

# First record of invasive red lionfish (*Pterois volitans* [Linnaeus, 1758]: Scorpaenidae) in waters of a natural protected area from Campeche, México

## SCIENTIFIC NOTE

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### ABSTRACT

We recorded the first opportunistic observation and capture of a non-native lionfish (*Pterois volitans* [Linnaeus 1758]: Scorpaenidae) in waters of a natural protected area off the coast of Campeche state, southern Gulf of Mexico. The specimen was collected about 600 m off the shore at scarcely 1 m depth. The length (365 mm) and weight (701 g) of the specimen are close to the upper range registered for the area. No gonadic development was observed. With this finding, it appears that the gulf basin inner circuit invasion is advancing.

**Keywords:** invasive species, lionfish, Campeche, Los Petenes biosphere reserve

### RESUMEN

Se registró la primera observación y captura de un espécimen no nativo del pez león (*Pterois volitans* [Linnaeus 1758]: Scorpaenidae) en aguas de un área natural protegida del Estado de Campeche, al sur del Golfo de México. El espécimen fue colectado a 600 m de la costa a 1 m de profundidad. La longitud total (365 mm) y peso (701 g) de la muestra se encuentra cerca de la gama superior registrada para otras regiones. No se observó

desarrollo gonádico. Con este hallazgo se confirma el proceso de invasión en el interior del Golfo de México.

**Palabras clave:** especies invasivas, Campeche, Reserva de la Biosfera Los Petenes, pez león.

### INTRODUCTION

The presence of invasive lionfish (*Pterois volitans*, Linnaeus 1758) has been recorded in northern Gulf of Mexico (GoM) since 1985 (Florida) and for the first time in Mexican waters in 2009 on Alacranes National Reef Park, off northern from the Yucatan peninsula offshores (Aguilar Perera and Tun-Sulub, 2010). A second sighting was registered also in a reef park at 7.5 km off the shores of Veracruz (Santander-Monsalvo *et al.* 2012). Furthermore, a recent study by Rodriguez-Cortés *et al.* (2015) provided evidence of a well-settled and structured population again in Alacranes, the largest reef formation of Southern Gulf of Mexico. Otherwise, no other evidence has been provided of a similar population in any other part of the GoM Mexican coastal waters.

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Johnston and Purkis (2011) built *P. volitans* and *P. miles* invasion models (regional scale) for the Western Atlantic and the Caribbean and determined that ocean currents are the most influential transport factor to new localities. Furthermore, Aguilar-Perera and Tuz-Sulub (2010) consider the first sighting of *P. volitans* in Mexican waters in Alacranes´ reef, as the closing of the invasion circuit for that area. However, there is not enough data to infer what is the current situation in southern GoM basin waters, although Johnston and Purkis (2011) predicted that western GoM –among others- was the most susceptible area to be invaded in the following years.

After 30 yrs. of invasion, Darling *et al.* (2011) determined that the Atlantic *Pterois volitans* population has developed larger body size than their native counterparts of the Indo-Pacific Ocean. The species is a broad generalist in terms of feeding habits, although fish can compound 55% of their diet; it has been demonstrated that some important commercial species of fish conform part of their preys (Dahl and Patterson 2013). Furthermore, the invasion of lionfish into nine coral reefs off New Providence Island in Bahamas, coincided with a 65% biomass decline of its prey fishes, just two years after its introduction; previously thought as a shallow water wanderer, lionfish can also invade habitats at more than 100 m depth (Nuttal *et al.* 2014), diversifying the habitats that can be at risk. Thus, it is easy to foresee the threat that this species poses for natural protected areas like *Los Petenes* that serve as nursery grounds for many aquatic species (Muñoz-Rojas *et al.* 2013). The aims of this note are to report the presence of the lionfish in a very special protected area and discuss briefly its progression into GoM basin waters.

