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A note on the occurrence of praniza larvae of Gnathiidae (Crustacea, Isopoda) on fishes from Northeast of Pará, Brazil

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ABSTRACT

The infection of the estuarine teleost fishes *Mugil gaimardianus* Desmarest, 1831 (Mugilidae), *Arius phrygiat* Valenciennes, 1839 (Ariidae), *Conodon nobilis* Linnaeus, 1759 (Haemulidae), *Cetengraulis edentulus* Cuvier, 18 (Engraulidae), and *Anableps anableps* Linnaeus, 1758 (Anablepidae) by praniza larvae of Gnathiidae (Crustace Isopoda) was studied in specimens fished off the Atlantic Ocean in Northeast of Pará State, near Bragança, Braz The highest infection prevalence value was found in *Anableps anableps* (42.3%) and the lowest in *Conodon nobi* (9.1%). The mean intensity varied from 1 parasite in *Conodon nobilis* to 19.5 in *Arius phrygiatus*. A description of t larvae is provided. The morphology of the mouthparts is related to the blood sucking activity, and is compared wi the characteristics of other gnathiidae species.

Key words: fish, parasites, Isopoda, Gnathiidae, Brazil.

INTRODUCTION

Gnathiid isopods are crustacea which are free-living as adults and have juvenile stages, the praniza larvae, which are temporary ectoparasites feed intermittently on the blood and tissue fluids of fishes, both elasmobranchs and teleosts (Davies 1981). There are twelve genera within the Gnathiidae family, and most of the species belong to the genus *Gnathia* (Smit and Davies 2004, Hadfield and Smit 2008).

The larval stages attach to the gills and skin and can cause focal lesions on the place of attachment (Heupel and Bennett 1999, González et al. 2004, Marino and Grutter 2005) or even cause the death of t (Mugridge and Stallybrass 1983).

Apparently these parasites are not host spec were described from a number of hosts wor (Smit and Basson 2002, Smit and Davies 2004 and Grutter 2005, Genc et al. 2005). In some they can be very abundant: in *Dentex dentex* fr Western Mediterranean the prevalence of prani vae reached 85%, with a mean intensity of 2 sites per fish (González et al. 2004), and in *Epine aeneus* from the North-Eastern Mediterranean 57 the specimens were infected presenting a mean in

larvae. Moreover, we describe the morphology of the praniza larvae, and identify the most infected fish species in order to subsequently study their blood parasites since praniza larvae have been shown to transmit haemogregarines to fish (Davies 1982, Davies et al. 1994, Davies and Smit 2001), and the possibility of transmitting other blood parasites can not be ruled out.

MATERIALS AND METHODS

Specimens of the estuarine fish "tainha", *Mugil gaimardianus* Desmarest, 1831 (Mugilidae – 29 specimens), "peixe-gato", *Arius phrygiatus* Valenciennes, 1839 (Ariidae – 52), "jiquiri", *Conodon nobilis* Linnaeus, 1759 (Haemulidae – 11), "sardinha", *Cetengraulis edentulus* Cuvier, 1829 (Engraulidae – 71) and "tralhoto", *Anableps anableps* Linnaeus, 1758 (Anablepidae – 59) were net-fished in the Atlantic Ocean, in the coastal zone of Pará State, near Bragança, Brazil, from August 2006 to February, 2007, and identified according to Santo et al. 2005. The fish were immediately transported to the laboratory, and were anaesthetized with benzocaine and sacrificed for parasite collection according to Ghiraldelli et al. 2006. Prevalence and mean intensity were calculated according to Bush et al. 1997. Ten praniza larvae, with origin in different host fish species, (total length: 2.09 ± 0.12 mm, 1.8–2.26 mm) were dissected for anatomical studies following the recommendations described elsewhere (Smit et al. 1999, Smit and Basson 2002). No attempts were made to moult the pranizae to adults.

RESULTS

The number of fish, the total length and weight of the specimens, the prevalence and mean intensity of infection are depicted in Table I.

The parasites were found only in the gill chamber with expanded anterior hindgut filled with host blood, attached to the gill filaments with the mouthparts. The gill filaments were not pale and there were apparently not relevant modifications of the host near the place of attachment of the parasites.

The highest prevalence value was found in *Ana-* lower in the other species (varying between 2.2 and 3.4), the range being very high in *A. phrygiatus* (1–200 parasites) and much lower in the other species.

