First record of the “snapper-choking isopod”, Cymothoa excisa (Isopoda: Cymothoidae), parasitizing the Red Lionfish, Pterois volitans, from the Parque Nacional Arrecife Alacranes,...

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First record of the snapper-choking isopod *Cymothoa excisa* (Isopoda: Cymothoidae) parasitizing invasive lionfish *Pterois volitans* (Scorpaeniformes: Scorpaenidae)

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Two female snapper-choking isopods Cymothoa excisa *(body length 11 and 14 mm) were in the buccal cavity of two invasive lionfish* Pterois volitans *(total length 294 and 301 mm) collected in Alacranes Reef, southern Gulf of Mexico. This is the first record of* C. excisa *parasitizing invasive lionfish* P. volitans *in coral reefs of the Western Atlantic, where these isopods appear to have infected the host through adult prey-predator transfer.*

Keywords: Invasive lionfish, isopod, Gulf of Mexico, Alacranes Reef

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INTRODUCTION

The Indo-Pacific lionfish *Pterois volitans*, introduced in the Western Atlantic (Whitfield *et al.*, 2002; Schofield, 2010) 30 years ago, invaded a large portion of the region posing a serious threat to the marine ecosystem (Côté *et al.*, 2013). In the southern Gulf of Mexico, invasive lionfish was detected late in 2009 (Aguilar-Perera & Tuz-Sulub, 2010) and now is considered established in coral reefs of Alacranes Reef, northern Yucatan Peninsula, Mexico (López-Gómez *et al.*, 2014).

In the Western Atlantic, 24 taxa have been recorded parasitizing invasive lionfish including digeneans, monogeneans, cestodes, nematodes, isopods, a copepod and an acanthocephalan (Bullard *et al.*, 2011; Fernández-Osorio *et al.*, 2014; Sikkel *et al.*, 2014; Ramos-Ascherl *et al.*, 2015) in the Cayman Islands, Puerto Rico, The Bahamas and Cuba. The most common and abundant parasite recorded in the invasive lionfish is the digenean, *Lecithochirium floridense* (Ramos-Ascherl *et al.*, 2015). In general, invasive lionfish has shown a low susceptibility to parasites in its invaded environment (Ruiz-Carus *et al.*, 2006; Bullard *et al.*, 2011; Loerch *et al.*, 2015; Ramos-Ascherl *et al.*, 2015; Sellers *et al.*, 2015). In fact, Tuttle *et al.* (2017) argued that the escape from parasites hypothesis may have contributed to the success of lionfish invasion.

Isopod species (Isopoda) have also been recorded parasitizing invasive lionfish, including *Aegiochus tenuipes*, *Carpias serricaudus*, *Eurydice convexa*, *Excorallana quadricornis*, *Gnathia* sp. and *Rocinela signata* in coral reefs of the Cayman Islands, Puerto Rico and The Bahamas (Ramos-Ascherl *et al.*, 2015). Additional records include *Anilocra haemuli* in Cuba (Fernández-Osorio *et al.*, 2014), *Excorallana* spp. in Bonaire (Poole, 2011) and *R. signata* in Panama (Simmons, 2014).

Cymothoa excisa (Cymothoidae), a parasitic isopod that attaches in the buccal cavity of fish hosts (Bunkley-Williams *et al.*, 2006), has been recorded in 16 fish species of five families in the Caribbean Sea (Bunkley-Williams *et al.*, 1999, 2006; Joca *et al.*, 2015). However, only nine fish species are currently recorded as hosts of *C. excisa* in the Gulf of Mexico (Kensley & Schotte, 1989; Joca *et al.*, 2015).

In the southern Gulf of Mexico, off the northern Yucatan Peninsula, Mexico, *C. excisa* has been found parasitizing mainly snappers, such as the yellowtail *Ocyurus chrysurus* and mutton, *Lutjanus analis* (Kensley & Schotte, 1989), and recently the pinfish *Lagodon rhomboides* (Sparidae) (Bonilla-Gómez *et al.*, 2014). In the present study, while not a parasitological study, we document the occurrence of the snapper-choking isopod *Cymothoa excisa* parasitizing invasive lionfish *Pterois volitans* in Alacranes Reef.

MATERIALS AND METHODS

Alacranes Reef (22°21′44–22°35′12 N 89°36′30–89°48′00 W) is located 130 km off the northern coast of the Yucatan Peninsula, Mexico, and is the largest reef complex in the southern Gulf of Mexico. Local diver-fishermen participated in collections of invasive lionfish in Alacranes reef and

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provided specimens. In the laboratory, lionfish were measured for morphometric data, such as total length (TL) in millimetres and weight in grams, and for meristic data (e.g. fin rays number, spines counting, etc.) (López-Gómez *et al.*, 2014). In 2016, during routine examinations we noticed isopods in the buccal cavity of two lionfish collected in November 2015 at 10 m deep. In previous routine examinations conducted since 2010 to present in more than 1000 lionfish specimens, no isopods were noticed.

