

Helminth Parasites of Red Lionfish, *Pterois volitans* from the Veracruz Coral Reef System, Mexico, Southern Gulf of Mexico

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Abstract

A helminthological survey was conducted on 78 red lionfish, *Pterois volitans*, collected in the Veracruz Reef System National Park (VRSNP). Register: trematodes (5 spp.), cestodes (1), and nematodes (2). Prevalence per species < 30% and mean intensity < 6.0. Three new host records are reported herein. The red lionfish is infected by species of endoparasites generalist and played a role as accidental host.

Keywords: endoparasites, lionfish

1. Introduction

Today, invasive species are one of the most challenging environmental problems, e.g. *Cyprinus carpio* or *Oreochromis mossambicus*. These species invade territories out of their natural distribution areas, disturbing and displacing native species through predation, competence and disease transmission (Lockwood et al., 2007). The red lionfish, *P. volitans*, came from the Indo-Pacific Ocean, and for more than 30 years has sprayed across the West Atlantic Coast, Caribbean (Morris et al., 2008; Morris, 2012), and Southern Gulf of Mexico (Santander-Monsalvo et al., 2012; Wakida-Kusunoki & Amador del Ángel, 2015). This organism has been studied from different perspectives, to take actions aimed to control and mitigate its impact on native biota and habitat in general. Studying one of these facets, helminthiasis and its infections, has shown that *P. volitans* participates in parasite life-cycles as accidental, paratenic or intermediate host (Simmons, 2014). This conclusion is supported by records of 30 helminth species from groups such as digeneans, monogeneans, cestodes, nematodes and acanthocephalans (Bullard et al., 2011; Simmons, 2014; Ramos-Ascherl et al., 2015; Sellers et al., 2015; Fogg et al., 2016). In general, helminths have low prevalence and low abundance, due to the introduction time of the invasive species, the low susceptibility of the host to be infected by native parasites, and consumption of vectors with infective stages (Torchin et al., 2003; Torchin & Mitchell, 2004; Vignon & Sasal, 2010). Despite being an invasive species, lionfish have also acquired parasites from indigenous fish (Guegan & Kennedy, 1993; Gendron et al., 2012). This study aims to pinpoint parasitic helminthes of this species, recently sighted in the reefs of Veracruz, Mexico.

2. Methods

Between May 2016 and March 2017, 78 lionfish (body length: 9.0-39.7 cm, weight: 15-1,063 g) were examined. The fish were captured with spear and SCUBA diving, in 15/22 reefs of the VRSNP, by personnel from the Marine Park of the National Commission of Natural Protected Areas (*Comisión Nacional de Áreas Naturales Protegidas*) (CONANP), framed within the Park activities against lionfish. These fish were transported into plastic containers with ice to the Applied Aquaculture Research Lab (*Laboratorio de Investigación Acuícola*

Aplicada) (LIAA), of the Technology Institute of Boca del Río. They were examined 24 hours after capture, and specimens were identified under criteria described by Schultz (1986). The helminthological examination was conducted on all tissues and organs, excepting blood and bones, following Lamothe (1997). Parasites were placed in Petri dishes with saline solution, 0.65%, fixed with hot 4% formaline, and preserved in vials with 70% alcohol. Trematodes and cestodes were stained with Mayer's carmine or Gomori's triple stain, and then dehydrated in a graded alcohol series, cleared with clove oil, and mounted whole in Canada balsam. Nematodes were in glycerin (Vidal-Martínez et al., 2001). Prevalence (percentage of infected hosts) and mean intensity of infection (mean number of parasites per infected fish) were calculated following Bush et al. (1997).

3. Results and Discussion

Eight parasite taxa, from three helminth groups, were recorded (one at species level, four at genus level, two at family, and one at group), as follows: 5 trematodes (3 adults, 2 metacercariae); 1 cestode (larva); and 2 nematodes (1 adult, 1 larvae); and three new host records are described (Table 1). About 50% of taxa were adult stages. All parasites showed prevalence values < 30% and mean intensity < 6.0 helminths per infected fish. Infection of red lionfish are mainly associated to their feeding habits, with the exception of the fins metacercariae. Six out of the eight taxa have previous records in local hosts, such as *Lecithochirium floridense*, *Gonocercella* sp., and *Hysterothylacium* sp., as well as by Didymozoidae metacercariae or Tetracapsulidae larvae in carangids and lutjanids (Montoya-Mendoza et al., 2014, 2016, 2017), confirms that in red lionfish, infections are accidental and caused by generalist helminth parasites, with low abundances and prevalences. Comparatively, the number of species found in this study is similar to that registered in different sites of the Gulf of Mexico and the Caribbean Sea, e.g., Eastern Florida Coast, USA (8 spp.) (Simmons, 2014), Cayman Islands (7), and the Bahamas (6); but lower than that recorded in Puerto Rico (13) (Ramos-Ascherl et al., 2015). Three new host records are provided, enriching parasite records in red lionfish. *P. volitans* specimens from southern Gulf of Mexico have all characteristics of invasive species, and have been recorded for other sites of the Gulf of Mexico and Caribbean Sea (Torchin et al., 2003; Simmons, 2014; Ramos-Ascherl et al., 2015; Sellers et al., 2015; Fogg et al., 2016). It is probable that helminths recorded belong to other host fish, which are lionfish preys, and we do not rule out the possibility of lateral transference of nematode larvae, as described for helminths of other marine fish (Marcogliese, 2007). Finally, lionfish could also be a dead-end host for some species infecting them, due to the lack of natural predators.

Table 1. Infection parameters and site of infection of the helminth parasites of red lionfish, *Pterois volitans*, from the VRSNP, Veracruz, Mexico

Helminth	Site	n (% prevalence)	Mean intensity (±SD)	Range
<i>Trematoda</i>				
Adult				
<i>Lecithochirium floridense</i>	intestine	3 (3.84)	3.33 ± 4.04	1-8
<i>Gonocercella</i> sp.*	gill	1 (1.28)	1 ± -	1
<i>Proserpinus</i> sp.*	intestine	3 (3.84)	2 ± 1.73	1-4
Metacercariae				
Didymozoidae gen. sp.	intestine	14 (17.94)	2.64 ± 3.67	1-13
Metacercaria	caudal fin	2 (2.56)	6 ± 7.07	1-11
<i>Cestoda</i> (larva)				
Tetracapsulidae gen. sp.	intestine	8 (10.25)	1.62 ± 0.91	1-3
<i>Nematoda</i>				
Adult				
<i>Pseudocapillaria</i> (<i>Pseudocapillaria</i>) sp.*	intestine	23 (29.48)	2.21 ± 2.31	1-11
Larva				
<i>Hysterothylacium</i> sp.	intestine	2 (2.56)	1 ± 0	1-1

Note. * New host record; n, number of hosts infected.

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