

A Note on Lionfish Removals in St. Thomas/St. John, U.S. Virgin Islands

Una Nota sobre Mudanzas de Lionfish en St. Thomas / St. John, Islas Vírgenes de los Estados Unidos

Une Note sur les Déménagements de Lionfish à St. Thomas / St. John, Îles Vierges Américaines

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ABSTRACT

Small individuals of the invasive lionfish first made an appearance in St. Thomas' plastic lobster traps with 2.5 mm gaps between slats in late 2009. Larger individuals which could be retained in fish traps (with 5.9 mm mesh size) were not present until mid-2010. By 2012 they were the 19th most common species caught in a trapping study. Catch per Unit effort values from that study and from one of the project fishermen indicate that fish and lobster trap fishermen are removing between 10 and 12,000 lionfish annually. Removal by sport divers has been reported since 2010. Sport Divers are currently removing between 1,200 and 3,000 lionfish annually.

KEYWORDS: Lionfish, commercial fishery, sport divers, trap selectivity

INTRODUCTION

Invasion of Atlantic waters by lionfish (*Pterois volitans*) has been well documented and has led to attempted control efforts throughout their range. Modeling of potential control measures (Barbour et al. 2011) has suggested that removal rates between 35 and 65% would be required in order to create recruitment overfishing but that lionfish would return to 90% of pre-control levels within six years. They conclude that "complete eradication of lionfish through fishing is unlikely, and substantial reduction of adult abundance will require a long-term commitment and may be feasible only in small, localized areas where annual exploitation can be intense over multiple consecutive years"...

Small individuals of the invasive lionfish first made an appearance in St. Thomas' plastic lobster traps in 2009. These traps utilize 2.5 cm gaps between slats (Figure 1). Larger individuals, which could be retained in fish traps affixed with 5.9 cm mesh size, were not present until mid-2010. Thereafter, they continued to increase in numbers and were caught in fish traps throughout the shelf area from the south eastern border with the British Virgin Islands to north of Culebra island.

In the context of lionfish retention, fish traps are relatively non-selective (Figure 2). Fish caught in our escape vent study (Olsen et al. 2012) ranged from 172 mm total length (TL), just under the size at first reproduction (175 mm according to Gardner et al. 2015), to 372 mm TL although average size has clearly been increasing since their first arrival in the fishery. Fish trap selectivity was analyzed during the trap vent project, using the equation:

$$S = 1/(1 + \exp(-\alpha(L_i - L_{50}))) \quad (1)$$



Figure 1. Plastic lobster trap where lionfish first appeared in St. Thomas.



Figure 2. Gregory Ledee with a single days' catch of 95 lionfish.

- i) Where S is Selectivity and a and L_{50} are calculated iteratively via nonlinear regression. From the non-linear model (Proc NLIN in SAS) with known values of size class and percent of the sampled population for that size class. The output was estimates of both parameters, which were then used within the selectivity equation to estimate size selectivity for each size class and particularly the size class at which selectivity peaked.
- ii) L_{50} is the length at which 50% of the population is retained by the gear. It was calculated after the method of Quinn and Deriso (Equation 1). This analysis included both catch and bycatch species.
- iii) L_{100} is the length at full recruitment and is simply the size-frequency bin with maximum retention frequency and represents the inflection point between increasing frequencies and decreasing frequencies. L_{100} was 300 mm TL in the trap vent study.

Initially, lionfish harvested from the waters surrounding St. Thomas were reported to be highly ciguatoxic (Robertson, et al. 2014). Subsequent analysis indicated that the degree of toxicity among a range of finfish species, including lionfish, was not uniform throughout the shelf (Loeffler et al., *In preparation*). Initially, fishermen generally did not sell lionfish but instead killed them before dumping them overboard. Currently fishermen regularly report daily landings of 50-100 lionfish (Figure 2) and a limited market has developed where lionfish are selling directly to restaurants for \$10/lb. (Ruth Gomez, Director, Virgin Islands Division of Fish and Wildlife, *Personal communication*).

