

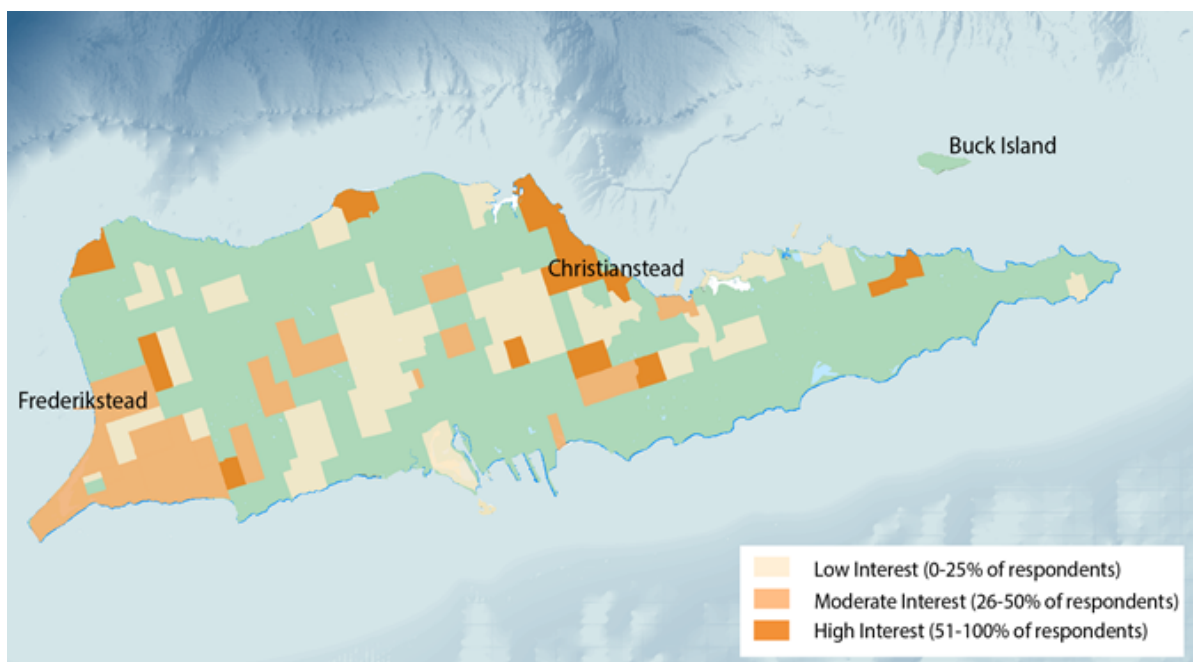
ASSESSING THE VIABILITY OF A COMMERCIAL LIONFISH FISHERY IN THE U.S. VIRGIN ISLANDS: A FACT SHEET FOR POLICY MAKERS

The Issue

Lionfish are an invasive fish the US Virgin Islands that breeds rapidly, can eat up to half its weight in reef fish each day, and has venomous spines. Because there are no natural predators to lionfish, control of this invasive species depends on human removal. This can be labor-intensive and expensive.

Simultaneously, management in the USVI expresses concerns about whether many fish species are being harvested sustainably and fishing communities question their ability to make a living fishing with reduced harvests.

These two problems create an oddly complementary set of dilemmas. Conservationists have had difficulties implementing a financially sustainable means of reducing lionfish population. Meanwhile, commercial fishers have been frustrated by the decline in traditional fisheries. The successful development of a market for lionfish could address both problems by providing an alternative fishing target and increased income potential for commercial fishermen while reducing pressure on wild stocks and on the coral reefs caused by both lionfish and fishing.

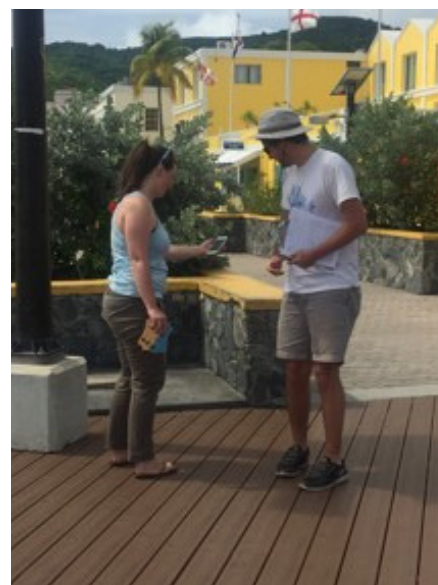


Spatial Distribution of Consumers Interested in Purchasing Lionfish

Our Research

A multi-disciplinary team (economics, anthropology, spatial analysis, policy analysis) approached both the supply and demand end of the potential lionfish fishery, using data gathering methods appropriate for each group during the summer of 2016:

- Local and Tourist Consumers – Intercept surveys were used to measure consumers’ knowledge of seafood and lionfish issues, interest in new food (lionfish), willingness to pay for lionfish, and their spatial and demographic characteristics.
- Restaurants – Structured, in-depth surveys enabled quantitative, qualitative, and economic data collection on issues similar to consumers while collecting additional insights into restaurant market dynamics.
- Fishermen – Fishermen were both interviewed and surveyed across St. Croix and St. Thomas, as well as observed through participant observation. We investigated fishing behavior, knowledge of and willingness to harvest lionfish, and their spatial and demographic characteristics.



