

A morphological study (SEM) on a parasitic marine isopod, *Cymothoa spinipalpa* (Isopoda: Cymothoidae)

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ABSTRACT

The incidence of parasitic marine isopods among wild 100 *Argyrops filamentosus* fish was studied. Specimens were subjected to clinical, postmortem and parasitological examinations for detection of isopod infestations. The detected parasite was *Cymothoa spinipalpa*. The infestation rate was 9%, one per fish. *Cymothoa spinipalpa* was observed in the gill chamber and buccal cavity of the host. Slight protrusion of gill cover (operculum), atrophy and haemorrhage at site of attachment were noticed. The morphological characteristics of this species were described in details using light and scanning electron microscopy and discussed.

INTRODUCTION

Marine sector of the aquaculture industry is expected to develop in the next 20 years in Egypt especially with limitation of freshwater resources and decline of the valuable commercial wild capture fisheries. The expansion and intensification of fish cultures will be challenged by several factors especially diseases. Fish parasites and diseases constitute one of the most important problems confronting the fishery biologist (Ravichandran, 2007). Isopods considered as a large ectoparasites crustacean group on marine fish, diverse and occur on fish worldwide (Rhode, 2005). Kabata (1970) mentioned that the numbers of isopods infesting fish were expected to increase and numerous of isopod species awaited discovery, especially in the tropical and subtropical regions. According to (Argano, 1979) about 4000 Isopod species in terrestrial, marine, brackish and freshwater habitats were identified.

Economic losses due to ectoparasite infestation not only result from direct harm to fish, but also from disfigurement which renders fish grown for food and ornamental fish unsuitable for sale, thus impose a big loss to fish industry (Piasecki *et al.*, 2004). Cymothoid isopod causes serious problems to host fishes either directly or indirectly affecting the physiological status of the host (Ravichandran *et al.*, 2007 and Ravichandran *et al.*, 2009). Woo (2006) mentioned that the suborder Cymothoidae contains about 500 species that parasitize fish. According to (Trilles, 1986), 46 species of Cymothoidae were reported in Africa (12 Anilocrinae and 34 Cymothoinae). They were fed on blood and macerated tissues; several species settled in the buccal cavity of fish, others lived in the gill chambers or on the body surface including the fins (Kabata, 1970;

Woo, 2006 and Ravichandran *et al.*, 2007).

In Egypt culturist collect feral fingerlings marine fishes to be cultured. The isopods have been transferred from the feral fish to the farmed species due to the increasing populations of the latter (Ramdane *et al.*, 2007). However, little is known about the marine isopods in Egypt except those recorded by (Hassan, 2001; Eissa, 2002 and Ali and Abo-esa 2007) because the species concepts are weakly established in the literatures. Therefore, the present investigation was conducted to view light on isopodosis among wild marine fish *Argyrops filamentosus*.

MATERIALS AND METHODS

A total number of 100 *Argyrops filamentosus* fish were collected from Mediterranean Sea at Matrouh Province, transferred to the laboratory and subjected to clinical, postmortem and parasitological examinations according to Amlacher (1970).

Isopods were removed from the host fish; their location and its density were noted. Also, prevalence among the examined fish was calculated. Isopod specimens were collected from the gill chambers and buccal cavity and immediately preserved in 70% ethanol. Broad pouch (marsupium) of gravid female was dissected to obtain developmental stages.

Preparation for scanning electron microscopy (SEM) involved dehydrating parasite to an absolute (100%) ethanol solution followed the method outlined in Wilson (2003). Drying the specimens for SEM was accomplished using carbon dioxide

critical point method. Dissected parts were mounted vertically on SEM stubs using double adhesive carbon spots. Specimens were digitally imaged on a Leo 435VP using a Robinson backscatter detector. Digital images were saved for later processing.

RESULTS

Investigation of 100 *Argyrops filamentosus* fish revealed that unilateral infection of their gill chambers with one species of Cymothoidae identified as *Cymothoa spinipalpa* with a prevalence rate 9%. The intensity of infestation was one per fish. Examination of the infested fish revealed the presence of parasite in the gill chamber or buccal cavity. Slight protrusion of gill cover (operculum), atrophy and haemorrhage at site of attachment and retardation of growth in comparison with the non-infested fish were observed (Fig., 1&2).

The morphological description of the parasitic isopod, *Cymothoa spinipalpa* based on nine females. The details are shown in Figures 3-15.

Order: Isopoda

Family: Cymothoidae

Genus: *Cymothoa* Fabricius, 1793.

Species: *Cymothoa spinipalpa* (Thatcher et al; 2007).

Site of infestation: gill chamber and buccal cavity.

Intensity: 1/ infected fish.

Prevalence: 9/100 (9%).

Male: unknown.

