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Short Communication

Occurrence of *Nerocila acuminata* (Schiödte & Meinert, 1881) (Crustacea, Cymothoidae) parasitic on the shortnose guitarfish *Zapteryx brevirostris* (Rhinobatiformes, Rhinobatidae) off Brazil

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ABSTRACT. The isopods of the family Cymothoidae are ectoparasites crustaceans that infest a wide variety of saltwater fish. This paper documented the first occurrence of *Nerocila acuminata* (Schiödte & Meinert, 1881) parasitizing the shortnose guitarfish *Zapteryx brevirostris* (Müller & Henle, 1841) (Rhinobatiformes, Rhinobatidae) in the southern Atlantic Ocean. This report can be an available tool to create a parasitology database for a species of conservation interest. It will also provide scientific data that can help the understanding of the biological factors acting in healthy populations and thus support the efforts made to preserve and conserve the species.

Keywords: *Nerocila acuminata*; *Zapteryx brevirostris*; ectoparasite; elasmobranchs; isopod; shrimp fishing; ray; parasitology database

Shortnose guitarfish *Zapteryx brevirostris* (Müller & Henle, 1841) is the only species of the *Zapteryx* genus in the Atlantic Ocean (Batista 1991) and has been classified as vulnerable (VU) by the International Union for Conservation of Nature (IUCN) (Vooren et al. 2006). Shortnose guitarfish has been reliably recorded from the coasts of the Southwest Atlantic in southern Brazil, Uruguay, and northern Argentina. This species has no commercial importance. Guitarfish play an important role in the food chain as the top predator (Schwingel & Assunção 2009). However, they suffer capture pressure because they are part of the bycatch produced by the fishing activity with trawl aimed at capturing shrimp, with most of the captured specimens returned dead to the ocean (Santos et al. 2006).

The study of parasitic species associated with economically valuable fishes is an important area of research that contributes to the successful and sustainable management of fisheries and aquaculture systems worldwide (Reed 2012). Cymothoidae was associated with many species of commercially important fishes worldwide and caused significant economic losses to fisheries by killing, stunting, or damaging these fishes (Bunkley-Williams et al. 2006, Smit et al. 2014). Several species are morphologically highly variable, and their identification is often difficult (Bruce 1987). Cymothoids settle on various body regions, including fins, the buccal cavity, the gill chambers, or sometimes living in a pouch (Alas et al. 2008).

Elasmobranchs have occasionally been reported as hosts for some parasitic species, but these data are probably due to trawl transfers (Brusca 1981, Trilles 1994). The development and mode of infection of Cymothoidae are not yet very well understood (Bakenhaster et al. 2006), and the aspects of the influence of parasitism on elasmobranchs biology have

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been relatively little studied (Takatsuka et al. 2019). Studies on elasmobranch parasites can still be considered insufficient compared to teleosts (Garner 2013, Souza et al. 2020, Ota et al. 2022). Therefore, this study aimed to identify the species of isopod parasites of the shortnose guitarfish *Z. brevirostris* and thus contribute toward forming a database on the parasitology of elasmobranchs.

A male specimen of *Z. brevirostris* (Rhinobatiformes, Rhinobatidae), of weight 546.4 g and a total length of 43 cm, was caught accidentally through commercial pink shrimp trawl fishery operations in the southern Atlantic Ocean, on the coast of Ubatuba, São Paulo, Brazil, at a depth of approximately 30 m (23°44'08"S, 45°00'16"W).

The shortnose guitarfish was taken to the laboratory to observe and identify the parasite, under authorization SISBIO No49980-3 and Ethics Committee for Animal Experimentation of the Fisheries Institute (CEEAIP) N°12/2016. The fish were examined during this sampling and identification process, and a single specimen of Isopoda order was attached to the right clasper. After removing the isopod, the fish was released in the same catch region.

A stereomicroscope was used to determine the parasite's morphological characteristics. The isopod was carefully removed with tweezers and placed in a test tube for preservation in 70% alcohol. To identify the isopod species was then sent to the University of São Paulo Oceanographic Institute. Parasites were identified according to Williams & Williams (1978), Brusca (1981), Trilles (1994), Trilles et al. (2013), and Rameshkumar et al. (2015).

Based on the pereiopod morphology: seven subequal in length to six, uropodal rami not serrate, uropod exopod about twice as long as endopod; endopod distal margin deeply indented; uropod exopod slightly longer than endopod and distal margin not deeply indented. The specimen collected from the shortnose guitarfish corresponds to the description of *Nerocila acuminata* (Schiödte & Meinert, 1881) (Fig. 1). The isopod specimen *N. acuminata* (MZUSP 34817) was deposited in the Zoology Museum of the University of São Paulo, in São Paulo, SP.

