Problem Statement Worksheet (Hypothesis Formation)

How can we decrease the estimated Lionfish population by %25 in the next year by directing extraction teams to modeled environments favored by Lionfish in Puerto Rico and the USVI.

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1 Context

The Lionfish is an invasive species that threatens coral reefs and other important marine ecosystems. Invasive adult Lionfish feed mostly on fish and have few predators. The presence of a Lionfish on a reef can reduce native reef fishes drastically, and their prey tends to be normally consumed by commercially/recreationally important species. Additionally, the herbivore fish that clean algae from reefs are targeted by the Lionfish and the reef suffer further degradation. The Lionfish was first sighted in the USVI in 2009 and population continues today. Since extraction is a key goal, a data driven method to increase extraction is desired.

2 Criteria for success

Lionfish population estimate reduced by %25

3 Scope of solution space

This model is based on Puerto Rico and USVI data. The model may apply elsewhere but is not intended for such usage.

4 Constraints within solution space

Data accuracy is limited due to most Lionfish sightings happening near recreationally popular areas.
Further, a negative indication may not mean a lack of presence of Lionfish, but rather a lack of observed Lionfish.

5 Stakeholders to provide key insight

The Caribbean Oceanic Restoration and Education Foundation

6 Key data sources

https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=963#

https://coastalscience.noaa.gov/project/benthic-habitat-mapping-puerto-rico-virgin-islands/

H D E I P

Lionfish Reduction Model

Sometimes called the devil firefish, the lionfish has flourished in the Caribbean. It is a top level predator that competes with the native species for both food and space. It is known as a voracious hunter and has no known predators. Additionally, the lionfish is a prolific reproducer. Between 10,000 and 30000 unfertilized eggs can be released every four days, year round. Further, the spines of the lionfish contain a toxin that causes extreme pain, respiratory distress and paralysis; making handling dangerous. The lionfish is a formidable invasive species.

In the Caribbean, the lionfish is believed to inhabit nearly all marine environments in the warm water of the tropics. Eradication programs have been introduced to slow the spread of the species.

A model that predicts the probability of locating a lionfish in a specific habitat may be useful in increasing the eradication efforts. By directing extraction teams to high probability areas, we believe the dive trips may become more productive (i.e. more lionfish are removed per trip), or more informational.

Lionfish habitat identification and removal is a community problem and thus requires a community solution. Ideally, the model will be available via the Internet to all interested parties. Finally, since lionfish are a living species, the model ideally should allow online learning to adapt to new data to reflect new realities.