

**ANOTHER RECORD OF *Pennella instructa* (COPEPODA, PENNELLIDAE)  
PARASITIZING SWORDFISH *Xiphias gladius* IN THE SOUTH ATLANTIC, AFTER 20  
YEARS AGO**

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**ABSTRACT**

The species of the genus *Pennella* are highly modified copepods that have been found parasitizing several species of fishes in Atlantic waters. Although these parasites have been recorded several times in the Atlantic Ocean, little is known about them in South Atlantic waters, except for one report published 20 years ago. The present contribution reports the occurrence of *Pennella instructa* Wilson, 1917 parasitizing the swordfish *Xiphias gladius* Linnaeus, 1758 in the South Atlantic. The prevalence of infestation was 15.6% and the mean intensity of infestation was 1.6, ranging from 1 to 3.

**Keywords:** Xiphiidae host; crustacean; copepod; Brazilian coast

**OUTRO REGISTRO DE *Pennella instructa* (COPEPODA, PENNELLIDAE) PARASITANDO O  
ESPADARTE *Xiphias gladius* NO ATLÂNTICO SUL APÓS 20 ANOS**

**RESUMO**

Os copepoda do gênero *Pennella* são altamente modificados e têm sido encontrados parasitando vários peixes nas águas do Atlântico. Embora já tenha sido registrado no Oceano Atlântico, pouco é conhecido deste parasito nas águas do Atlântico Sul. Neste trabalho, descreve-se a ocorrência do copepoda *Pennella instructa* Wilson, 1917 parasitando o espadarte *Xiphias gladius* Linnaeus, 1758 no Atlântico Sul. A prevalência de infestação foi 15,6% e a média da intensidade da infestação foi 1,6, com um mínimo de 1 e máximo de 3.

**Palavras chave:** Hospedeiro Xiphiidae; crustáceo; copepode; costa do Brasil

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## INTRODUCTION

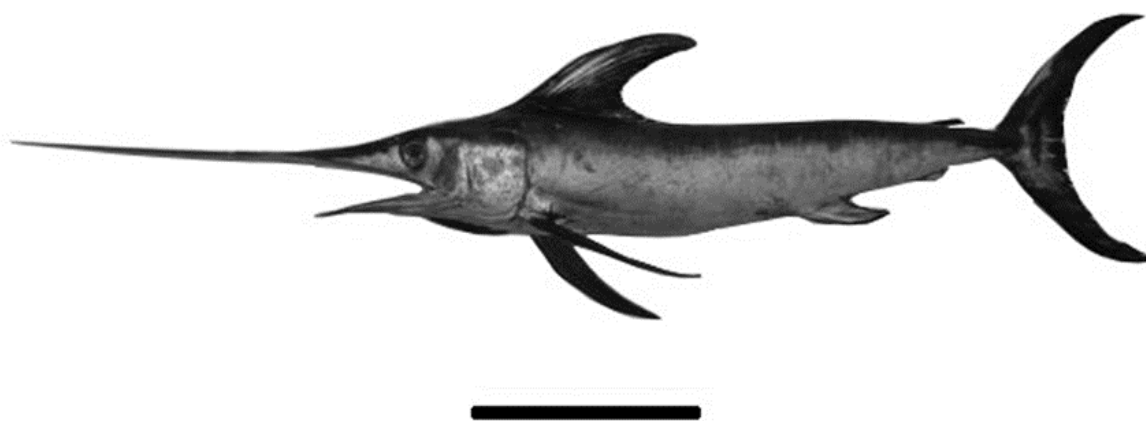
Pennelid copepods are mesoparasites of pelagic and demersal fishes (OHTSUKA *et al.*, 2007) and cetaceans (YAMAGUTI, 1963; KABATA, 1979). Among the pennelids, the genus *Pennella* Oken, 1816 is more common in fish, and in the investigation of parasitofauna of the swordfish *Xiphias gladius* Linnaeus, 1758 by CASTRO-PAMPILLÓN (2002b) this genus was suggested as a biological tag. This parasite inserts its cephalothorax into the body surface of the host, and eventually anchors in the musculature or organs (HOGANS *et al.*, 1985). MATTIUCCI *et al.* (2005) found it in both surface and internal organs of *X. gladius*, with a positive correlation between host age and parasite intensity.