The isopods commonly seen on teleosts in tropical and subtropical water, attached to the body surface; in the mouth or on the gills. The stages normally found are the non

swimming, permanently attached females, (Fig., 1-2)

Females (Fig. 3-5, 10-15): have creamy white color and mean measures 29 mm long by 14 mm wide at level of pereonite 5. Cephalon deeply immersed in the first pereonite. The anterior border of the first pereonite broadly excavated to receive cephalon. Two seserial eyes dark in color present anteriorly one on each side of cephalon. Antennule consists of 8 articles. Also, antenna consists of 8 articles but shorter and narrower than antennule (Fig. 15). Fig. 11, 14 clear the mouth parts at two level of magnification. Pereon, pereonite 1 longest; 2-5 sub equal in length; 5-7 shorter. Pereopods 1-3 small; 4-7 larger with carinae (Fig. 3, 4, 10, 11). Pleon formed of five segments immersed in pereonite 7 (Fig. 3, 12). Pleopods all billaminated and simple (Fig. 4, 13). Uropods with slender sub equal rami (Fig. 3). Pleotelson rounded posteriorly and twice wide as long (Fig. 3, 12).

Developmental stages of *C. spinipalpa*: they obtained by dissecting the marsupium (broad pouch) of the gravid female, eggs are round in shape, deep yellow in color having paler color in outer rim and measure 35 – 45 μ (Fig. 6). Several embryonated eggs (Fig. 7) which finally yield full manca stage (juvenile of *C. spinipalpa*). The body of manca stage (Fig. 8, 9) measures 2.5-2.9 mm long and 0.9-1.1mm wide at pereonite 5. Six sub equal pereonites present with six pairs of pereopods. Cephalon wider than long, not immerse. Eyes are large and black. Uropods elongate, extending beyond Pleotelson with

two sub equal rami and provided with many setae and also pleopods.

DISCUSSION

Isopod parasites have received considerable scientific attention because they cause serious damage to fishery resources (Ravichandran *et al.*, 2009). Cymothoids (Crustacea, isopoda) are ectoparasites of marine and freshwater teleost fishes. The examination of *Argyrops filamentosus* fish resulted in the recovery of one species of Cymothoidae identified as *Cymothoa spinipalpa*. Where, the infected fish harbor only one parasite in a unilateral gill chamber with slight protrusion of gill cover and retardation of growth in agreement with that described by (Eissa, 2002; Woo, 2006; Ravichandran *et al.*, 2007 and Ravichandran *et al.*, (2009). Ravichandran *et al.*, (2009) mentioned that Cymothoids harm fish in several ways. Mancae feed voraciously and easily kill fry and fingerlings through the tissue damage they cause. Permanently attached adults stunt the growth of fish and retard or inhibit reproduction, probably because of the nutritional drain though more subtle mechanisms such as through hormonal changes have not been ruled out. They added that a greater number of *Vibrio* count was recorded in the infested fish compared with normal one. However, Yamauchi *et al.*, (2005) recorded the presence of *Norileca indica* in stomach of dolphin for first time in Philippines.

In the present investigation, the prevalence of *Cymothoa spinipalpa* in *Argyrops filamentosus* fish was 9% nearly agreed with (Carvalho- souza *et al.*, 2009) who mentioned that its

prevalence were 11.76 and 15.38% in *Caranx crysos* and *Lutjanus synagris* fish respectively. Meanwhile (Eissa, 2002 and Mousa and Tantawy, 2006) recorded higher prevalence 47 and 40.8% in *Centropristis filamentosus* and *seabastus marinus* fish respectively. Where, isopod spp. of latter having six pleon segments but, our specimen having only five pleon segments. Ali and Abo-esa (2007) recorded an isopoda, *Ovoinella obovata* in Red sea shrimp (*Penaeus semisulcatus*) but belonged to different family (Bopyridea) with higher incidence 32%.

Based upon our current knowledge, *Cymothoa spinipalpa* was a new described isopoda in Egypt. The morphological description of adult female agree to a great extend with that described by (Thatcher *et al.*, 2007) except of slight differences ,where specimens in the present study were measured 29 by 14 mm larger than that of (Thatcher *et al.*, 2007) which measured 11.5 by 5.1 mm. Also, the present specimens have 8 articles in both antennules and antennae while, that of (Thatcher *et al.*, 2007) has 7 articles in antennule and 8 in antenna.

Mancas greatly resemble that described by Thatcher *et al.*, (2007) in having 6 pairs of pereopods and uropods extend posteriorly well beyond pleotelson but in adult they don't reach the posterior margin of that structure. Uropods, pleopods and pleotelson are provided with many setae in manca which lost in adults. In the same time, the manca in the present study is slightly larger (2.5-2.9 mm long by 0.9-1.1 mm wide at level of pereonite 5) than that of (Thatcher *et al.*, 2007) which measures 2.37- 2.51 mm long by 0.92-0.94 mm wide at

level of pereonite 4. Also, the two manca species of *C. Oestum* and *C. Catarinensis* described by (Thatcher *et al.*, 2003) differ from the present specimens in the form of pleotelson and uropods.