Isopods were removed from lionfish with forceps, preserved in 95% ethanol, placed in labelled containers, and later identified under the dissecting microscope following Kensley & Schotte (1989) and Thatcher *et al.* (2003). Additionally, isopods were measured with a calliper for body length (BL) in millimetres and deposited in the invertebrate collection of the Universidad Autonoma de Yucatan, Merida, Mexico.

RESULTS AND DISCUSSION

Isopods were identified as *Cymothoa excisa* by characters that distinguish them from other cymothoid isopods, including the anterolateral angles of pleonite one reaching to half-length of cephalon or less, eyes or eye traces present, and anterolateral angles of pleonite one narrow and subacute (Kensley & Schotte, 1989). Isopod specimens were adult females attached to the lionfish buccal cavity. The smaller specimen (11 mm in BL, Figure 1A) was attached at the base of the buccal cavity of one lionfish (294 mm TL) posterior to the tongue, with the head of the isopod facing anteriorly toward the mouth of the lionfish. The larger specimen (14 mm BL, Figure 1B) was attached upside down on the roof of the buccal cavity of the other lionfish (301 mm TL), with the head of the isopod oriented anteriorly facing the mouth of the lionfish. There was no evidence of tissue deterioration in the buccal cavity of the lionfish due to isopod attachment or presence of blood content in the isopods.

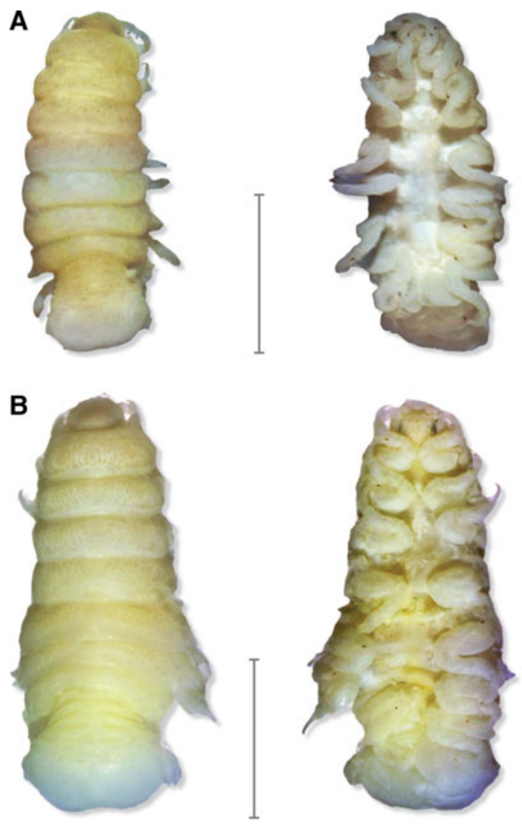

Fig. 1. Two snapper-choking isopod *Cymothoa excisa* recorded parasitizing invasive lionfish *Pterois volitans*. (A) 11 mm body length, (B) 14 mm body length. Scale bar = 5 mm.

The invasive lionfish *Pterois volitans*, as a new host for *C. excisa*, represents a new record in the Western Atlantic. In general, introduced species arrive in the invaded region without their natural parasites (Torchin *et al.*, 2003) and local parasites opportunistically infect invasive species. In this case, there is not any evidence that suggests invasive lionfish brought parasites with them from the Pacific Ocean (Ruiz-Carus *et al.*, 2006; Bullard *et al.*, 2011; Tuttle *et al.*, 2017). In fact, Tuttle *et al.* (2017) proposed that low infection rates of invasive lionfish indicate that parasites are not, and have not been likely, sources of biotic resistance to the lionfish invasion. Sellers *et al.* (2015) found that lionfish accumulate native parasites in the introduced range with patterns of parasitism varying regionally, but the absence of an association between lionfish condition and parasite abundance suggests that parasites probably do not have a substantial direct effect on lionfish.

Interestingly, infective free-swimming juveniles of *C. excisa* always attach on top of the tongue of their hosts and develop into females. In this case, neither specimen in Alacranes Reef appeared to be attached to the tongue or feeding on the lionfish host. Williams & Bunkley-Williams (in press) described juvenile prey-predator transfers as a new life cycle strategy in *Cymothoa oestrum*. This latter transfer was previously documented in adult *Anilocra acuta* to King Mackerel *Scomberomorus cavalla* (Williams & Bunkley-Williams, 1994). We suggest the possibility that *C. excisa* infected invasive lionfish in Alacranes Reef through adult prey-predator transfer.

In Alacranes Reef, *Cymothoa excisa* either infected lionfish as free-swimming juveniles or as adults through prey-predator transfer (probably ingesting a yellowtail snapper *Ocyurus chrysurus*, recorded in lionfish stomach content analyses in various locations of the Western Atlantic; Morris & Akins, 2009). Our findings, and the rarity of infections, suggest the latter. Monitoring should continue to further elucidate the infection method as well as prevalence of other parasite species in invasive lionfish. Additionally, we recommend determining the degree of susceptibility of lionfish to parasite species by comparing the parasite prevalence between native and invasive lionfish populations (as in Sikkel *et al.*, 2014) or between invasive lionfish and ecologically similar native fish species (as in Sellers *et al.*, 2015).

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