*Xiphias gladius* is an oceanic pelagic migratory scombrid that can grow to more than 3 m in length (TSERPES and TSIMENIDES 1995; SUN *et al.*, 2002). This widely distributed species is one of the most important fishery resources in the world (HAZIN *et al.* 2005; DAMALAS *et al.*, 2007). Studies on swordfish parasites have focused on Mediterranean (CASTRO-PAMPILLÓN *et al.*, 2002a; MUSCOLINO *et al.*, 2012), North Atlantic (HOGANS *et al.*, 1983, 1985) and tropical-equatorial waters (MERELLA *et al.*, 2003; GARCIA *et al.*, 2008). However, in the South Atlantic, these crustaceans are relatively little studied.

The occurrence of *Pennella instructa* Wilson, 1917 parasitizing *X. gladius* was reported in the northwest Atlantic (ILLES, 1971; HOGANS *et al.*, 1983, 1985), in the Gulf of Guinea (CASTRO-PAMPILLÓN *et al.*, 2002a,b) and in tropical-equatorial waters (MERELLA *et al.*, 2003; GARCIA *et al.*, 2008). Although AMORIM and ARFELLI (1984) commented on the relationship of *X. gladius* and its parasites in an article about fisheries biology in Brazil, this information is not readily available to the scientific community. None of the articles cited above (published after 1984) noted the occurrence of *P. instructa* in South Atlantic waters. The present contribution provides a new record of *P. instructa* parasitizing *X. gladius* in the South Atlantic, extending those of AMORIM and ARFELLI (1984) after 20 years, in order to provide this information to the general scientific community.

## MATERIALS AND METHODS

During October and November of 2007, the fish landed at the TAYO Company, located in the Port of Santos (State of São Paulo, Brazil) were inspected weekly, and the body surface of swordfish *X. gladius* (Figure 1) was examined for the presence of the copepod *P. instructa*. The fish were caught in the southwest Atlantic (between 30°38'29''S; 47°06'49''W and 19°26'44''S; 35°25'13''W), by means of longlines.



**Figure 1.** Swordfish *Xiphias gladius*. Scale bar = 20 cm (Photograph by Teodoro Vaske)

The pennelids were collected by excising the fish muscle around the area where the cephalothorax was inserted, and specimens were

fixed and stored in 70% ethanol. In the laboratory, the specimens were identified according to HOGANS *et al.* (1985).

For the determination of sex, the gonads were analyzed according to the description by PALKO *et al.* (1981). To evaluate the relationship between the lower jaw fork length (LJFL) of the hosts and the intensity of infection of *P. instructa*, Spearman's correlation coefficient ( $r_s$ ) was used. The  $t$  test was used to evaluate a possible difference in the LJFL and weight between males and females. These tests were performed using SigmaStat 3.5 software (SYSTAT Software Inc., 2007), with a significance level of  $P < 0.05$ . The mean intensity of infestation and the prevalence were calculated according to BUSH *et al.* (1997). The length of the egg strings was measured using a computerized image analysis system (Qwin Lite 3.1, Leica Microsystems, Wetzlar, Germany).

