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Case report/Reporte de caso

Reporting of lionfish *Pterois volitans/miles* (Linnaeus, 1758) in the coastal área of Dzilam de Bravo, Yucatán, México

Registro de pez león *Pterois volitans/miles* (Linnaeus, 1758) en la zona costera de Dzilam de Bravo, Yucatán, México

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ABSTRACT

The invasive and predatory lionfish (*Pterois volitans/miles*) has been caught and recorded in areas more than 100 km off the Yucatan coast, as far as Scorpion Reef (22°22´5" N, 89°40´57" W), in the Gulf of Mexico. On August 2020, fishermen from the Dzilam de Bravo community captured and recorded an adult lionfish 338 mm in length and 568 g in weight. This site consists of a marine bottom that is mainly rock formation, where different juvenile fish species gather. The diet is wide and voracious, hence lionfish present many threats to a variety of fry and juvenile fish species; fish that are of commercial fisheries interest. Consequently, the fishing community is concerned since the lionfish specimen was caught nearby known fishing areas. Its presence poses a threat to their livelihood and may affect the catch rate. Therefore, the present study aims to provide early warning signs that could encourage the corresponding authorities to monitor the lionfish population in this area and along the Yucatán coastline.

KEY WORDS: Threat, Protected natural areas, Invasive alien species, Gulf of Mexico, Fisheries.

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RESUMEN

En el Golfo de México, particularmente en el Estado de Yucatán, se ha reportado la presencia y captura de pez león (*Pterois volitans/miles*) en zonas a más de 100 kilómetros de la costa como es Arrecife Alacranes (22°22´5" N, 89°40´57" W). En agosto de 2020, pescadores de la comunidad de Dzilam de Bravo capturaron un ejemplar adulto de pez león de 338 mm de longitud total y 568 gramos de peso a 22 kilómetros de la costa y 13.4 metros de profundidad. El paisaje marino en este sitio está conformado por formaciones rocosas en donde se agregan peces juveniles de diferentes especies. La voracidad y amplitud de dieta de este organismo presentan una potencial amenaza debido al consumo de alevines y juveniles de especies de importancia pesquera. Por tal motivo, la presencia de este organismo en una zona cercana a la costa causa inquietud entre los pescadores de la comunidad debido al posible efecto sobre las tasas de captura. El presente estudio pretende generar una alerta temprana e incentivar a las autoridades correspondientes a monitorear esta y otras zonas de la costa yucateca.

PALABRAS CLAVE: Amenaza, áreas naturales protegidas, Especie exótica invasora, Golfo de México, pesquerías.

Introduction

The lionfish (*Pterois volitans/miles*) has invaded and colonized diverse coastal and marine ecosystems of the Caribbean and Gulf of Mexico (GM) (Sabido-Itzá *et al.*, 2016). It was first registered in Mexican waters in 2009 (Schofield, 2010), and now, several studies (Fogg *et al*., 2013; Amador-Núñez & Morán-Silva, 2020; Bustos-Montes *et al.*, 2020; Bustos-Montes, 2021) are currently suggesting a successful propagation of this specie in sites that had reported at least one individual. Reports of lionfish presence for the GM include all the Mexican Coastline States from Tamaulipas to Yucatan (Santander-Monsalvo *et al.,* 2012; Wakida-Kusunoki & Amador del Ángel, 2015; Arellano-Méndez *et al*., 2017; Sosa-López *et al.*, 2017). In Yucatan, Aguilar-Perera and Tuz-Sulub (2010) first reported lionfish catch in Scorpion Reef National Park (SRNP), a Natural Protected Area (NPA) located 140 kilometers from the Progreso de Castro Port. Subsequently, Aguilar-Perera *et al.* (2012) reported catch in sites for Bajos del Norte, Río Lagartos, and El Cuyo, in deep (>30 meters), or distant areas (>50 kilometers) from the coastline.

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The present study documents the presence of one adult lionfish caught in an area less than 20 kilometers from the Dzilam de Bravo community. In this community, the populace mainly engages in daily fishing activities for commercial purposes, or simply for personal consumption.

