

An assessment of the impact of the lionfish invasion on shallow reef fish communities and fishing yields in Barbados

Una evaluación del impacto del pez león en las comunidades de peces de arrecife coralino de poca profundidad y en captura pesquera en Barbados

Une évaluation de l'impact de l'invasion du poisson lion sur les communautés de poissons récifales de faible profondeur et sur les prises de pêche à la Barbade

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EXTENDED ABSTRACT

The invasive lionfish (*Pterois volitans*) quickly spread throughout the insular Caribbean over the last two decades, raising concerns on potential negative impacts on native (ecologically and economically important) reef fishes and fisher livelihoods across the region (Green et al. 2012). Due to its geographic location, Barbados was one of the last Caribbean islands to be invaded by lionfish, with the first report of lionfish presence taking place in late 2011 (Oxenford and Vallès 2014). The government-funded Barbados Lionfish Project was launched in early 2012, during the very early stages of the lionfish invasion, with the aim of assessing the expected ecological and economic impacts of lionfish (Oxenford and Vallès 2014).

This project included collecting baseline data on reef fish community structure and fishing yields and catch composition of trap fishers and spearfishers before the lionfish invasion in 2012 (the pre-invasion period) (Oxenford and Vallès 2014). Reef fish community structure data were obtained by conducting underwater fish surveys at ten sites (<25 m deep) representative of Barbados reef types (i.e. fringing, patch and bank reefs) along the west and south coastline. This involved using ten 30 x 2 m belt transects per site to record abundance and size-structure of parrotfishes, surgeonfishes, damselfishes, and wrasses. These surveys were conducted three times over the year to capture seasonal changes. Fishing yields and catch composition of trap fishers and spearfishers were obtained by conducting surveys of daily fishing trips at the two main reef fishery landing sites of the island (Oistins and Pile Bay). These surveys were repeated twice over the year. Between 2021 and 2022, approximately 10 years after the beginning of the invasion (i.e. the post-invasion period), these surveys were then repeated. Data between the pre- and post-invasion period are here compared to quantify the magnitude of the changes and assess the extent to which such changes could be associated with lionfish presence. Overall, during the pre-invasion period, lionfish were absent from all ten reef sites surveyed and from the catches of reef fishers. During the post-invasion period, lionfish were found in eight of the ten sites, although its abundance remained relatively low (0.0 – 2.0 lionfish per 100 m²) across all sites and was positively correlated with depth ($r_s=0.70$, $n=10$, $p=0.024$). The impact of lionfish on fisher catches differed between trap fishers and spear fishers.

Lionfish remained a negligible component of the catch of trap fishers, representing only in 0.6% of the abundance of all fish caught in traps surveyed during the post-invasion period (Fig 1 a). In contrast, lionfish became the most abundant fish group caught by spearfishers after parrotfishes (Fig 1 b). We found no evidence of differences in yields per fishing trip between the pre- and post-invasion period for either trap fishers or spearfishers (Welch's t-test: spearfishing: $t=-0.406$, $df=26$, $p=0.687$; trap fishing: $t=-0.199$, $df=48$, $p=0.842$). A PERMANOVA based on the transect data found that fish community composition had changed over time, but that the extent and direction of such changes differed across reef sites (Table 1). Importantly, we found no evidence that lionfish presence was linked to any of such changes (Table 1). In summary, we found no evidence of lionfish impacts on reef fish community structure nor on the fishing yields of trap fishers and spearfishers. We also found no evidence of lionfish impacts on the catch composition of trap landings. In contrast, we found that lionfish had become an important component of the catch of spearfishers. Overall, our results support that, in Barbados, recreational and commercial spearfishing play a critical role in maintaining lionfish abundance at low levels on shallow reefs. As expected (e.g. Arias-Gonzalez et al. 2011), this has likely strongly contributed to our findings that the lionfish invasion has not so far had any measurable negative ecological and economic impacts.

KEYWORDS: lionfish impacts, post-invasion, Barbados, reef fishery, abundance surveys

LITERATURE CITED

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