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Metoncholaimus sp. (Nematoda Oncholaimidae) pseudoparasite of *Mullus surmuletus* (Linnaeus, 1758) (Perciniformes Mullidae) in the western Algerian Sea

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ABSTRACT This study was carried out between October 2009 and July 2010 to determine nematode parasites of the red stripped mullet, *Mullus surmuletus* (Linnaeus, 1758), in the gulf of Oran (western Algeria), located at 35°43' N - 0°37' W. A total of 100 fishes caught from the local fishermen by gill-net were investigated. Our investigation revealed the presence of three nematodes (one female and two males) located in the intestine of two infected fishes, these nematodes were alive and not attached to the mucosa of the fish host. The examination of the nematodes recovered showed that they belong to the genus *Metoncholaimus* Filipjew 1918 (Oncholaimidae Oncholaiminae). These nematodes are free living mostly in the coastal marine sediment; *Mullus surmuletus* might acquire them accidentally while either feeding on them or along with other food items taken from the bottom.

KEY WORDS *Mullus surmuletus*; Nematode; Pseudoparasites; Oran; Western Algeria.

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INTRODUCTION

The striped red mullet *Mullus surmuletus* (Linnaeus, 1758) (Perciniformes Mullidae), a benthic perciform fish with a widely known distribution, is very common in the Algerian coasts and is a commercially important species (Figs. 1-3).

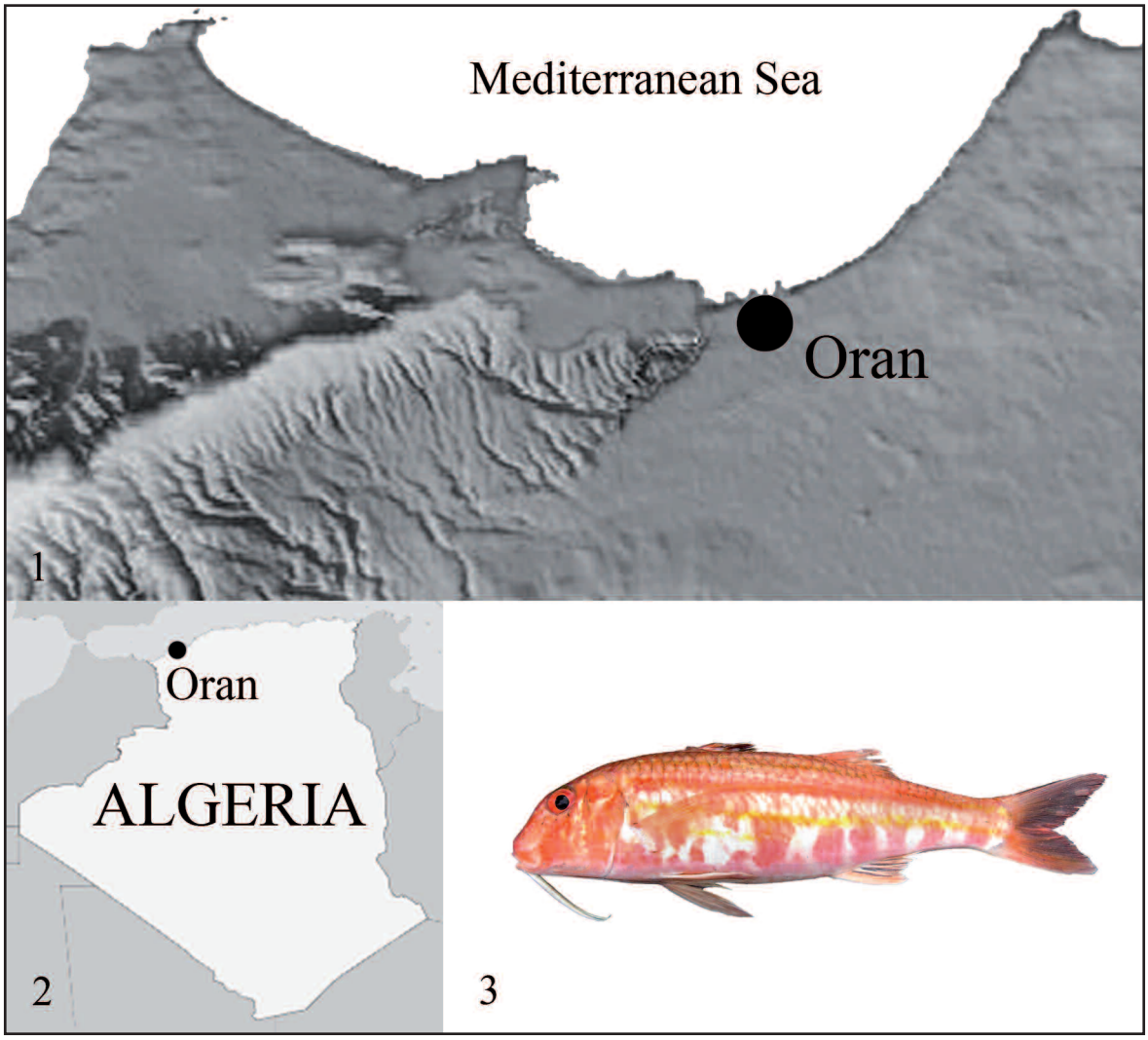
On the other hand, its nematode parasites in the western Mediterranean sea are poorly known although having been studied since more than one century by numerous authors who considered the system Helminthes-*Mullus* as the richest one and the most diversified of the Mediterranean sea (Bayoumy et al., 2008; Ferrer et al., 2005; Neifar et al., 2007; Ternengo et al., 2009). In this regard, we began a helminthological study during which we faced the problem posed by pseudoparasitism by known species of free-living nematodes.