The aim of this study is motivated by the presence of lionfish as an approaching problem. It attempts to highlight the importance, scope, focus, and limitations of the problems associated with lionfish. Inclusive, is a literature review that provides a brief analysis of other publications that are related to this research topic. The review is presented in a logical sequence to indicate the respective background of this problem; with efforts to support and link this work with other previous research. This section finalizes by showing the objectives of this study.

Material and Methods

On August 31, 2020, a local fisherman from the Expormar cooperative in Dzilam de Bravo caught a lionfish specimen with a harpoon. The site location was recorded using a manual GPS Garmin eTrex 20. On-site, at the cooperative facility, biologist Paul Ortega Tun was responsible for identifying and measuring the organism. The total length (TL) was recorded using a measuring tape whilst the weight (g) was recorded using a commercial scale. Additionally, photographs were taken using a 16 megapixels digital camera.

On September 4 (4 days later), a site visit was done to determine the site features through underwater videoing; filmed using a GoPro3+ camera with a red filter feature. Depth was measured using a manual depth recorder Hondex Ps-7. A visual census of fish was done using a meandering scuba technique that allowed for a richness estimation of the area.

Results and Discussion

This organism was caught 22 kilometers off the coastline (21.590827 N and 88.856905 W), with a bearing of 10° from the Dzilam de Bravo harbor (Fig. 1). This site is nearby the Dzilam State Reserve (DSR), and, in an area where, lobster, octopus and fish species are normally caught by fishermen from Dzilam de Bravo.

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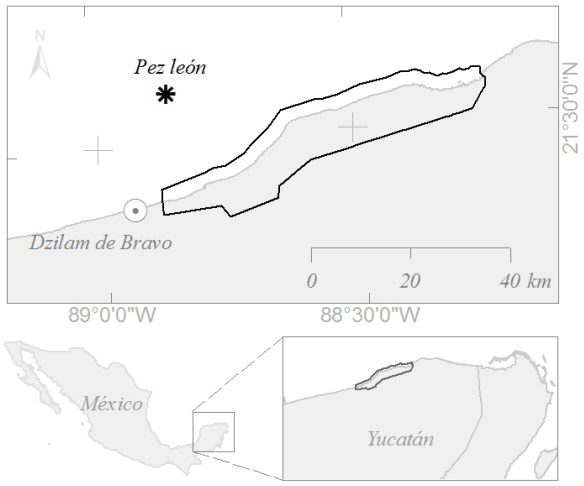

Figure 1. Geographic location; catch site of the lionfish specimen.

The *P. volitans/miles* specimen caught (Dorsal, XIII-11; Anal, III-7) was 338 mm in total length (TL) (Fig. 2) and weighed 568 (g) respectively. The length recorded for this specimen was greater than the lengths reported for other lionfish specimens caught along the Yucatan coastline (Aguilar-Perera & Tuz-Sulub, 2010; Aguilar-Perera *et al.*, 2012; López-Gómez *et al.,* 2012).

Figure 2. Sample of the lionfish caught.

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A depth of 13.4 meters was recorded for the catch site that presented a rocky range covered by green, red and brown macroalgae, with the presence of colonies of encrusting sponges. The small caverns and crevices shelter diverse marine organisms, mainly fish that gather in the area's vicinity (Figure 3). The marine bottom is complemented with sandy patches and unconsolidated material (or loose gravel).

Figure 3. Seafloor images of the lionfish catch site. A rocky bottom is observed, with the presence of large schools of juvenile fish.

During the visual census 13 fish species pertaining to 8 families (Table 1), as well as large schools of juvenile *Haemulon* spp. were observed. It is important to highlight that 5 of the 13 species, *Haemulon plumierii* (red mouth grunt), *Lachnolaimus maximus* (hogfish), *Calamus calamus* (white mojarra), *Lutjanus synagris* (lane snapper) and *Epinephelus morio* (red grouper), are fished mainly for consumption and local commerce.

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Table 1. Families of different fish species were identified at the lionfish catch site.