Sport divers have been reporting lionfish sightings in the Virgin Islands through the Caribbean Restoration and Education Foundation website since 2010 (Figures 4 and 5) (K. Edwards, *Personal communication*, 2017). The first report in the CORE data base was June 5, 2010 in St. Thomas and July 5, 2010 in St. Croix. Sport divers report

landing between 1273 to 3059 lionfish from the northern islands and 400 - 2035 from St. Croix each year from 2013 to 2016 (*Caribbean Oceanic Restoration & Education Foundation* <http://www.corevi.org/submit.html>)

During 2008 - 2012 the St. Thomas Fishermen's Association was carrying out a project to develop escape vents for release of bycatch from fish traps, which involved direct sampling of over 3500 fish trap hauls during 406 fishing trips between 2008 and 2014 (Olsen, et al. 2012). Lionfish first appeared in our study traps on April 7, 2011 and continued to increase in numbers, becoming the 19th most common species (of 112 different species caught) a year later. The average catch of lionfish per trap haul in the study traps during 2011 - 2012 was 0.092/trap haul.

One of the project fisherman (and co-author) also kept records of lionfish caught in his fish and lobster traps between July 2011 and March 2012 (Table 1). The average catch of lionfish per trap haul in his traps was 0.132 lionfish per trap haul for fish traps (7,400 trap hauls) and 0.034 lionfish per trap haul for lobster traps (4,578 trap hauls).

The Southeast Fisheries Science Center (National Marine Fisheries Service) reports that St. Thomas/St. John fishermen hauled an average of 80,273 fish traps and 54,689 lobster traps annually between July 2011 and August 2016 (Table 1). Catch per unit effort values from these two sources were multiplied by the average number of reported trap hauls to obtain an estimate of the total numbers of lionfish captured in the trap fisheries. These extrapolations estimate that St. Thomas/St. John fishermen removed between 7,385 and 10,596 lionfish in their fish traps and 1,859 in their lobster traps each year during this period (Table 2).

LITERATURE CITED

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Table 1. Total St. Thomas annual trap hauls (2012-2015) from NMFS Southeast Fisheries Science Center.

Year	Fish Trap Hauls	LobsterTrap Hauls
2012	86,499	57,179
2013	76,819	53,397
2014	81,240	49,301
2015	76,532	58,877
Average	80,273	54,689

Table 2. CPUE (Lionfish/Trap Haul) and extrapolated total catch numbers from St. Thomas Trap Fisheries.

	Lionfish/Trap Haul)		Mean Hauls/yr	Extrapolated Total Catch
	Trap Hauls	STFA (CPUE) ¹ DB (CPUE)		
Fish Traps				
DB Hauls	6,500	-	0.132	10,596
STFA Hauls (2011-12)	2,086	0.092	-	7,385
Lobster Traps				
DB Lobster Trap Hauls ²	4,578	-	0.034	1869

¹STFA Vent Trap Study; ²DB Logbook; ³SEFSC Statistics

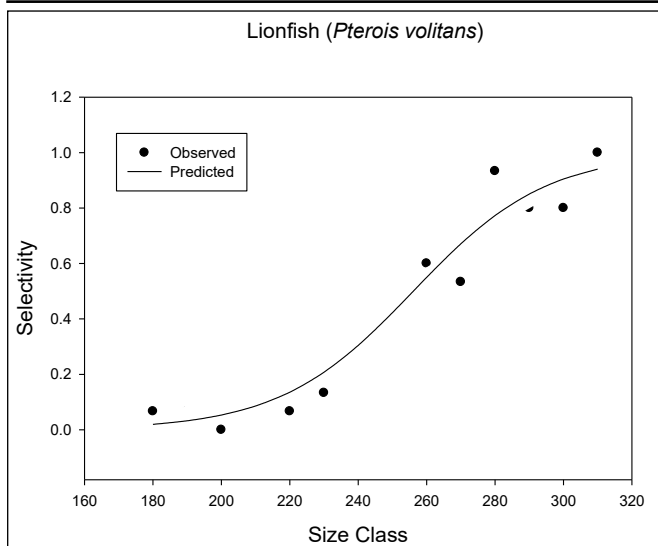


Figure 3. Selectivity of St. Thomas fish traps for lionfish.

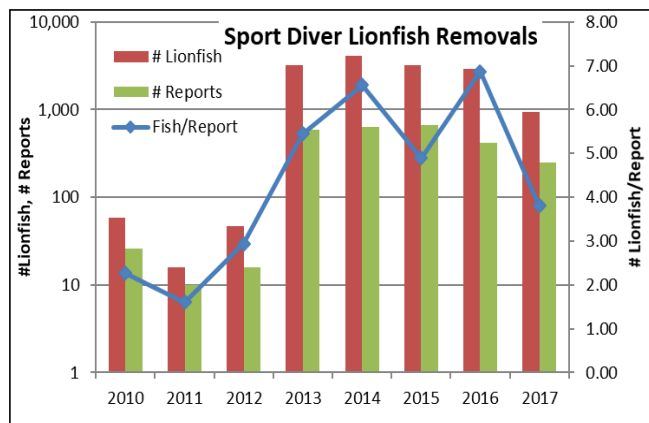


Figure 4. Reported Lionfish removals by sport divers (CORE 2017).