MATERIALS AND METHODS

Fish were collected by means of a trammel net at a mean depth of 15 m, according to the traditional local small-scale fishery techniques. Individual body weight and size (total length), sex, and maturity stage were recorded. The range of fish size (total length) was 10.5-22 cm.

The whole gastro-intestinal tract was removed immediately after capture and all portions (stomach, pyloric caeca and intestine) were opened by a longitudinal incision. Removal of contents was obtained by successive washes with a wash bottle in a Petri dish, the food material collected was examined under a dissecting microscope Zeiss Stemi 2000.

Only helminthes infesting this tract were examined. The parasites were hand sorted and placed ini-



Figures 1, 2. Sampling site: Madagh bay, Oran, Algeria. Figure 3. *Mullus surmuletus* (Linnaeus, 1758).

tially in 2% NaCl saline solution and then stored in 75% ethanol. The nematodes specimens were stained in Acetic-Carmin, dehydrated and mounted in Canada balsam.

The collected nematodes were cleared in glycerin for examination. Drawings were made with the aid of a Camera Lucida connected to a Wild bright field microscope.

For the identification of nematodes, drawings were compared with those of specialists in parasitic nematodes of fishes (Anderson, 1992; Moravec, 1998). Identification of nematode pseudoparasites did require the consultation of specialist works on free-living nematodes (i.e. Hope & Murphy, 1972; Tarjan, 1980; Platt & Warwick, 1983).

RESULTS

Systematic position

Phylum Nematoda Rudolphi, 1808
Class Adenophorea Linstow,1905
Order Enoplida Filipjev, 1929
Family Oncholaimidae Filipjev, 1916
Genus *Metoncholaimus* Filipjew, 1918

Metoncholaimus sp.

Description (Figs. 4-7). Body elongated, somewhat tapering to both cephalic and caudal regions.

Cuticle. Smooth without transverse striations, thick, particularly in the cervical and the caudal regions.

Anterior extremity. The head bears a crown of tubular and non-segmented sensilla; mouth opening is spacious, roughly hexagonal, with narrow membranous margin provided with small papillae; lips are very distinct and developed; buccal capsule large, with well sclerotized walls, sub-terminal next to a simple muscular esophagus very long and somewhat expanded at its posterior part. Nerve ring encircling esophagus anteriorly, excretory pore not located. Outer sensory organs represented by a crown of well developed tubular and non-segmented bristles, never seen beyond the nerve ring.

Caudal region: the tail of males and females is conical, tapered and curved, short bristled mainly located in both preanal regions in both sexes.

Genital equipment, males: testes initiating at a short distance below the end of the muscular esophagus; strong spicules, regularly pairs are arched without individualized capitulum and the distal end is flared into two points. Solid gubernaculum, consisting of two distinct parts, central bulging and curved ventral apophysis. Numerous short bristles (8 to 10) are present in the cloacal opening region.

