

## Aquatic Invasions Records

## Non-native, invasive red lionfish (*Pterois volitans* [Linnaeus, 1758]: Scorpaenidae), is first recorded in the southern Gulf of Mexico, off the northern Yucatan Peninsula, Mexico

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Received: 8 January 2010 / Accepted: 25 January 2010 / Published online: 29 January 2010

### Abstract

We recorded the first sighting and collection of the non-native, invasive red lionfish (*Pterois volitans* [Linnaeus, 1758]: Scorpaenidae) in the southern Gulf of Mexico, off the northern Yucatan Peninsula. In December 2009, two individuals were sighted (one of them speared) at 38 m depth over a reef formation, about 58 km northwest of the Alacranes Reef National Park, which is located 130 km off the northern coast of the Yucatan Peninsula, Mexico. More than 20 years after the introduction of *P. volitans* into the western Atlantic, specifically off the Florida and North Carolina coasts, the invasion circuit now appears to be closing in, since this new record was made about 800 km from the Dry Tortugas and Marquesas, Florida. This recording appears to be the first introgression of the *P. volitans* population into the Gulf of Mexico via larval transport.

**Key words:** lionfish, non-native marine fish, Yucatan Peninsula, Gulf of Mexico, Alacranes Reef

### Introduction

Non-native organisms are frequently transported by human activities, and accidentally or purposely introduced into a given environment different to their original one. When conditions are favorable, the newcomers can reproduce and establish successfully. However, when the interactions of the newcomers with the new environment and other communities are destructive, then the introduction is known as “invasion”. Mechanisms of transportation of non-native organisms to other habitats are known as vectors (Rilov and Crooks 2009). Oceangoing vessels are among the vectors responsible for global introductions of marine organisms through the ballast-water or hull fouling (Carlton and Geller 1993). However, accidental or deliberate introductions from aquaria are also frequent (Semmens et al. 2004). This latter vector appears to be the cause of the introduction of the red lionfish *Pterois volitans* (Linnaeus, 1758) from the Indo-Pacific Ocean into the western Atlantic Ocean (Whitfield et al. 2002, 2007; Ruiz-Carus et al. 2006; Morris and Whitfield 2009).

Although there are confirmed and unconfirmed (anecdotal) records of *Pterois volitans* in the Florida (USA) waters since 1980s, with first individuals captured in 1985, Whitfield et al. (2002) officially reported the establishment of *P. volitans* off the North Carolina (USA) coast in 2000. The invasion of this fish throughout the region now appears to be widespread. More than 20 years after first sightings, it has covered most of the western Atlantic, from Florida, The Bahamas, Cuba, Dominican Republic, Puerto Rico, most Lesser Antilles, Cayman Islands, Jamaica, Colombia, Costa Rica, Belize, Venezuela, and recently (2009) Mexico (Schofield 2009). The continuous expansion of its presence now may be naturally self-sustaining through larval dispersal capabilities rather than by repeated deliberate introductions; however, there is still no conclusive evidence for this. The larval phase of this fish lasts about 25 to 40 days (Hare and Whitfield 2003; Ahrenholz and Morris 2010), but when it becomes a juvenile its dispersal capabilities are reduced. Despite an experimental study warning about the potential threat of *P. volitans* to the native fish communities (Albins and Hixon 2008), there is

no known clear impact of the invasion under natural conditions. Likewise, there is no real scientific understanding about its natural enemies in a new habitat. However, some groupers (*Mycteroperca tigris* [Valenciennes in Cuvier and Valenciennes, 1833], *Epinephelus striatus* [Bloch, 1792]) in the Bahamas were able to feed on *P. volitans* (Maljković et al. 2008).

## Materials and methods

During September 2009, we provided lionfish information pamphlets to a small group of local spear-fishers from Puerto Progreso, Yucatan, Mexico, with the aim of recommending them to report any sighting of *P. volitans* (the pamphlet included two pictures and contact information). On December 21th 2009 at 2:00 PM, two *P. volitans* were sighted by a local spear-fisher at a reef formation locally known as “Pacharela” at 38 m depth (22°28.132' N; 90°14.232' W, Figure 1), which is located 58 km northwest to the Alacranes Reef National Park. This Park is located 130 km off the northern Yucatan Peninsula, Mexico. One of the *P. volitans* was speared, while the other one could not be captured because it was hidden in a reef cave. The collected fish was examined following the key meristic identification characteristics established by Schultz (1986), its body cavity was inspected for gut contents and gonads, and then it was deposited in the Fish Collection (CIR-UADY-1466) of the Universidad Autónoma de Yucatán, México.

