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Short Communication

First report of the fireworm *Hermodice carunculata* (Annelida: Amphinomidae) preying on a Sea Cucumber

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Abstract: The annelid 'fireworm' *Hermodice carunculata* is widely recorded in clear shallow waters of the tropical Atlantic Ocean and adjacent seas, where it inhabits hard substrata. It is an omnivore and opportunistic scavenger, feeding strategies considered central to the maintenance of its broad geographic distribution. *Hermodice carunculata* also preys on various cnidarians, and starfish. This study represents the first report of active predation by *H. carunculata* on living specimen of the holothurian *Isostichopus badionotus*, from the southwestern Atlantic, Brazilian coast. The fact that parts of living holothurians were consumed, excluded the possibility of scavenging behavior. Such predatory behavior is described here for the first time, corroborates that *H. carunculata* feeds on Echinoderms other than starfish. However, we cannot presently answer the question whether *H. carunculata* actively preys on healthy holothurians or opportunistically feeds on injured sea cucumbers.

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Introduction

The 'fireworm' *Hermodice carunculata* (Pallas, 1766) is a shallow-water species distributed in tropical Atlantic waters including the Gulf of Mexico, Caribbean, Mediterranean and Red Seas (Ahrens et al., 2013). These worms are often called 'fireworms' since they can deliver urticating neurotoxin(s) to defend themselves against some predators and the occasional hapless diver. Nakamura et al. (2008) characterized the neurotoxin complanine in *Eurythoe complanata*, but its method of delivery remains elusive. Tilic et al. (2017) refuted the long-held notion that hollow syringe-like harpoon notochaetae inject the neurotoxin into tissues since such chaetae are solidly constructed. Moreover, Tilic et al. (2017) found no evidence of venom glands or pores associated with the liberation of a neurotoxin.

In respect to feeding habits, *H. carunculata* is a generalist species that is both omnivorous and an opportunistic scavenger (Fauchald and Jumars, 1979; Wolff et al., 2014; Jumars et al., 2015). Marsden (1963) conducted the first study on the feeding behavior of *H. carunculata* by examining the contents of its digestive tract. She found cells and fragments of corals, eunicid jaws, radular ribbons and numerous annelid chaetae, and maintained her laboratory specimens by feeding *H. carunculata* pieces of fish flesh and eventually a dying crinoid (Marsden, 1963). Various reports describing cnidarian predation by *H. carunculata* include hermatypic corals (Ott and Lewis, 1972; Miller and Williams, 2007; Wolf and Nugues, 2013; Miller et al., 2014); anemones (Lizama and Blanquet, 1975); gorgonians (Vreeland and Lasker, 1989); fire corals (Whitman, 1988; Lewis and Crooks, 1996); zoanthids (Sebens, 1982; Francini-Filho and Moura, 2010); and upside-down jellyfish (Stoner and Layman, 2015). A relevant aspect of cnidarian predation by *H. carunculata* is that these

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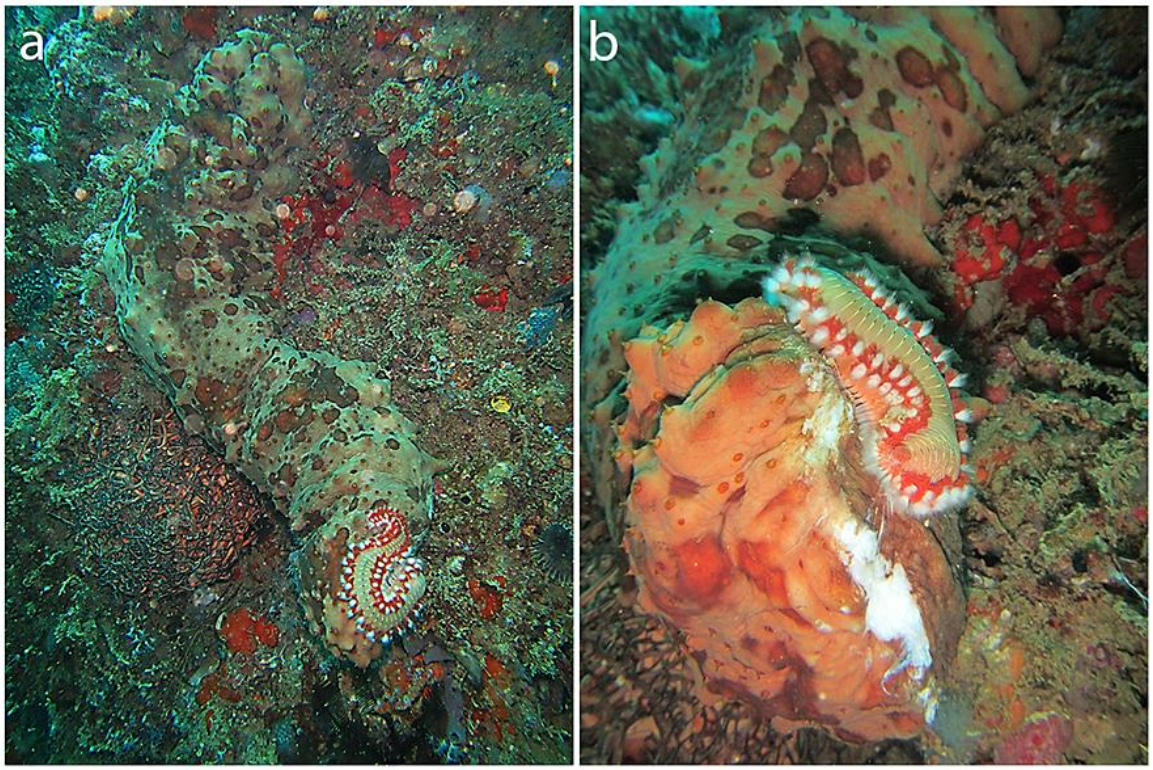