Genital equipment, females: only one female was found, it was non-gravid with monodelphic uterus. Ovary anteriorly starting below esophagus end. Genital opening situated in posterior end of the body.

DISCUSSION

The examination of stomach contents of *Mullus surmuletus* revealed the presence of several preys difficult to identify because of their advanced state of digestion. Generally, they are mainly composed of fragments of polychaetes, small fish or crustaceans (N'Da, 1992).

The stomach content analysis of *Mullus surmuletus* revealed a wide food range that can explain the observed parasite richness (Klimpel et al., 2008). Only parasites resist to digestion which led us to believe that the three *Metoncholaimus* specimens found alive and intact were nematode parasites of the fish. More precisely, these nematodes are pseudoparasites, i.e. *Mullus surmuletus* may accidentally ingest them from marine sediments, the diet of the latter being composed largely of benthic prey (Quéro & Vayne, 1997) that the mullet harvests from the sediment through its burrowing and tactile barbells (Bougis, 1949).

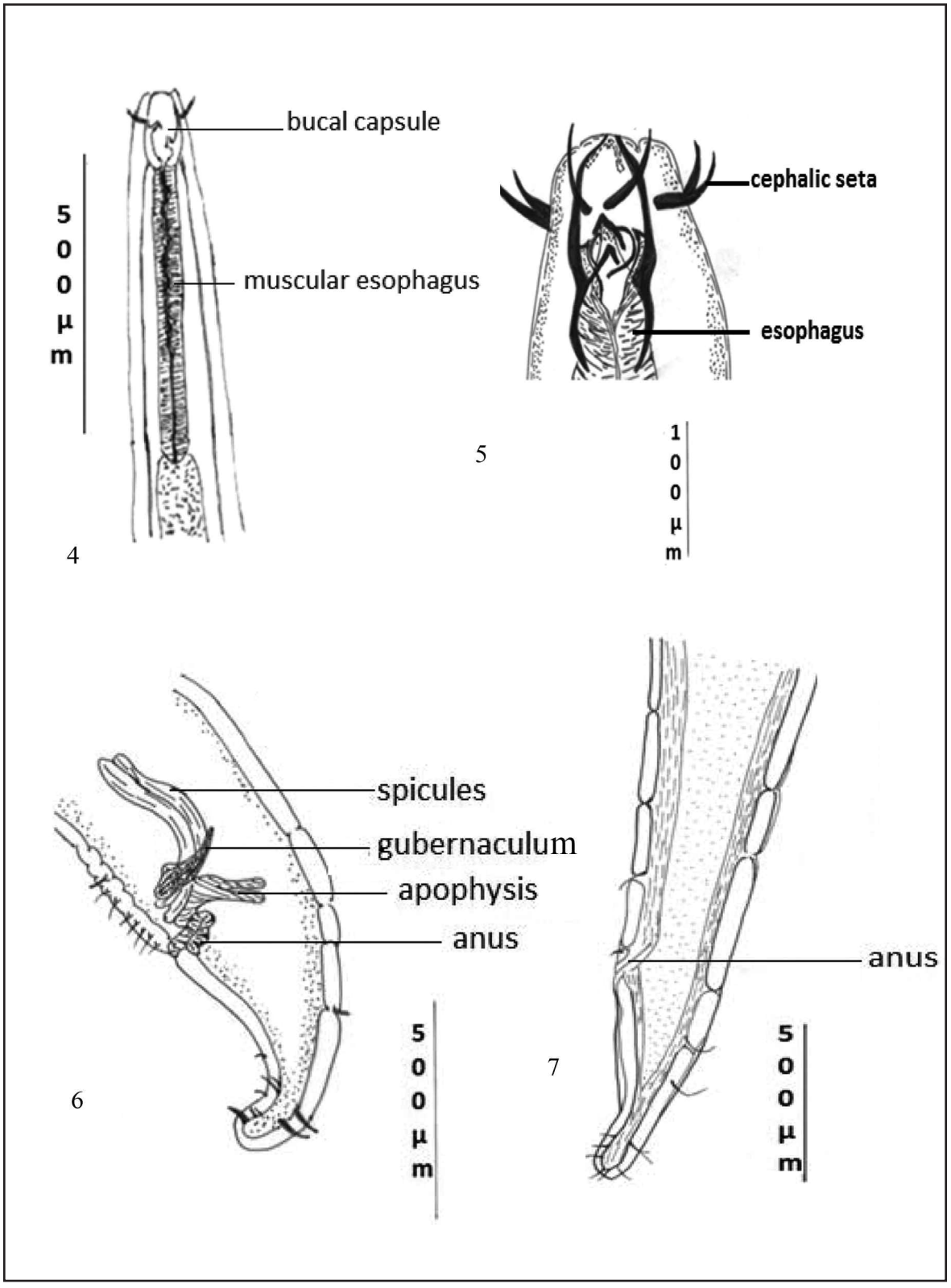
Pseudoparasitism is a fairly rare phenomenon, but was nevertheless described; indeed, pseudoparasites were found alive and in perfect condition in the fish *Haemulon sciurus* (Shaw, 1803) in Brazil. On a total of 50 fish examined, 13 contained nematode pseudoparasites at the rate of 2 to 50 specimens per fish.