Emory undergraduates conduct tourist intercept surveys in Christiansted

Table 1: Summary of Data Gathering Approaches and Populations

	Local Consumers	Tourist Consumers	Restaurants	Fishers	TOTAL
Intercept surveys	346	193	—	152	542
In-depth, structured interviews	—	—	61	—	61
In-depth, semi-structured interviews	—	—	—	15	15

We conducted four different types of analysis: Qualitative Analysis, Quantitative Analysis, Spatial Analysis, and Economic Analysis.

- Quantitative Analysis: Consists of analyzing information from larger numbers of observations to observe patterns of behavior that may not otherwise be apparent. This may include descriptive statistics, testing of the statistical significance of differences, and creation of statistical models (e.g., OLS, Logistic Regression).
- Qualitative Analysis: This encompasses a variety of methods used in the social sciences. This method focuses on gathering in-depth understanding of human behavior and the reasons for these actions. Qualitative analysis uses data from a variety of sources and seeks to understand the why and how, rather than simply measuring actions.
- Spatial Analysis: Conducting spatial analysis enables researchers to integrate physical, social, and biological research data and allows examination of issues spatially to identify patterns of activity and areas where certain activities are either more likely to succeed or be challenging. This sometimes-overlooked component has an important integrative role in analysis and presentation of information.
- Economic Analysis: This approach allows us to critically examine the fundamental drivers of a market from an economic perspective. Specifically, it allows us to calculate how much various types of consumers are willing to pay for lionfish, and thus estimate the financial feasibility of a market for lionfish.

Key Findings

By combining insights from the data analysis methods listed above, we were able to gain a clear understanding of the opportunities and challenges of creating a market for lionfish in the US Virgin Islands.

- Interest in consuming lionfish
- Among local consumers, nearly 41% were at least “a little” interested in trying lionfish. Local consumers distrust the lionfish because they thought they could be dangerous. However, many consumers were also curious about the fish or were familiar with people who recommended the fish. There is considerable spatial variability in consumers’ interest in lionfish.
- Among tourists, nearly 75% were at least “a little” interested in trying lionfish. Tourists mentioned barriers such as distrust of an unknown fish, with many saying that the fish name is frightening. However, while there is also a great lack of awareness, they are open to new fish and are seeking the exotic for their vacation
- Statistical models of local consumers and tourists willingness to try lionfish shows that people’s preference to eat fish in restaurant, their knowledge of lionfish, whether they considered lionfish safe to eat, and potential concern about fish poisoning in lionfish all increased their willingness to try lionfish. Notably not significant variables included income, education, age, knowing, and a preference for locally sourced seafood.
- Ultimately, people’s willingness to try (WTT) lionfish is driven by specific knowledge, rather than market demographics. This is fortunate, as it suggests that WTT can be increased through targeted consumer education about lionfish.
- Interest in harvesting lionfish
- The vast majority of fishermen had caught lionfish, but most of them were not intending to. Thus, finding and harvesting the lionfish is not an issue. Most fishermen also knew how to catch lionfish and had the necessary gear. However, only approximately half knew how to handle and prepare it for sale or consumption.
- Spatial analysis showed that fishermen perceive a nearly ubiquitous presence of lionfish in the waters they fish. Fishermen were also asked about the presence of Ciguatera (a potential toxin that bioaccumulates in seafood), and spatial analysis shows that fishermen perceived it as being located only in specific geographic areas. There an awareness and care among fishermen about Ciguatera, that provides important consumer safety. This is especially important because the location of Ciguatera hot-spots may change over time, so maps such as this cannot be relied upon long-term.
- A match between fishermen’s and consumers’ needs
- Economic analysis shows that with conservative estimates, there is compatibility between the price suppliers (fishermen) are willing to accept and the price that consumers are willing to pay. However, the proportion of consumers (particularly local consumers) who are actively interested in consuming lionfish is relatively low. Further analysis reveals that the consumers willingness to try lionfish is driven by specific knowledge about lionfish, rather than demographics.
- This research suggests that a robust market for lionfish in the U.S. Virgin Islands is certainly possible although not inevitable. The growth and success of such a market in the U.S. Virgin Islands (and possibly elsewhere throughout the Gulf and Caribbean region) may depend on further initiatives to increase consumer awareness and demand.