Larvae Morphology

The body of the larvae (Fig. 1A) is divided into three parts: the cephalosome (including the antennae and the mouthparts), the peraeon with five pairs of peraeopods, the pleon with five pairs of pleopods, and the telson with one pair of uropods.

The posterior margin of the cephalosome is slightly wider than the anterior one, almost as wide as it is long, presenting few setae on the posterior dorsal region. The lateral margins are straight and parallel. The well developed compound eyes are oval-shaped and located on the lateral margins of the cephalosome, and the length of the eye is more or less half of the length of the cephalosome (Fig. 1A). The cephalosome has straight medio-anterior margins with concave lateral excavations to accommodate the first articles of the antennae.

The antennae are straight, the antenna 2 being longer than the antenna 1. Antenna 1 has three pedunculate articles, the third of which is the largest (Fig. 1A). The flagellum has four articles, of which article 2 is the largest. Articles 2 and 3 have one aesthetasc seta each, and article 4 ends in one aesthetasc seta and two simple setae. Article 2, 3 and 4 presented few setae. Antenna 2 has four pedunculate articles, the fourth of which is the largest. The flagellum has seven articles, of which article 1 is the largest, article 7 ends in three or four simple setae, and few setae exist on the distal end of each article (Figs. 3A and 3B).

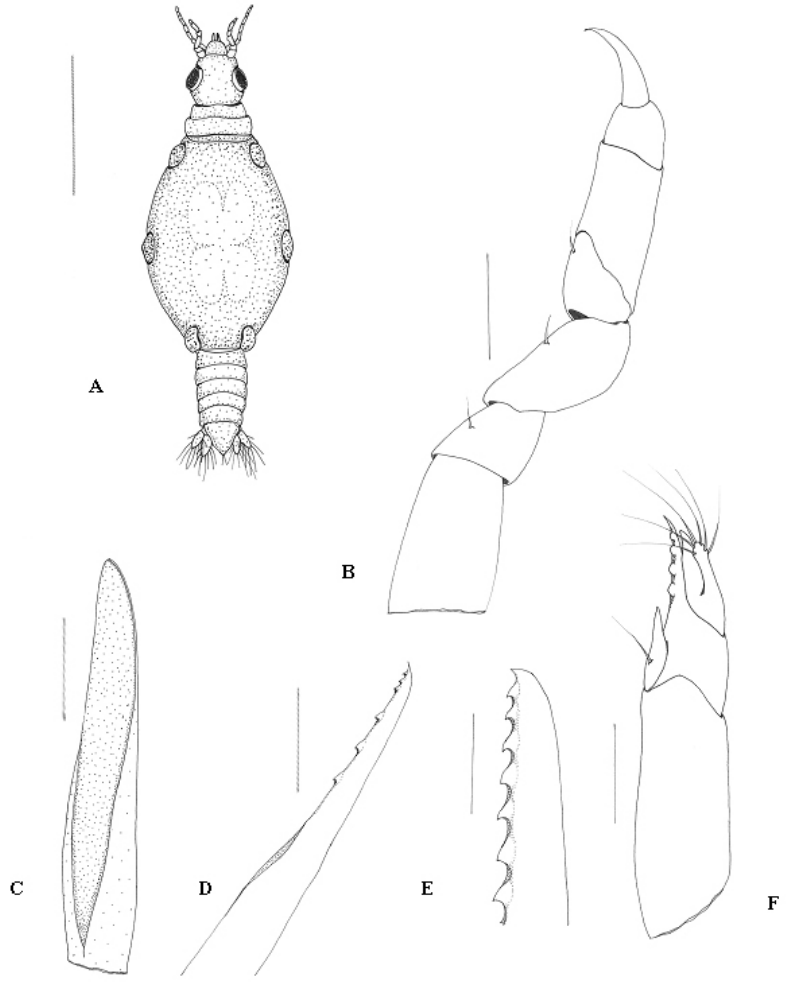
The labrum is prominent and semicircular, with an apical process, and its posterior and anterior margins are concave. The ventral part is gutter-like with a central groove, covering the mandibles both dorsally and laterally (Fig. 1A).

The gnathopods are smaller than the peraeopods, have seven articles, the dactylus is hooked, and they present a few simple setae without scales (Fig. 1B).

The paragnaths are prolonged and end in sharp points, presenting no teeth (Fig. 1C).

TABLE I
Biometric and parasitological data of the fishes captured from Northeast of Pará, Bragança, Brazil.