Nerocila is a large genus of the family Cymothoidae, including at least 65 species living attached to the skin or on the fins of fishes (Trilles et al. 2013). Regarding the hosts the species *N. acuminata* has been observed on as many as 40 species of fishes (families Engraulidae, Atherinidae, Serranidae, Mugilidae and Embiotocidae) (Espinosa-Pérez & Hendrickx 2001). Despite their importance, isopods associated with fishes are relatively poorly studied or even surveyed in many parts of the world (Bunkley-Williams et al. 2006). The first record for *N. acuminata* parasitizing teleost fish in Brazil was recorded off the coast of Amapá (Esteves-Silva et al. 2020). However, there were no records of *N. armata* parasitizing shortnose guitarfish.

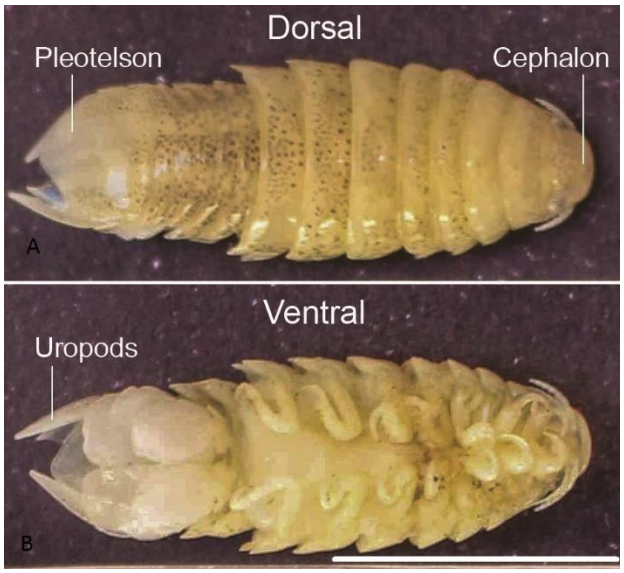

Figure 1. Anatomical structures of the species *Nerocila acuminata*. Bar scale: 1 cm.

The presence of these ectoparasites may affect these body parts, causing gill filament atrophy, removal of brachial arcs, and obstruction of the mouth cavity and thus the destruction of the tongue, compromising the whole of the fish behavior and leading, sometimes, to the death of the animal (Rhode 2005). However, there have been no reports of the occurrence of *N. armata* on clasper of elasmobranchs.

Nerocila are hematophagous parasites feeding on host blood, but they can sometimes eat their hosts' mucus, epithelium, and subcutaneous tissues (Ravichandran et al. 2007). Isopods can cause tissue, osmoregulatory and respiratory damages, histopathological alterations, and secondary infections caused by bacteria and fungi, besides a reduction in growth and reproduction, leading to mortality of farmed and wild fish populations and economic losses in aquaculture and fishing (Tavares-Dias et al. 2014). Normally one parasite of the genus *Nerocila* was collected per host fish (Rameshkumar et al. 2015). This cymothoid isopod attaches to the skin of a variety of marine fish species, and all known species of *Nerocila*, as adults, reside on the surface of their hosts, except for *N. lomatia* that attaches to the gills (Segal 1987). *N. acuminata* attaches to the body and the fins or the host fishes' buccal and branchial cavities using seven pairs of sharply hooked legs and specialized mouthparts (Brusca 1981). In

addition, no damage was observed to the parasitic fish clasper. Our findings show no severe health problems in the infested shortnose guitarfish. However, more studies are needed to conclude the effects that this isopod may cause in elasmobranchs.

The parasitized guitarfish did not show any apparent injuries, and there were no significant clinical signs of the parasite's action on its skin, possibly due to the host's good nutritional and physiological state, in equilibrium with the environment, thus avoiding the manifestation of diseases. Parasitism in fish has been frequently assumed to be an indicator of environmental health and, therefore, an essential complement for aquaculture development and environmental balance in marine ecosystems (Carvalho-Souza et al. 2009).

This paper reported the first occurrence of *N. acuminata* parasitizing *Z. brevirostris* in the southern Atlantic Ocean. This study can be an available tool to create a parasitology database for a species of conservation interest. It is emphasized that there are few pieces of research about cymothoids parasitizing elasmobranchs and that more study is necessary to understand the occurrence and the impact of ectoparasites on the elasmobranchs in their natural environment.

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