## MATERIAL AND METHODS

*Los Petenes* biosphere reserve is a coastal flood plain protected by the federal government, which receive a significant discharge of freshwater

from underground flows (CONANP 2006). These freshwater surges to the surface forming spring waters. Special vegetation surrounds these springs giving place to small islands in the plain, therefore the name. Catalogued as a RAMSAR site since 1999, this ecotype is present only in three parts of the world, Florida, Cuba and the Yucatan Peninsula. At least 47 aquatic species find refuge and shelter in *Los Petenes* that acts also as ground for reproduction and nursery of a wide range of terrestrial animals (Ayala-Pérez *et al.* 2014)

A lionfish specimen was captured last February by local fishermen in shallow waters of the reserve (1 m depth), at scarcely 600 m from the shore (19°55'53.6N - 90°28'22.4W, Fig. 1). The specimen was brought to the laboratory where meristic data was recorded (total length, weight, number of fin ray

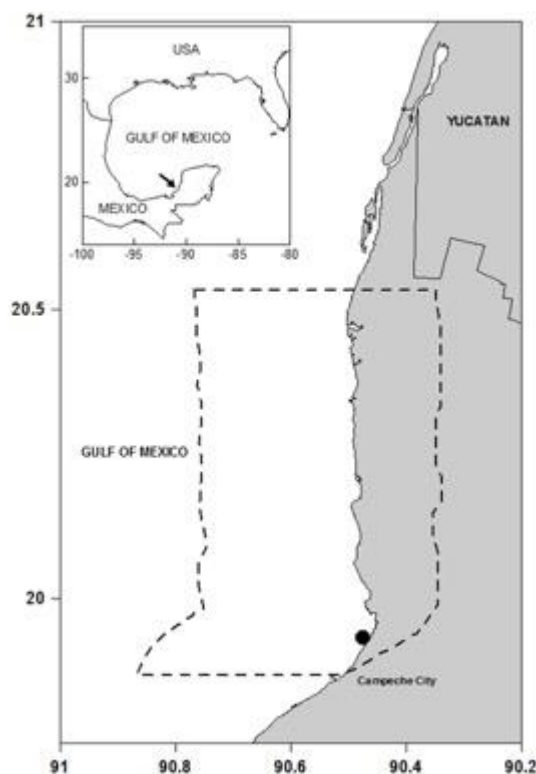


Fig. 1. Los Petenes Biosphere Reserve (dotted line) in Campeche, México, and collection site of lion fish (*Pterois volitans*).

elements) and taxonomically identified following Schultz (1986). The fish was dissected for internal inspection and gut content. Prey identification was performed following FAO (1999).

## RESULTS AND DISCUSSION

The specimen captured was identified as *Pterois volitans* (XIII-11, III-7) and it is larger in total length (365 mm, Fig. 2) than both specimens from Alacranes (Table 1) and Veracruz reef parks, and close to the upper range reported in a recent extended population study from Alacranes Reef Park (Rodríguez-Cortez *et al.* 2015; Table 2). The specimen of the present note did not display signs of gonadic development.

Gut content was filled with a specimen of silver jenny (Gerridae: *Eucinostomus gula*, 16.4 g) in an early digestion state. This indicates that *P. volitans* is already preying on local species. In contrast, lionfish in the Caribbean Sea has been reported as groupers prey (Family Serranidae) (Maljković *et al.* 2008), which may occur as well on Southern GoM where groupers fishery is well established.



Fig. 2. The lionfish captured in Los Petenes Biosphere Reserve, Campeche, México (365 mm, LT).

It is difficult to infer settlement of this species departing from a sole adult specimen only, but since larval dispersion is likely to be the invasive mechanism (Johnston and Purkis 2011), and that the species shows high site fidelity (Jud *et al.* 2012), it is probable that this fish originated from populations of Alacranes Reef or the Caribbean, following the geography and wind-driven current patterns as previously suggested (Santander-Monsalvo *et al.* 2012; Zavala-Hidalgo *et al.* 2003) (Fig. 3).

Following the coastline, Campeche is located between Yucatan and Veracruz and the presence of *P. volitans* could mean a long past closed-circuit invasion of the GoM basin shoreline waters. This circuit is already closed in Western Atlantic and Caribbean.