	M. gaimardianus (Mugilidae)	*A. anableps* (Anablepidae)	*A. phrygiatus* (Ariidae)	*C. nobilis* (Haemulidae)	*C. edentulus* (Engraulidae)
Total length (cm)	20.2 ± 2.9	21.4 ± 3.2	17.8 ± 5.6	14.5 ± 3.8	13.6 ± 1.0
Weight (g)	84.2 ± 34.1	83.1 ± 36.1	53.0 ± 45.2	55.1 ± 49.4	21.5 ± 5.1
Number of fish	29	59	52	11	71
Parasitized fish	6	25	16	1	23
Prevalence (%)	20.7	42.3	30.8	9.1	33.8
Mean intensity	3.0 ± 6.1	3.4 ± 3.8	19.6 ± 48.9	1.0	2.3 ± 2.2
Range	1–18	1–16	1–200	1	1–9



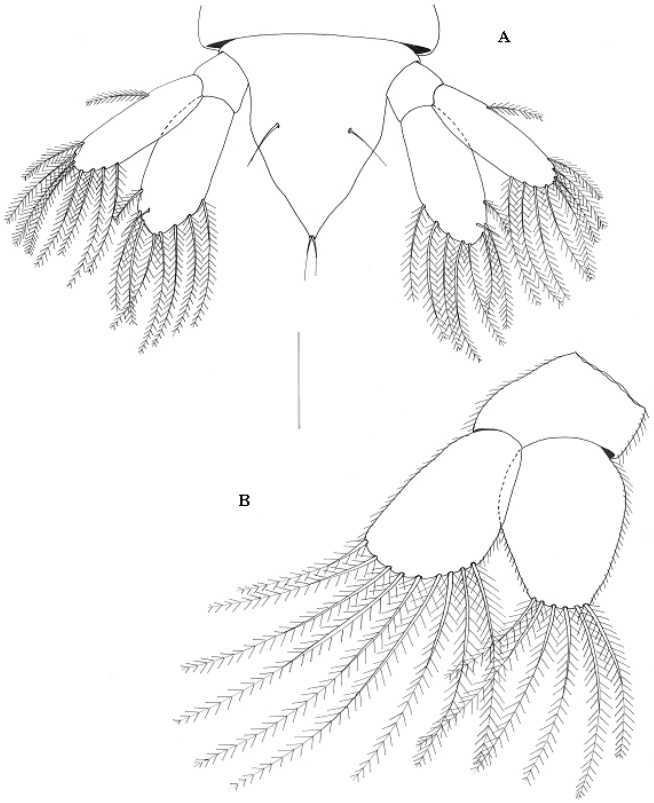
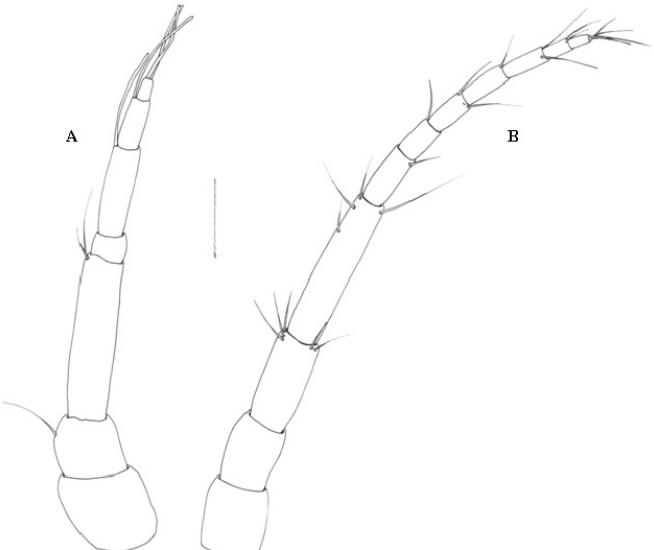


Fig. 2 – Praniza larvae collected from fishes of estuarine zone of Northeast of Pará, Brazil. A: Telson and uropods with setae. B: Right pleopod. Bar = 75μm.



The mandibles are stout, swollen at the base, with the distal margin styliform with seven large triangular teeth on the medial margin, facing backwards, and one small tooth located at the tip of the mandible (Fig. 1E).

The maxilliped is large and cylindrical, with an elongated base. The palp has three articles, the first one being acute, with five teeth placed distally, and a single long simple setae ventrally located. Article 3 has six long simple setae (Fig. 1F).

