Preliminary Analysis of Lionfish (*Pterois volitans* and *P. miles*) Populations in Bermuda

El Analisis Preliminary de la Poblacion del Pez Leon (*Pterois volitans* y *P. miles*) en las Bermudas

Une Analyse Preliminaire de la Population de Poisson-lion (*Pterois volitans* et *P. miles*) aux Bermudes

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ABSTRACT

Since the first official sighting of the invasive lionfish (*Pterois volitans* and *P. miles*) in Bermuda nearly fifteen years ago, anecdotal evidence suggests their population has concentrated at depths of 20 meters and is expanding more slowly than in other parts of the northwestern Atlantic Ocean. However, research into the distribution, population status and ecological impact of lionfish in Bermuda has only recently begun. In 2013, approximately 60 sites in five depth bands were surveyed to determine lionfish and prey fish abundance. In the same period, approximately 250 lionfish were captured by surveyors, recreational spear fishers and SCUBA divers, and commercial fishermen. Captured fish were weighed, measured, and dissected to provide otoliths for age and growth studies, and various tissue samples for further analyses. Based on these efforts, we present a preliminary size distribution and abundance estimate for the invasive lionfish population in Bermuda, along with insights into their diet. Although still in the early stages, this research highlights some of the ways in which the invasive lionfish population in Bermuda differs from others in the region.

KEY WORDS: Lionfish, Bermuda, population structure, feeding ecology, distribution

INTRODUCTION

Lionfish, native to the Indian and Pacific Oceans, were first sighted in the Atlantic Ocean off the Florida coast in 1985. Within fifteen years, they had reached the shores of Bermuda and, in the years since their original invasion, their population has grown considerably. As a generalist and opportunist predator, lionfish have a voracious appetite for anything and everything, and consume large numbers of juvenile reef fish and invertebrates as well as the adults of small species. To make matters worse, they have no known predators in this region that could control their population growth. These concerns, in combination with their incredible reproductive potential, suggest the possibility that this invasion could cause significant ecological damage. Local control of this invasive species and its impact is only possible with a comprehensive understanding of its site-specific feeding ecology and life history.

While recent studies have made considerable progress in understanding lionfish in parts of the Caribbean, very little is known about them in Bermuda. The overall goal of this study is to model the ecological impact of invasive lionfish in Bermuda and garner the necessary data to help the Bermuda Lionfish Task Force create an effective plan for the control and management of these predators.

METHODS

Lionfish abundance was assessed at 60 sites in five depth zones across the Bermuda platform using SCUBA or appropriate deep diving equipment. A diver using a roving search protocol encompassing cryptic habitats recorded the number and estimated size of all lionfish seen, and attempted to capture each individual using a pole-spear. Belt transect surveys of prey fishes were conducted concurrently by other divers. All captured lionfish were measured and weighed prior to being dissected to determine gender and provide tissue samples and stomach contents.

To evaluate lionfish prey selectivity, stomach contents of captured specimens were identified and described in terms of number and weight of prey consumed relative to predator weight. Gonads were weighed and examined to determine the developmental stage of lionfish.

RESULTS

In 2013, approximately 60 sites, ranging in depth from 10 m to 60 m, were surveyed to determine lionfish and prey fish abundance. In the same period, approximately 250 lionfish, 42% of which were female, were captured by surveyors, recreational spear fishers and SCUBA divers, and commercial fishermen. Only one captured lionfish was less than 200 mm

fork length, providing for a potentially exaggerated estimate of 98% maturity among females. The size frequency distribution of lionfish suggests females were generally smaller than males.

Survey results suggest the density of lionfish in Bermuda is far greater at 60 m sites than anywhere else across the platform. Video recordings taken at this depth reinforce the prevalence of lionfish there and also suggest an abundance of prey could be the driving force behind their distribution. Repeat surveys at one 60 m site suggest either a rapid re-colonization rate or greater than expected movements within this depth band, raising the possibility that even large culling events have minimal impact on lionfish density in the depth range where they are most abundant.

Reef fish surveys indicate wrasse are the most abundant fish in the reef environment; they are also the most common fish species consumed by lionfish. Fish and invertebrates are found in nearly equal proportions of lionfish stomachs, but the red night shrimp (*Rhynchocinetes rigens*) is the most commonly found animal.

CONCLUSION

The results described here are preliminary, coming at the beginning of Bermuda's investigation of the lionfish population and its impact. Nonetheless, these preliminary data appear to confirm that Bermuda's lionfish are more abundant at depth. Moreover, the data suggest a generalist, opportunistic diet and emphasize that the impact of lionfish in Bermuda could be substantial.