of Utila, where recreational scuba divers routinely hunt lionfish with spears, and the consumption of lionfish is commonplace.

I aimed to do this by collecting lionfish population data at various dive sites around the island to test the hypothesis that the busier sites (busier = more dive boats = more hunting pressure) would display lower lionfish populations than sites dived less frequently.

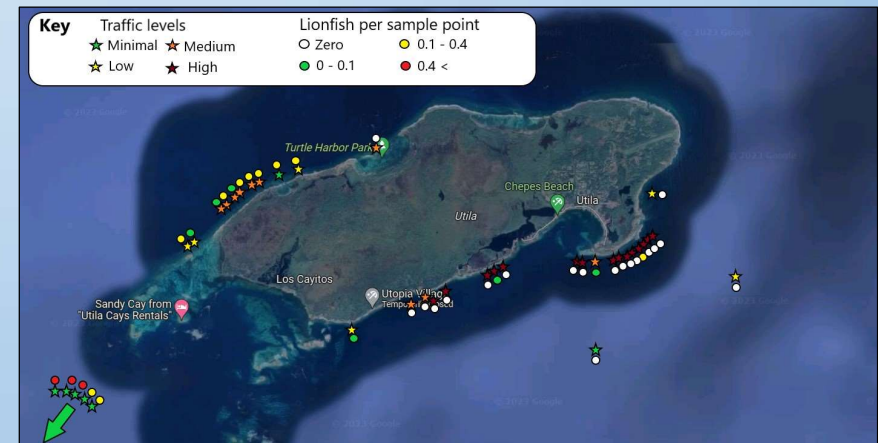
### And how did I do it?

By going diving! And by:

**Lionfish sampling** – On dives of 40-45 minutes, measurements were taken at 4-minute intervals. The number of lionfish within a radius of 4m was recorded (lionfish typically don't move very much).

**Dive site classification** – Local dive operators were surveyed and asked to provide the approximate number of visits per week to sites around the island. These values were then used to group sites into 'Minimal', 'Low', 'Medium', or 'High' traffic levels.

I then compared the average number of lionfish recorded per sample point between the different traffic levels. For example, if I took 10 samples and saw 2 lionfish in total, then I saw 0.2 lionfish per sample point. I was then able to produce the map below (the green arrow indicates that those 5 sites were further offshore).

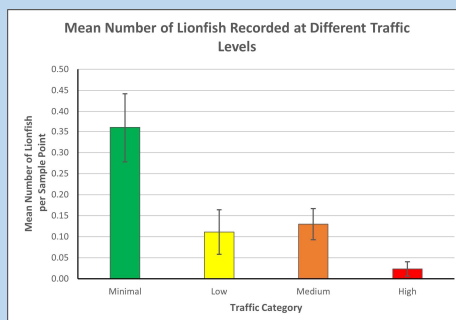


### What did the results show?

Results aligned loosely with the hypothesis - **there was a significant difference between the sites of minimal traffic and those of higher traffic levels, but no difference between the low-, medium- or high-traffic sites.** The graph shows a comparison of the mean number of lionfish recorded per sample point for each traffic level.

But the statistics don't tell the interesting story here!

**The key finding was...** there are very few lionfish left above 30m (the typical recreational depth limit), regardless of traffic level! Even the sites that are very rarely visited by dive operators were home to relatively few lionfish. This seems to be due to the activity of a small number of charter boat operators taking divers out specifically to hunt lionfish, as well as the organisation of 'Lionfish Derby's' by dive operators.



Additionally, I found anecdotal evidence from technical divers that large populations of lionfish persist at depths beyond 40m. Tech teams would often return with 20-30 lionfish after a 20-minute dive.

### What can we conclude?

- The data I collected supports the hypothesis that **recreational divers are effectively reducing populations of lionfish on the reefs around Utila.** This is the first time this has been quantified, to my knowledge.
- More interestingly, I found **generally low numbers of lionfish across the reefs,** and a clear decline in comparison to my previous visits in 2014 and 2017 (anecdotal).

### Some questions remain...

- What amount of hunting pressure might be necessary to restrict lionfish numbers to acceptable levels? And what might those levels be?
- What is the impact of those populations outside the depth limits of recreational divers? How might they affect broader ecology from these deeper reefs?

We hope that studies such as this can help to inform policy elsewhere in the region and encourage other territories to follow the model that has been successful for Utila. By enlisting the aid of recreational divers, the impact of invasive lionfish can be greatly reduced, helping to preserve these valuable ecosystems.