## Results and discussion

The single specimen of *Pterois volitans* (137 mm in total length; Figure 2) collected from the “Pacharela” reef, in the southern Gulf of Mexico, was relatively larger than the lionfish the spear-fisher could not capture. However, compared to individuals from other geographic areas, the collected lionfish was smaller (Table 1). Body cavity inspection of this latter fish revealed an empty stomach and immature gonads.

In the Mexican Caribbean, *P. volitans* was first sighted in early 2009, off Cozumel Island, Quintana Roo, Eastern Yucatan Peninsula. Subsequently, there has been a progressive collection of individuals in locations off the mainland Mexican coast, such as at Playa del Carmen, Akumal, Xel-Ha, and even in the Banco

Chinchorro (30 km off the coast and close to Belize). As a measure of mitigation for the invasion, there is an emergent program for the collection of individuals under the management of the Commission of Natural Protected Areas (CONANP), Yucatan Peninsula Program, which is a federal government agency and also under



**Figure 1.** Location of the “Pacharela” reef (star) off the northern Yucatan Peninsula, Mexico, where the fishermen speared the first recorded red lionfish, *Pterois volitans*, in the southern Gulf of Mexico. Black dot indicates the geographic location of St. Petersburg, Florida, where a lionfish was found dead in 2006 (Brown and Ruiz-Carus 2006).



**Figure 2.** Red lionfish, *Pterois volitans* (137 mm TL), captured in the “Pacharela” reef off the northern Yucatan Peninsula, southern Gulf of Mexico. Photograph by Armin Tuz-Sulub.

**Table 1.** Meristic data for the red lionfish, *Pterois volitans*, from the "Pacharella" reef in the southern Gulf of Mexico, compared to individuals from other geographic areas.

	Indo-Pacific	Colombia	Florida	North Carolina	Mexico (Pacharella)
Dorsal fins	XIII-12	XIII-12	XIII-12	XIII-11	XIII-11
Anal fins	III-8	III-8	III-8	III-7	III-8
Size (TL, mm)	85-235	96-157	378	120	137
Depth Site (m)	unknown	16	45	40	38
Source	A	B	C	D	E

TL = total length. A: Schultz 1986, B = González et al. 2009, C = Ruiz-Carus et al. 2006, D = Whitfield et al. 2002, E = This study

the municipality (state government) of Playa del Carmen, Quintana Roo. More than 100 individuals (less than 15 mm TL) have been collected so far in this area and continue to be taken by local divers who own diving shops and by other volunteers (Samuel Bretón and Maricarmen García, pers. comm.).

For the Gulf of Mexico, there was a previous report of an individual found dead off the St. Petersburg coast, Florida (Brown and Ruiz-Carus 2006); however, this fish was known to be recently introduced and did not get the Gulf of Mexico through larval transport. The two sightings in the "Pacharella" reef, off the northern Yucatan Peninsula, appear to be the first documented records of *P. volitans* in the Gulf of Mexico that arrived through larval transport after more than 20 years of the invasion's onset. The implication this latter recording may have is interesting, since it represents indirect evidence that the invasion has been following the prevalent marine currents in the area. The Yucatan current flows through the Yucatan channel into the Gulf of Mexico, and then it is part of the Loop current (Ochoa et al. 2001). It is possible that larvae of *P. volitans* have dispersed through the Caribbean current, then to the Yucatan Current passing through the Yucatan Channel and are transported by the Loop Current. Now, the circuit of the *P. volitans* invasion appears to be closing in, since the potential displacement of individuals from the southern Gulf of Mexico to the Florida coast, following the Loop Current, is imminent (there is about 800 km from the Alacranes Reef to the Dry Tortugas and Marquesas in Florida). However, this latter assertion is only a hypothesis that still needs to be refuted using genetic marker studies.

## Acknowledgements

We greatly acknowledge the generously help of fishers from the fishing vessel "Don Chelo II" (from de company "Pulpesmar SA de CV"), Captain Humberto Manzano "Cacalchén" and his team of fishers: "Caxita", "Bimbo", "Chac-chi", "Moyo", "Primo", "Huario", and especially to the fisher "Cóli" who speared the lionfish and brought it to us. The map was originally drawn by Daniel Poot-Cardós with modifications. We also thank the anonymous reviewer's suggestions and recommendations.

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