These nematodes were identified as *Metoncholaimus amplus* Filipjev, 1918, Oncholaimidae (Moravec et al., 1990) that is a species of free living nematodes described for the first time by Hopper (1967). There are small differences between *Metoncholaimus amplus* specimens which may be considered to be within the limits of intraspecific variability.

This species was recorded in the coast of Florida, Bermuda Islands and also from the Suez canal (Riemann & Rachor, 1972). Comparison of our designs with those of Hopper (1967) did not allow us to assign our specimens to this species, however, we can assign it to the genus *Metoncholaimus* whose identification keys according to Keppner & Tarjan (1989) are:

- Cuticle smooth without transverse striations.
- Non-segmented cephalic setae located in one to three crowns before the nerve ring.
- Simply muscular and cylindrical esophagus without vesicular cells.
- Well-developed buccal capsule.
- Tapered shank short and curved.
- Spicules paired, fronted a gubernaculum.
- Presence or no of ventral apophysis.
- Short caudal setae concentrated primarily on the preanal region of male.

From a comparison of *Metoncholaimus amplus* Hopper, 1967 with our specimens, a few differences came to our attention: (i) *M. amplus* has two crowns of cephalic setae, *Metoncholaimus* sp. just one; (ii) as far as concerns shape and size of the copulatory apparatus, *M. amplus* shows thin and slender spicules and lacks of a ventral apophysis, our specimens - on the contrary- had stronger spicules and a ventral apophysis; (iii) in *M. amplus* the nerve ring of esophagus is situated at the mid-length of esophagus while in *Metoncholaimus* sp. is located more anteriorly.



Figures 4-7. *Metoncholaimus* sp. pseudoparasite of *Mullus surmuletus*. Fig. 4: anterior end; Fig. 5: detail of the anterior end; Fig. 6: posterior end of male; Fig. 7: posterior end of female.

It should be noted that *M. amplus* approximates our specimens particularly by the appearance of the head region, the esophageal structure, the shape of the buccal capsule, the measurements of the body and the implementation of the bristles in the caudal region.

The genus *Metoncholaimus* has twelve species and, in the Mediterranean Sea, is mainly represented by the species *Metoncholaimus pristiurus* Zur Strassen, 1894 (Gerlach & Riemann, 1973), with an abundance of 68.54% of the total population of free-living nematodes (Hedfi et al., 2010).

CONCLUSIONS

It is clear that *Metoncholaimus* sp. is not a real parasite of *Mullus surmuletus*. Indeed, setae on its cephalic and caudal regions indicate a free-living mode of life. Nevertheless, the mode of survival of pseudoparasites into the digestive tract and their resistance to digestive enzymes remain unknown although they are known to be biomonitoring tools in coastal ecosystems due to their extreme sensibility to any environmental stress (Mahmoudi et al., 2002).

Pseudoparasitism by known species of free living nematodes is rare, however it is interesting to report it in order to attract the attention of some ichtyoparasitologists who would easily confuse free living nematodes with parasitic nematodes of fishes because, despite nematodes are the most frequent and the most important parasites of fishes constituting a significant part of the parasite fauna of these hosts in freshwater, brackish-water or even marine environments throughout the world, there is a world-wide shortage of specialists capable of identifying unknown helminthological materials (Moravec, 2007).

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