The pereon is larger than the cephalosome and almost twice as long as it is wide. Pereonite 1 is fused with the cephalon (Fig. 1A), dorsally visible, and has shallow and convex anterior and posterior borders. Pereonite 2 has an anterior constriction separating it medially from pereonite 1. Pereonite 3 is the largest one and when the larvae are full of blood it represents about 50% of the body length. (Fig. 1A). Pereonite 4 is about twice as wide as it is long and has a rounded posterior margin stretching over pereonite 5, with lateral shields at the leg connection. Pereonite 5 consists of an elastic membrane with bulbous shields on its lateral sides at the leg connection. Pereonite 6 is rectangular and its posterior margin is slightly concave. Pereonite 7 is small and dorsally visible, with a rounded posterior margin overlapping the first pleonite (Fig. 1A).

The peraeopods show all six segments with simple setae in varying number (Fig. 4). They are divided at the base, ischium, merus, carpus, propodus and dactylus. The base is bigger than the others, with one simple seta. The ischium is three quarters of the length of the base, with the same width. The merus is three quarters of the length of the ischium, with an anterior bulbous protrusion and long simple setae. The carpus is the same length as the merus and equipped with a small bulbous protrusion. The size of the propodus is twice as long as the carpus, with one to four simple setae distributed at the back and at the front. The dactylus is the same size as the propodus, terminating in a sharp point with no setae.

The pleotelson is triangular in shape, longer than it is wide, with straight lateral margins, two simple setae on the dorsal surface, the distal tip ending in a pair of simple setae (Fig. 2A).

setae. Short, simple setae are distributed laterally
the margins (Fig. 2B).

The uropods have an endopod extending bey
tip of the pleotelson, and exopods reaching the tip
have eight plumose setae on the final appendage, a
plumose setae on the medial region (Fig. 2A).

REMARKS

As shown in Table I there was a considerable
tion concerning the prevalence and mean intensity
between the different host species, as well as
range of the parasites. Considering all the fea
can be concluded that *A. phrygiatus* was the m
fected species, in spite of higher values for prev
obtained for *C. edentulus* and *A. anableps*. Ho
A. phrygiatus had a mean intensity of infecti
range values much higher than the other species
fact is likely to be related to the benthonic beha
the fish since the adults and larvae of gnathiids
cated on the sea-bed, these fish are probably more
infected.

Comparing our values with literature repor
cerning the infection of other species it can be se
there is a great variation between the prevalence
tensity of infection, in some cases higher (Gonz
al. 2004, Genc et al. 2005) and in others low
the values obtained for our specimens (Grau et al
Yuniar et al. 2007). According to Genc et al.
who studied the infection of *Epinephelus aneus*
North-eastern Mediterranean, the infestation inc
at higher temperatures and varied throughout th
In our case, in spite of the relatively low number
observed in order to draw conclusions about seas
there are apparently no differences between the
tion from August, 2006 to February, 2007. This
related to a less variable water temperature arou
year at our sampling site.

The pathology induced by these parasites is v
(for review see Smit and Davies 2004). While so
thors did not find relevant lesions caused by the pa
others reported severe lesions or even the death
hosts. Giannetto et al. (2003) reported the mort