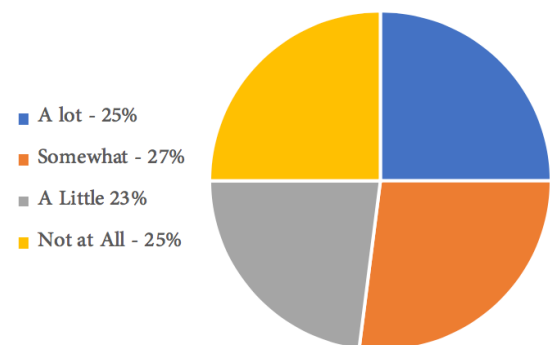
Policy Recommendations

- Because people’s willingness to try lionfish is largely motivated by their knowledge of lionfish, a government or non-profit led targeted consumer education campaign is likely to increase the size of the market, and thus its long-term viability.
- There is a need for education on lionfish handling and sales among both fishermen and restaurants. A sustained government or non-profit led education campaign for these groups would increase the supply of lionfish, and thus the long-term viability of a market.
- - Basic educational information about lionfish for USVI consumers and harvesters was developed by this project team, using the “Eat the Enemy” slogan and logo. This information is available at: <https://workingwaterfronts.org/projects/lionfish-in-the-us-virgin-islands/> **These materials can be used in future educational campaigns.**
- • Because of the presence of Ciguatera, the relationships between fishermen and consumers is important to food safety. These relationships should be encouraged by emphasizing to consumers the importance of purchasing fish from a knowledgeable, trusted fisherman. Because these fishermen are trusted, they can also be important messengers for consumer lionfish education campaigns.

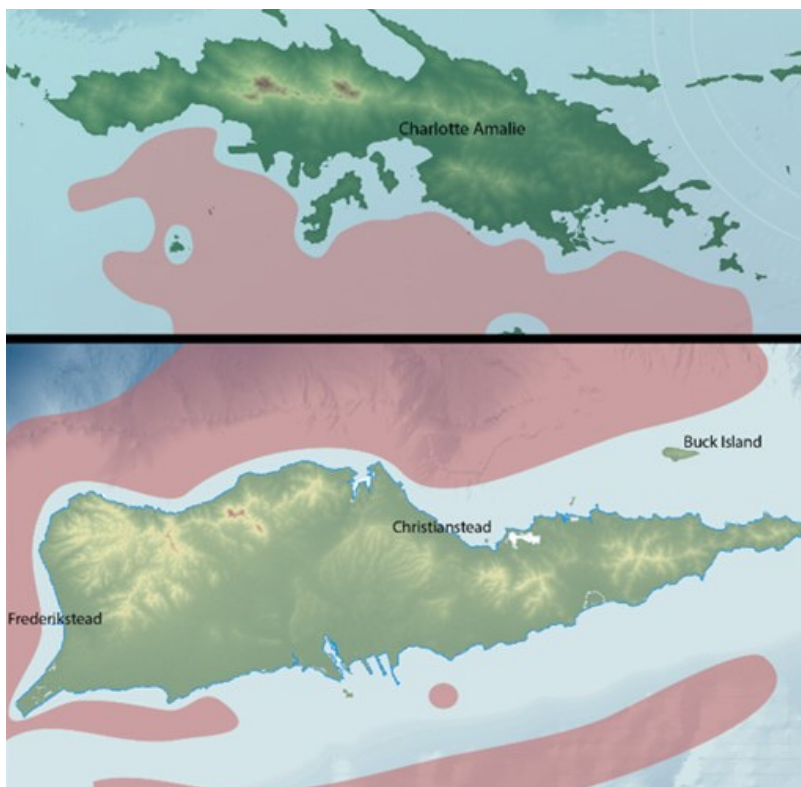
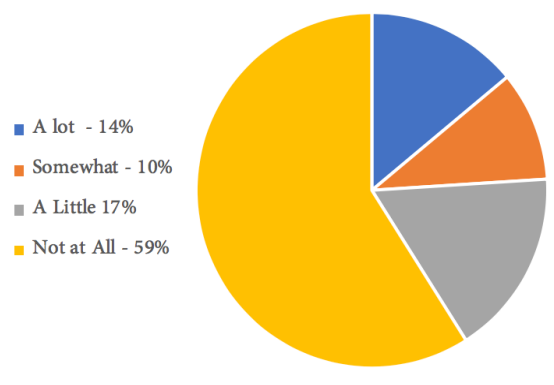


- "Eat the Enemy" Lionfish advertisement (above)
- A Comparison of Interests in Tourist and Consumers in Lionfish as food (below)

Tourist Interest in Trying Lionfish



Local Consumer Interest in Trying Lionfish



Fisherman-Reported Locations of Ciguatera

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