However, Southern GoM is poor in reports and sightings of lionfish when compared with the Northern GoM and the Caribbean. Johnston and Purkis (2011) predicted that western GoM would be next to be invaded and that significant detection and prevention efforts should be addressed. They did not forecast the invasion on the southern side, which aggravates the lack of knowledge. Its broad spectrum of habitat invasion and diet is causing grave concern

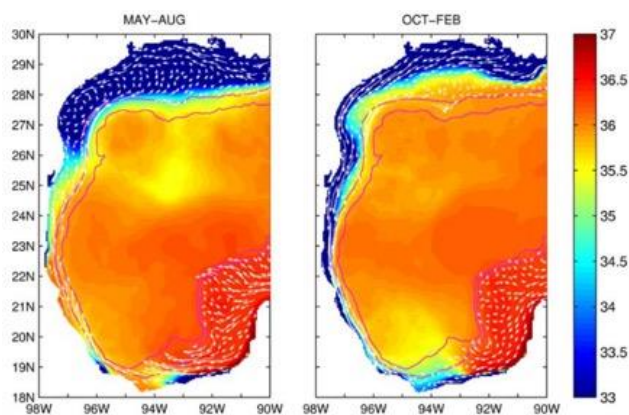


Fig. 3. Mean surface salinity from the model output for: (a) May to August and (b) October to February. Vectors represent the main currents. Shown are the 200 m and 1000 m isobaths (Zavala-Hidalgo *et al.* 2003).

**Table 1. Comparative biometrics data of *Pterois volitans* in some geographic regions.**

	Indo-Pacific	Colombia	Florida	North Carolina	México (Pacharela)	México (Los Petenes, Campeche)
<b>Dorsal fins</b>	XIII- 12	XIII- 12	XIII- 12	XIII- 11	XIII- 11	XIII- 11
<b>Anal fins</b>	III-8	III-8	III-8	III-7	III-8	III-7
<b>Size (TL, mm)</b>	85-235	96-157	378	120	137	365
<b>Depth site</b>	unknown	16	45	40	38	5
<b>Source</b>	A	B	C	D	E	F

TL = total length. A: Schultz 1986, B = González *et al.* 2009, C = Ruiz-Carus *et al.* 2006, D = Whitfield *et al.* 2002, E = Aguilar-Perera y Tuz-Sulub 2010, F= Juárez-Camargo *et al.* 2016.

**Table 2. Comparative length of *P. volitans* captured in Southern Gulf of Mexico on Feb 15th, 2016.**

Total Length (mm)	Locality	Source
365	<i>Petenes</i> , Campeche	Present report
137	Alacranes Reef Park, Yucatán	Aguilar-Perera and Tuz-Sulub 2010
185	Anegada de Adentro, Coral Reef, Veracruz	Santander-Monsalvo <i>et al.</i> 2012
90-389 (n=776)	Alacranes Reef Park, Yucatán	Rodríguez-Cortés <i>et al.</i> 2015

because of its deleterious effects (Arias-González *et al.*, 2011; Layman and Algeier 2012). Current sightings are the product of opportunistic or isolated inputs by fishery scientist, although more comprehensive fishery studies would clarify the present situation in the region.

At present, the Federal Board of Natural Protected Areas (CONANP Spanish acronym) has launched an emergent program for the collection of lionfish specimens. At local level (Yucatan and Quintana Roo) other measures have been enforced, like the distribution of pamphlets with basic information and encouraging the public to incorporate the fish in their diets. There is even a short booklet available on the internet with 20 cooking recipes that includes lionfish. According to Arias-Gonzalez *et al.* (2011) maintaining a low, but

constant fishing pressure of lionfish by consumption would increase the resilience of invaded habitats.

*Los Petenes* are a unique coastal environment whose value would be difficult to ascertain. Apart from the aquatic species, it sustains many terrestrial animals and birds that depend on the aquatic life. It is therefore of utmost importance, to implement comprehensive studies to determine and calculate the damage of the lionfish invasion, enabling us to suggest accordingly measures.

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Recibido: 07 de diciembre 2016

Aceptado: 20 de febrero de 2017

Publicado: 30 de junio de 2017