Obstacles and opportunities in developing commercial markets for invasive lionfish - lessons learnt from Belize

Obstacles et opportunités dans le development des marchés commerciaux pour le poisson lion invasive – leçons apprises en Belize

Obstáculos y oportunidades en el desarrollo de mercados comerciales para el pez león invasivo - lecciones aprendidas en Belice

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ABSTRACT

First officially recorded in Belize in 2008, by 2010 invasive lionfish were well established countrywide. Surveys in northern Belize in 2011 showed that demand for lionfish meat existed within the tourism sector, but no restaurant served lionfish regularly. A disconnect existed whereby fishers required a guaranteed market, and potential buyers needed a reliable supply. Identification of a buyer in the USA provided the surety needed for a fishing cooperative to invest in developing a central handling facility, providing support to buyers and suppliers. Media coverage following the first export prompted the largest fishing cooperative in the country to also purchase and stockpile fillet for bulk export, however this targets only the largest lionfish. Growth in the fledgling domestic market, which utilises smaller lionfish and increases market access for fishers, is now essential in intensifying lionfish removal efforts sufficiently to impact upon population growth and expansion.

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INTRODUCTION

It is estimated that 2,700 people currently actively work as fishers in Belize (James Azueta, Belize Fisheries Department, pers. comm.), with the total direct revenue of the fishing industry in 2011 estimated to be US$22 million (Harper *et al*., 2011). The Belize fishing industry is dominated by conch and lobster, comprising almost half of total catch (Zeller *et al*., 2011). The conch fishery is estimated to generate over US$3 million annually through domestic and international export markets, with higher-value lobster generating over US$8 million per year (Harper *et al*., 2011).

Both fisheries are considered to be fully- or over-exploited, with total reported landings steadily declining since the 1980s, despite increased fishing efforts (Gillet, 2003; Finch *et al*., 2008; Pomeroy and Goetze, 2003; Zeller *et al*., 2011). Populations within protected areas show declining trends, and are unlikely to recover without significant human intervention (Foley, 2011; Pomeroy and Goetze, 2003; Walker and Walker, 2009). Subsistence and artisanal fisheries for finfish, such as Nassau grouper and mutton snapper, are also recognised as being in decline. Local and international management interventions, with recorded localised successes (e.g., Carne, 2009), include size limits, seasonal closures, managed access and quotas.

Sarteneja Village, Corozal District, is the largest fishing community in Belize, where over 80% of households are directly dependent upon fishing as their primary source of income (SACD, 2009). Sartenejan fishing boats are active throughout the Belize Barrier Reef System (BBRS) (Walker and Walker, 2011), and the community's fishers are key stakeholders of six of Belize's nine Marine Reserves, as well as the Lighthouse Reef Atoll Management Unit (encompassing Half Moon Caye and Blue Hole Natural Monuments) and Corozal Bay Wildlife Sanctuary (Fedler, 2011; Walker and Walker, 2011; Wildtracks, 2009, 2010).

With such a large footprint across the entire BBRS and high dependency upon fishing, Sarteneja is particularly affected by depleted fish stocks. In order to prevent exceeding Belize's annual CITES quota, early seasonal closures for conch

fishing have occurred for two consecutive years (The Belize Times, 2012; News 5 Belize, 2013), forcing Sartenejan fishers to seek alternative sources of income.

Invasive lionfish were first recorded in Belize in 2008 (Searle *et al*., 2012). The consequences of the lionfish invasion, including significant loss of fish recruitment through predation (Albins and Hixon, 2008) and competitive exclusion of other native predators (Albins, 2013), combine with pre-existing stressors such as overfishing, to cause substantial changes to coral reef communities and national fisheries landings (Arias-González *et al*., 2011).

It has been estimated that monthly removal of 27% of the adult lionfish population is required to impact upon population growth and expansion (Morris *et al*., 2010). Further and even greater impact could be achieved through consistent targeting of juveniles (Arias-González *et al*., 2011; Morris *et al*., 2010).

Without action to stem the growth of lionfish populations, Belize's fishing industry stands to be severely impacted. Reduced fisheries revenue will have an impact on the livelihoods and local economy of communities dependent on fishing, as well as the national economy.

Lionfish population control and management must be addressed on a national scale, and market development, heralded as the most feasible means, is the primary recommendation of the Belize Lionfish Management Plan (Searle *et al*., 2012). A fully developed market for lionfish meat would provide a strong economic incentive to significantly increase the culling effort, whilst also acting as a substitute to less sustainable target species.

Utilising invasive lionfish as a food source provides an alternative fishery, alleviating pressures of overexploitation of native fish stocks and providing additional revenue for fishers. It also negates the need for the introduction of expensive management strategies to eradicate this potentially catastrophic invasion.

Growth in the lionfish industry in Belize is deemed socioeconomically viable for communities such as Sarteneja: traditionally freedivers, Sartenejan fishers targeting lionfish do not depend upon use of expensive SCUBA, utilising existing skills and equipment to engage with this alternative livelihood opportunity. With no seasonal closures or size limits, discard is reduced and fishers have access to a dependable target species year-round.