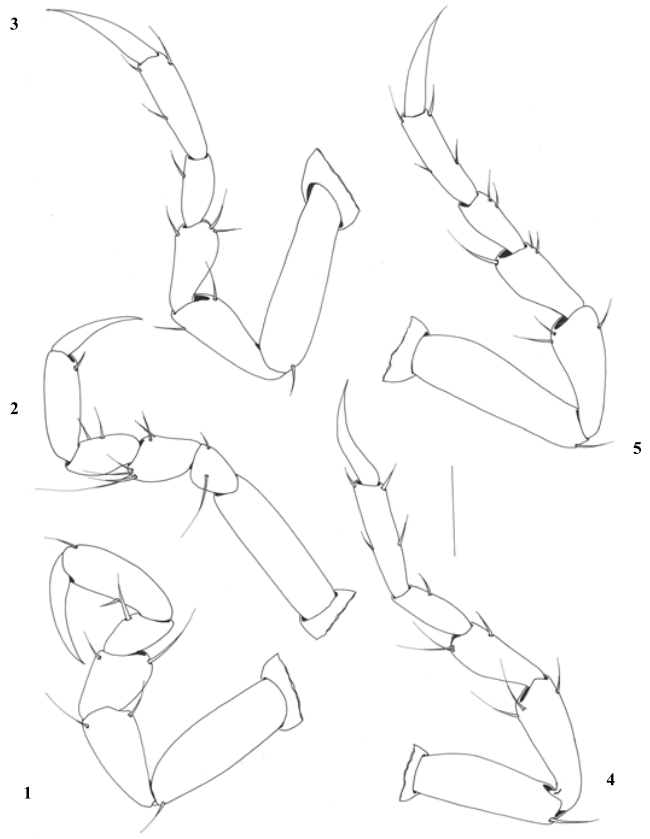


Fig. 4 – Peraeopods 1–5 of praniza larvae collected from fishes of estuarine zone of Northeast of Pará, Brazil. Bar = 150 μm.

the Red Sea, and also the death of fish from anaemia and stress, and Mugridge and Stallybrass (1983), described mortality of eels attributed to gnathiidae. In other cases focal lesions on the place of attachment of the larvae were described (Heupel and Bennett 1999, González et al. 2004, Marino et al. 2004), as well as the reduction of the haematocrit of the host (Jones and Grutter 2005).

In our specimens apparently there appeared to be no lesions other than the focal ones in the place of attachment, and the condition of the hosts was apparently unaltered.

The morphology of the larvae shows that the mouthparts are well adapted and modified for blood feeding. The backward directed teeth on the mandibles, and the hooked dactylus present at the extremity of the gnathopods, are very likely to contribute to the anchortured the larvae and the current taxonomy of gnathiids is based solely on the morphology of free-living adult males (Smit et al. 2003, Smit and Davies 2004). The general characteristics of our specimens are similar to those reported for other species (Davies 1981, Smit et al. 1999, Smit and Basson 2002, M.L. Coetzee, unpublished data). However, the comparison of our specimens with descriptions of other larvae descriptions (Table II) shows some differences, namely the relative small number of teeth on the mandible (7), and the lowest number of teeth (1) on the tip of the mandible, and the low number of setae in the pleotelson.

It is now well established that gnathiid larvae can transmit blood parasites to the fish, namely *Haemogregarina* spp., and act as definitive hosts during the life

TABLE II
Comparison of the morphological characteristics of praniza larvae of this study and the praniza larvae of others s

Species	Total L (mm)	Teeth on the mandible	Teeth on tip of mandible	Teeth on the maxillipede	Teeth on the maxillule	Setae on the pleotelson	Referen
Present study	2.0 ± 0.1	7	1	5	6	4	
Gnathia australis	2.3 ± 0.3	6	2	3–4	7	12	M.L. Coetz unpublishe data
G. nigro-grandilaris	6.1 ± 2.3	7	2	3–5	7	14	M.L. Coetz unpublishe data
G. trimaculata	4.0 ± 1.1	8	2	3–4	7	8	M.L. Coetz unpublishe data
G. africana	1.1 ± 3.9	7–8	2	7	6-8	6	Smit et al.
G. pantherina	3.9 ± 5.8	8	2	3–5	7	4	Smit et al.
G. maxillaris	2–3	12	2	9	9	–	Davies 198

the larvae. We do not know whether our fish hosts are infected by blood parasites and the continuation of this research aims to study of blood films to ascertain whether they are infected or not, as well as the examination of the gut content of praniza larvae to try to detect developmental stages of blood parasites as has already been demonstrated (Davies 1982, Davies et al. 1994, Davies and Smit 2001).

RESUMO

Foi estudada a parasitose dos peixes estuarinos *Mugil gaimardianus* Desmarest, 1831 (Mugilidae), *Arius phrygiatus* Valenciennes, 1839 (Ariidae), *Conodon nobilis* Linnaeus, 1759 (Haemulidae), *Cetengraulis edentulus* Cuvier, 1829 (Engraulidae), e *Anableps anableps* Linnaeus, 1758 (Anablepidae) por larvas praniza de Gnathiidae (Crustacea, Isopoda) em exemplares pescados no Oceano Atlântico, no Nordeste do Pará, próximo a Bragança, Brasil. O valor mais elevado da prevalência da infecção foi observado em *A. anableps* (42,3%) e o menor em *C. nobilis* (9,1%). A intensidade média da parasitose variou entre 1 parasita em *C. nobilis* até 19,5 em *A. phrygiatus*. Efetua-se a descrição da larva, verificando-se que a morfologia da armadura bucal está relacionada com a atividade sugadora

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