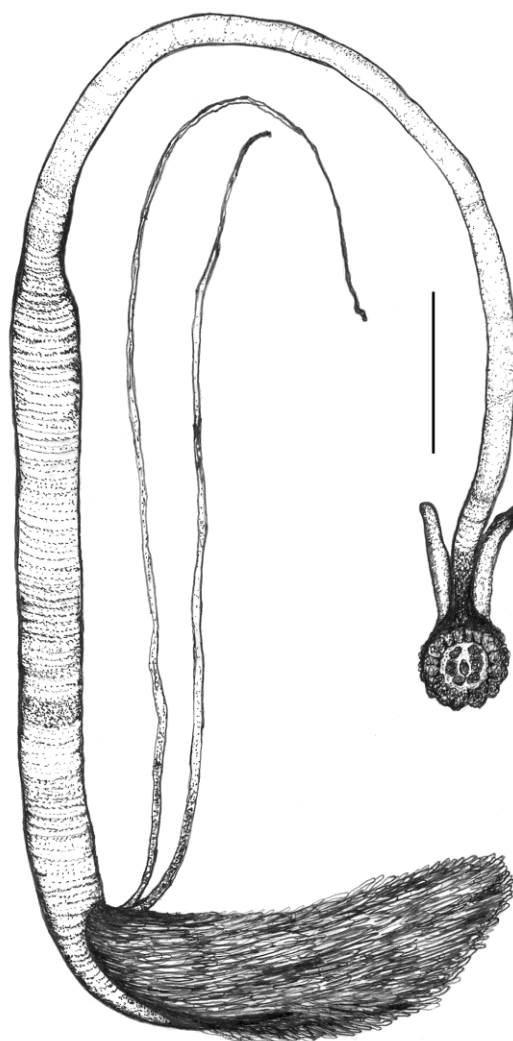
## RESULTS

According to HOGANS *et al.* (1985) and HOGANS (1986), *P. instructa* is characterized by two unbranched lateral horns that protrude from the head and extend posteriorly parallel to the neck. The truncate surface of the head is partially covered by a distinct group of papillae, and has five-segmented and setose first antennae. Also, the mouth is surrounded by papillae arranged in two concentric rows (Figure 2). This species differs from *Pennella filosa* (Linnaeus, 1758), which possesses three unbranched lateral horns that protrude from the head perpendicular to the neck, and the truncate surface of the head is covered by spherical to knob-like papillae. These papillae at the outer margin are twice the size of those at center (HOGANS 1987; BENZ and HOGANS, 1993).

A total of 32 specimens of *X. gladius* were analyzed, and five fish (all males) were parasitized by *P. instructa* (Figure 2). The adult females of *P. instructa* were found inserted in the musculature, with the cephalic portion penetrating into the body cavity, while the trunk was outside the body of the fish.

The prevalence and mean intensity of infestation were 15.6% and 1.6 (range 1-3), respectively. The mean LJFL of *X. gladius* was  $156.7 \pm 19.7$  cm for the females (range 131-189 cm) and  $155.3 \pm 20.2$  cm for the males (range 130-186 cm). The total mean weight was  $139.6 \pm 14.6$  kg for the females (range 115-160 kg) and  $138.1 \pm$

$14.4$  kg for the males (range 117-159 kg). There were no significant differences in the LJFL ( $t = 0.21$ ;  $p = 0.84$ ) and weight ( $t = 0.296$ ;  $p = 0.77$ ) between the sexes. There were no significant correlations between the LJFL and the intensity of the infection of *P. instructa* ( $r_s = 0.87$ ;  $P = 0.33$ ). The pennellids had a mean length of  $21 \pm 4.7$  cm; the mean length of the egg strings was  $29 \pm 7.5$  cm.



**Figure 2.** *Pennella instructa* Wilson, 1917. Adult female carrying two linear egg strings. Scale bar = 1 cm (Drawn by Alison Wunderlich).

## DISCUSSION

The relatively low prevalence and intensity found in the present study are similar to the data of GARCIA *et al.* (2008, 2011), who also studied this fish in Atlantic waters. The lack of correlation

between the LJFL and the intensity of infection of *P. instructa* found here also concord with data of GARCIA *et al.* (2008, 2011). The absence of *P. instructa* from the female fish in the present study could be explained because most of the individuals examined were juveniles (120-180 cm). According to GARCIA *et al.* (2008), the females parasitized by *P. instructa* were all adults, e.g., more than 200 cm long. In the Mediterranean, the prevalence and intensity were quite high (MATTIUCCI *et al.* 2005). GARCIA *et al.* (2008) found that the prevalence of *P. instructa* was lower in larger fish, except in the females.

This parasite associated with *X. gladius* was first reported in Brazilian waters by AMORIM and ARFELLI (1984), in a general study about fishery biology. The authors recorded only two species of pennellids, *P. instructa* and *P. filosa*, parasitizing *X. gladius*. Until the present date, no publication about this parasitism in *X. gladius* has mentioned the paper of AMORIM and ARFELLI (1984). The recent check list of LUQUE and TAVARES (2007) about Brazilian copepods cited only *P. filosa* from *Mola mola* (Linnaeus, 1758) (CARVALHO, 1951), confirming the lack of knowledge of the paper of AMORIM and ARFELLI (1984). We believe that the reason is that the paper of AMORIM and ARFELLI (1984) is a general study of fisheries biology, without emphasis on the parasitology of species. Therefore, the present study confirms the occurrence of this parasite on *X. gladius* in South Atlantic waters, and provides new data on the prevalence and mean intensity of infestation of this mesoparasite.

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