IMMEDIATE RESPONSE

In an immediate effort to prevent successful establishment of the species, campaigns encouraging dive operators and fishers to remove lionfish from the reef, with a US$25 cash reward for each individual caught, were implemented by the Belize Fisheries Department (Majil, 2010). Despite these early efforts, by 2010 lionfish were well established on the Belize Barrier Reef and in associated ecosystems, including estuaries and mangroves (Searle *et al*., 2012).

In 2010, local NGO Ecomar, through the National Coral Reef Monitoring Network, established the Belize Lionfish Project, and coordinated the "Belize Bahamas Fishermen Exchange", outreach in coastal communities countrywide, and monthly lionfish tournaments, which saw 8,000 lionfish being removed from Belizean reefs (Searle *et al*., 2012).

MARKET DEVELOPMENT

In 2011, Blue Ventures began holding regular lionfish safe handling demonstrations and taster events in Sarteneja. At every event, surveys were conducted to determine the public's awareness of invasive lionfish, flavour, and willingness to buy for home consumption.

In response to outreach events, a restaurant in Sarteneja began serving lionfish in 2012. Based at a hotel, their primary customers were tourists and expatriates. Similar stories of restaurants making individual actions across Belize began to surface, providing evidence that demand existed, though it was low and seasonal.

With growing evidence that the greatest demand lay within the tourism sector, surveys were expanded to Belize tourism hub, San Pedro, in 2012. Questionnaires were also modified for restaurateurs and chefs, to determine barriers and opportunities for lionfish purchase and sale.

Results of questionnaires showed that while the general public were aware of the lionfish invasion and liked the taste of the meat, the domestic market was unwilling to switch to lionfish consumption above other species. Limited demand for lionfish meat existed within the tourism sector, but no restaurant served lionfish regularly.

Despite this, fishers were keen to develop a lionfish market. Given the conch industry had closed months early for two consecutive years, the demand for an alternative, sustainable target species was growing.

A disconnect existed between fishers that wanted a guaranteed market, and potential buyers wanting a reliable supply. It became clear that a fully-certified central handling facility was required to provide support for both suppliers and buyers, however no one was willing to risk investment in such upgrades until year-round supply was secured.

A meeting that led to the identification of a buyer in the USA, Traditional Fisheries, coincided with a representative the National Fisherman's Cooperative approaching Blue Ventures to discuss market potential for lionfish at a taster event. Unfortunately, the National Fisherman's Cooperative withdrew from engaging in the lionfish market, concerned of investing in an undeveloped market.

Meanwhile, the lionfish population continued to grow, as did awareness of potential consumers and Belizean fishers, as well as the demand from Traditional Fisheries. A guaranteed export market provided the necessary surety to encourage the Placencia Producers Cooperative Society Limited to upgrade their processing facility to meet strict export requirements.

Media coverage following the first export of lionfish, which was coupled with the Placencia annual lionfish tournament, raised the profile of the issue nationally. Shortly after, a the largest fishing cooperative in Belize, Northern Fisherman's Cooperative, began to stockpile lionfish for bulk export. Furthermore, a limited domestic demand now existed, and some families in Sarteneja started to use lionfish too small for export in home cooking.

As more fishers sold lionfish to the Northern Fisherman's Cooperative for export, the availability of small lionfish fillets in Sarteneja grew and it is now readily available at restaurants serving locals and tourists alike.

LOOKING FORWARDS: OBSTACLES AND OPPORTUNITIES

Supply is still limited in tourist hub Placencia, where domestic demand is greatest. With few Sartenejan fishers delivering seafood to Placencia, it is clear that safe handling and outreach events targeting local fishers in southern Belize are required to fulfil opportunities in lionfish markets nationally.

Present demand for lionfish meat is dominated by the tourism sector and export to the USA. With international export demand for fillets greater than 3 ounces, combined with prohibitive export costs for fresh fish, the future in lionfish export is through bulk export of frozen fillet from the largest fish. However, to fully engage with this market, ciguatera toxicity tests must be performed with favourable results.

While lionfish exports are an important first step, this targets only the largest individuals, requiring a greater search effort and therefore less attractive for fishers. Growth in the domestic market for lionfish, which utilises smaller lionfish and increases market access for fishers, will be essential in intensifying lionfish removal efforts sufficiently to have a marked impact upon population growth and expansion. Opportunities to develop value-added lionfish products in Belize, particularly those with a potential for utilising small individuals such as reconstituted fish burgers or cat food, are as yet unexplored.

Although Belize's lionfish industry is still in its fledgling stages, Sartenejan fishers are confident in handling the fish, and domestic demand continues to grow. Belizean dishes, such as ceviche and panades, match perfectly with lionfish texture and taste. Whole, fried lionfish is also a suitable alternative as an accompaniment to rice and beans. The successes in Sarteneja demonstrate the potential for a national domestic lionfish market.

Growth in the domestic market for lionfish, which utilises smaller lionfish and increases market access for fishers, will be essential in intensifying lionfish removal efforts sufficiently to have a marked impact upon population growth and expansion.

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