	Species	Familia
1	*Haemulon sp (*juveniles)	
2	*Anisotremus virginicus*	Haemulidae
3	*Haemulon plumierii**	
4	*Holocanthus bermudensis*	
5	*Pomacanthus arcuatus*	Pomacanthidae
6	*Stegastes sp*	
7	*Diodon hystrix*	Diodontidae
8	*Chaetodon ocellatus*	Chaetodontidae
9	*Archosargus probatocephalus*	Sparidae
10	*Calamus calamus**	
11	*Lutjanus synagris**	Lutjanidae
12	*Lachnolaimus maximus**	Labridae
13	*Epinephelus morio**	Serranidae

Five of these species (*) serve as a direct food source and/or, are for commercial use; as indicated by local fishermen.

Conclusions

According to its feeding habits, the lionfish is a generalist predator, since it consumes available prey in the habitat it colonizes (Morris & Akins, 2009; Morris *et al*., 2009; Muñoz *et al*., 2011; Cabrera, 2011; Cabrera-Guerra, 2014 y Reyes-Aguilar *et al*., 2018); a posing threat, with negative effects on the biodiversity of any marine ecosystem (Layman & Allgeier, 2012; Coronado-Carrascal *et al*., 2015; Figueroa-López *et al*., 2021). Green *et al*. (2012) and Coronado-Carrascal *et al*. (2015), in their respective studies, showed that lionfish created competition for space and food resources with other species, lowering fish biomass through predation. Quijano-Puerto *et al*. (2013), emphasized that predation of benthonic fish (e.g. Haemulidae, Lutjanidae, Scaridae, and Gobiidae) may have direct or indirect effects on important economic and ecological species, including at higher trophic levels as seen for the SRNP trophic system. Similarly, Aguilar-Perera and Carrillo-Flota (2014) mentioned that although there is little evidence of its possible impact on fish stocks, in reality, it is occurring, and may worsen in the long term. In Costa Rica, Laguna-Cruz *et al*. (2019) mentioned that snapper (*Pagrus pagrus*) catch had decreased from 50,000 in 2008 to 30,000 kilograms in 2015; attributable to lionfish presence.

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The catch site for the lionfish in this study has the ideal physical and biological conditions favorable for its presence and propagation. Moreover, the rocky substrate has crevices and areas that enable the fish to hide and capture its prey. (Biggs & Olden, 2011; Hernández-Abello *et al*. 2015); additionally, the fish species identified (Table 1) coincide with the prey species reported by Arredondo-Chávez *et al*. (2016) for the Mexican Caribbean and Quijano-Puerto *et al*. (2013) for the SRNP, in Yucatan. Notably, since larger-sized fish are being caught by fishermen, it allows for more food availability and little competition for resources, which possibly explains the capture of a larger-sized lionfish in this work, as compared to that reported by Aguilar-Perera and Tuz-Sulub, (2010), Aguilar-Perera *et al*. (2012) and Quijano-Puerto *et al*. (2013) for Yucatan.

The mere presence of lionfish near to the coastline, and in an area where species for consumption are usually caught, has 1200 fishermen from Dzilam de Bravo (SEPASY, 2019) on alert. A vigilance that is understood, considering that its presence generates additional pressure on species of consumption and economic importance, with possible effects on future catch rates. Additionally, the catch site is close to the area that encompasses the DSR (<17 kilometers). Not only does it present a threat mainly to fish, but also to juveniles of other diverse species (e.g. mollusk, echinoderms, and crustaceans to mention a few) that utilize the mangrove ecosystem located in the DSR. According to SEDUMA (2018), this NPA shelters 146 marine fish species and 18 invertebrate species, of which 13 are of national commercial importance.

Hence, as an early warning, it would be wise to recommend a solid monitoring program for this area, and other neighboring coastal areas (including mangroves and coastal lagoons). Monitoring may allow an earlier and accurate evaluation, especially if it focuses on the probabilities of lionfish colonization. Likewise, the impact on fish communities can be used as an indicator to monitor the presence of this invasive species.

Author contributions

JOVI. Sampling design to determine site features where the lionfish was caught, underwater video coverage, and identification of organisms *in situ*. Map design and editing of the document. Timely feedback with the editors of the journal.

PHOT. Identification and measurement of the individual caught. Fish identification through video images. Revisions and corrections of the manuscript.

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Conflict of interest

In this work all authors declare non-existing conflicts of interest

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