

The Effectiveness of Small-scale Lionfish Removals in Puerto Rico

La Efectividad de Pequeña Escala Lionfish Mudanzas en Puerto Rico

L'efficacité de la Petite Lionfish Déménagement à Porto Rico

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EXTENDED ABSTRACT

Introduction

Lionfish removals (i.e. derbies and tournaments) have become an increasingly popular form of population control in various regions of their invaded range. Recent studies have indicated their effectiveness (Frazer et al. 2012, de León et al. 2013, Côté et al. 2014). In Puerto Rico, there are currently no well-organized lionfish removals at the large scale, but the dive industry and local fisherman have been very effective at reducing lionfish densities on near shore reefs. Our study sought to design and implement a small-scale approach to the popular removal method, in an attempt to assess effectiveness of targeted removals utilizing minimal effort and limited funding.

Materials and Methods

Study Site — The study was conducted on Cayo Pelotas in La Parguera from May 2013 to June 2014. The site was approximately 1.2 km in length with a maximum depth of 18 m. The study area was partitioned into three removal regions and two control regions for standardizing surveys and removals.

Sampling & Experimental Design — Prior to the experimental removals, underwater visual census (UVC) was utilized to assess the density of lionfish. This procedure was conducted in the removal regions, and the controls, for a Before-After-Control-Impact (BACI) design and carried out for 1, 3, 6, 9, and 12 months after the removal. Transects of 25 x 3 m were placed parallel to the reef crest, with approximately 3 - 5 m in between each transect (n = 52 per month sampled) with 15 minutes spent surveying for lionfish on each transect. The total area surveyed was 4,000 m². Thirteen lionfish were observed in the removal area prior to the removals.

Removal Design — The removal spanned a one-month period (June 2013), with three non-consecutive removal events on Saturday mornings. Volunteers of experienced lionfish spearfishermen were procured through an “invite-only” method to maximize effort. A total of 20 divers participated, with a daily count of 10 - 12 divers per removal event. As an incentive, each diver received a spearfishing kit which included: 1.2m pole spear, a collection bag, gloves, underwater flashlight and spine clippers. All divers used the same pole spear throughout the removals. Divers were dropped as a pair team into one of each of the three removal regions, using the permanent line marker on the reef to confirm they had covered all areas in their zone. Divers hunted for approximately 60 - 90 minutes, roving between their boundaries and from depths of 3-18m, covering approximately 6,000 m². After each removal day, a simplified transect survey was employed to count the remaining lionfish in the removal area to assess progress toward population reduction and to calculate catch-per-unit-effort (CPUE) per removal event.

Results

Twenty-two lionfish were removed from Cayo Pelotas during the removals. One year post-removal, ten lionfish were observed. The CPUE decreased after each removal event (June 1: 3.54, June 15: 1, June 29: 0.2) and lionfish re-colonization to the removal site was gradual and required at least nine months to achieve the initial density (Figure 1). Lionfish densities did not change from May to July in the control sites.

Summary

Targeted lionfish removals are effective on a small-scale at reducing lionfish densities. These results have applications for marine protected area management, natural resource management, or local organizations working to design a control strategy but lacking the manpower and funding of large scale removal efforts. In areas of similar habitat and trophic structure, and with similar lionfish densities, this design can be an effective method of controlling local lionfish populations and allowing natural ecosystem functions to persist.

LITERATURE CITED

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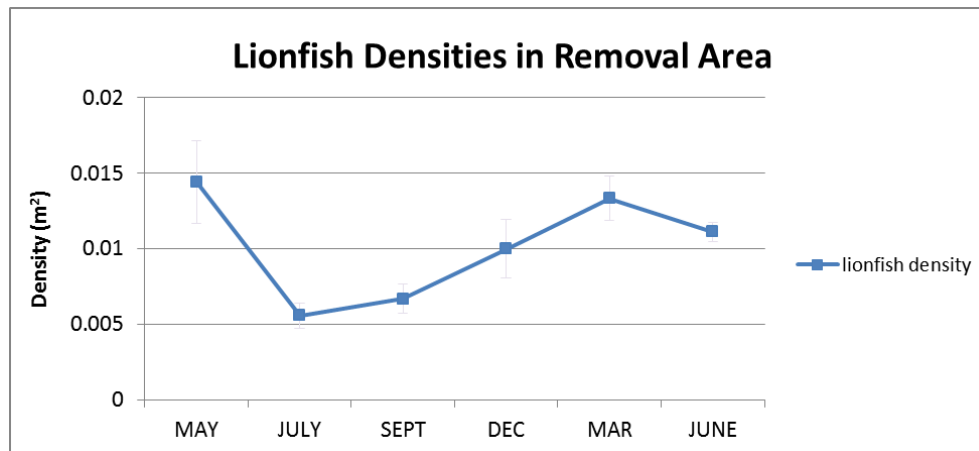


Figure 1. Depiction of lionfish densities before (May 2013) and after (July 2013 - June 2014) a series of three removal events in the month of June 2013.