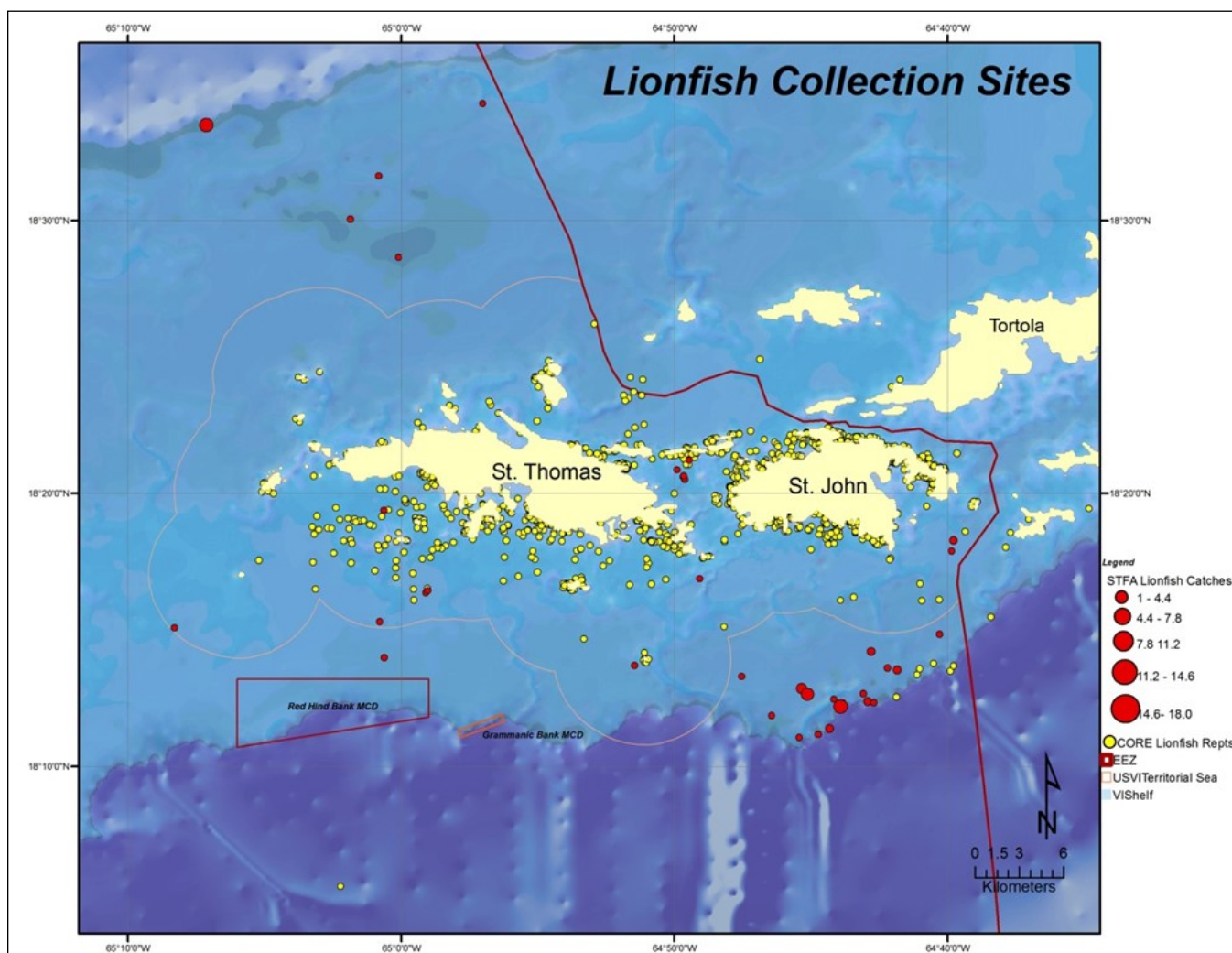


Figure 5. Location of lionfish removals.