Figure 1. *Hermodice carunculata* feeding on the anterior end of the holothurian *Isostichopus badionotus*. (a) entire specimens and (b) close up on the feeding action.

worms function both as vectors and as reservoirs for coral pathogens (Sussman et al., 2003).

Recently, Barroso et al. (2016) reported the first occurrence of predation by *H. carunculata* on two species of starfish, although another fireworm, *Pherecardia striata*, preys on *Acanthaster planci* (Linnaeus, 1758), the crown-of-thorn starfish (Glynn, 1984; Cortes, 1997). The purpose of this communique is to provide details about the first report of *H. carunculata* preying on a sea cucumber.

Materials and Methods

The present observation was made during SCUBA dives at Escalvada Island, Guarapari, Espírito Santo State, (20°42'0.08"S, 40°24'27.60"W), a subtropical region on the Brazilian south-eastern coast on March 18, 2017. The sandy habitat was 15 m deep, and visibility of water column was 10 m during the observations. Feeding activity was observed and photographed between 9:45 and 10:00 am.

Results and Discussion

One specimen of *H. carunculata* was observed preying actively on a specimen of the sea cucumber, *Isostichopus badionotus* (Selekna, 1867) during a 15-minute period (Fig. 1a). The sea cucumber was ca. 40 cm long, while the worm was ca. 15 cm. The worm fed actively on an open gash in the anterior end of the sea cucumber which repeatedly swung its anterior end from side to side, apparently in response to the worm's actions (Fig. 1b).

Such predation by *H. carunculata* is noteworthy, and reinforces both its role as an omnivore and the fact that its predation on Echinoderms is not restricted to starfishes, as reported by Barroso et al. (2016). Conversely, this observation also adds another taxon to known natural predators of sea cucumbers, which mainly includes fish, crustaceans and sea stars (Francour, 1997).

We began our observations after the worm's predatory attack began, and thus cannot categorically state whether the sea cucumber's initial injury was caused by the worm or whether the worm opportunistically exploited an open injury somehow sustained earlier. For instance, both Glynn (1984) and Cortes (1995) observed *Pherecardia striata* accessed

the coelomic cavity to feed on internal organs of the starfish *Acanthaster planci* through body wall incisions inflicted previously by harlequin and other shrimps.

The fact that *Hermodice* actively consumed a living *Isostichopus* excludes the possibility that the worm displayed scavenging behavior, which of course, is a previously confirmed feeding strategy for *H. carunculata* (Wolf et al., 2014; Jumars et al., 2015). Within this context, it is worth noting that *H. carunculata* may also function as a pathogen vector to starfishes and sea cucumbers as it does to cnidarians (Sussman et al., 2003).

Finally, given limited field observations, we cannot answer the question whether *H. carunculata* is an active predator of healthy holothurians or an opportunistic feeder of previously injured sea cucumbers. Clearly, additional observations and experimental data on the feeding biology and behavior of *H. carunculata* are needed to such questions.

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