Unfortunately, we can't detect male in this study. This may attributed to cymothoids are protandrous hermaphrodites as mentioned by (Ravichandran *et al.*, 2009).

Cymothoids are harmful on fish; manca feed on fry and fingerlings and easily kill them due to the tissue damage they cause, while adults stunt the growth of fish and retard reproduction through nutritional drain from fish and secondary bacterial infection. For this reason, (Ravichandran *et al.*, 2009) concluded that the intensive fish culture gave a great importance to study the parasites and diseases that it causes. Therefore, it is necessary to find out the parasitic fauna in the aquatic environment. This will give use to apply the preventive practices in the fish farms.

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LEGEND OF FIGURES

Fig. 1&2: *Argyrops filamentosus* infested fish showing *Cymothoa spinipalpa* in gill chamber and buccal cavity.

Fig. 3, 4&5: *Cymothoa spinipalpa* female, Dorsal, Ventral and Lateral view showing two sesal eyes (e), Cephalon (c), Preon (thorax) formed of seven preonites (Pr), Pleon (body) showing five compressed pleonites (Pl), Pleotelson (pt), Uropodes (U), preopodes (prd) and pleopods (pld), marsupium (brood pouch) with mancas (ma).

Fig. 6, 7, 8 &9: *Cymothoa spinipalpa* developmental stages. **Fig. (6)** Eggs. **Fig. (7)** Early developed manca. **Fig. (8&9)** Manca stage showing Pleotelson (p) and Uropod (u).

Fig. 10-15: Scanning electron micrographs (SEM) of *Cymothoa spinipalpa*. **Fig. (10)** Anterior

dorsal surface showing Cephalon (c) and preonites of preon (pr) X 10.

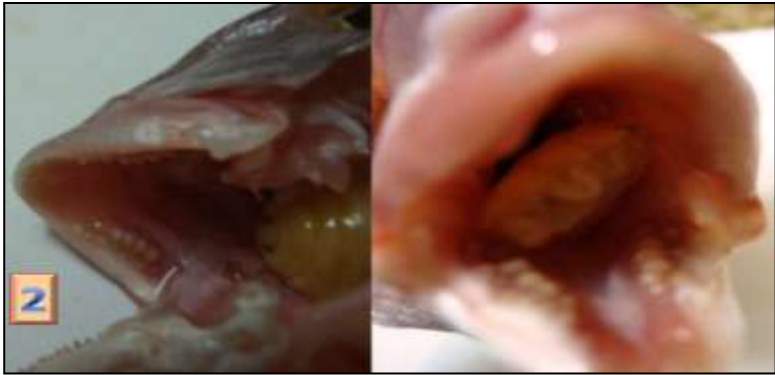
Fig. (11) Anterior ventral surface showing mouth parts (m), preopodes (pd) and marsupium (ma). X10.

Fig. (12) Posterior dorsal surface showing pleonites of pleon (plt), Pleotelson (pl) and Coxal crest (cc) X10.

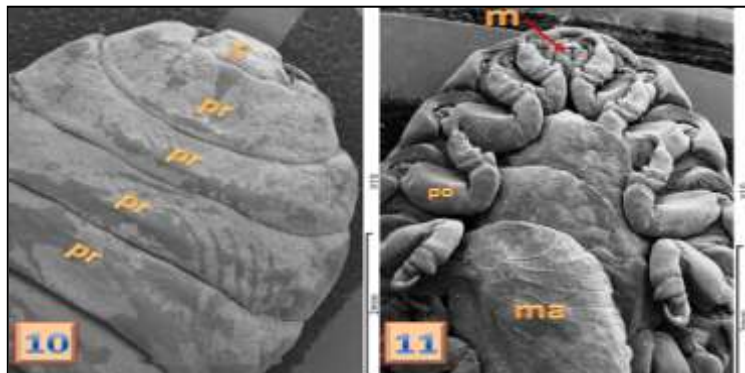
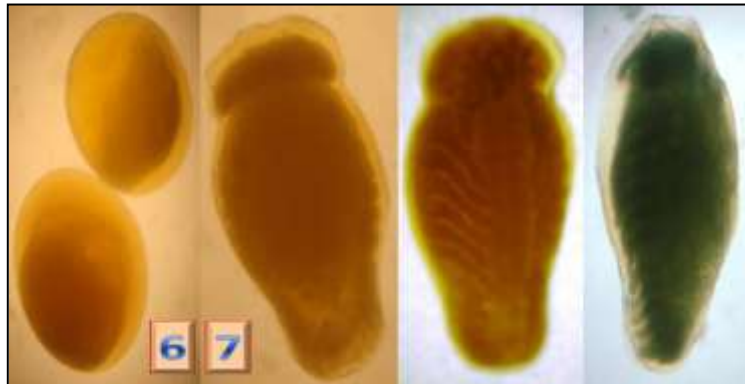
Fig. (13) Posterior ventral surface showing Pleopods (P) X10.

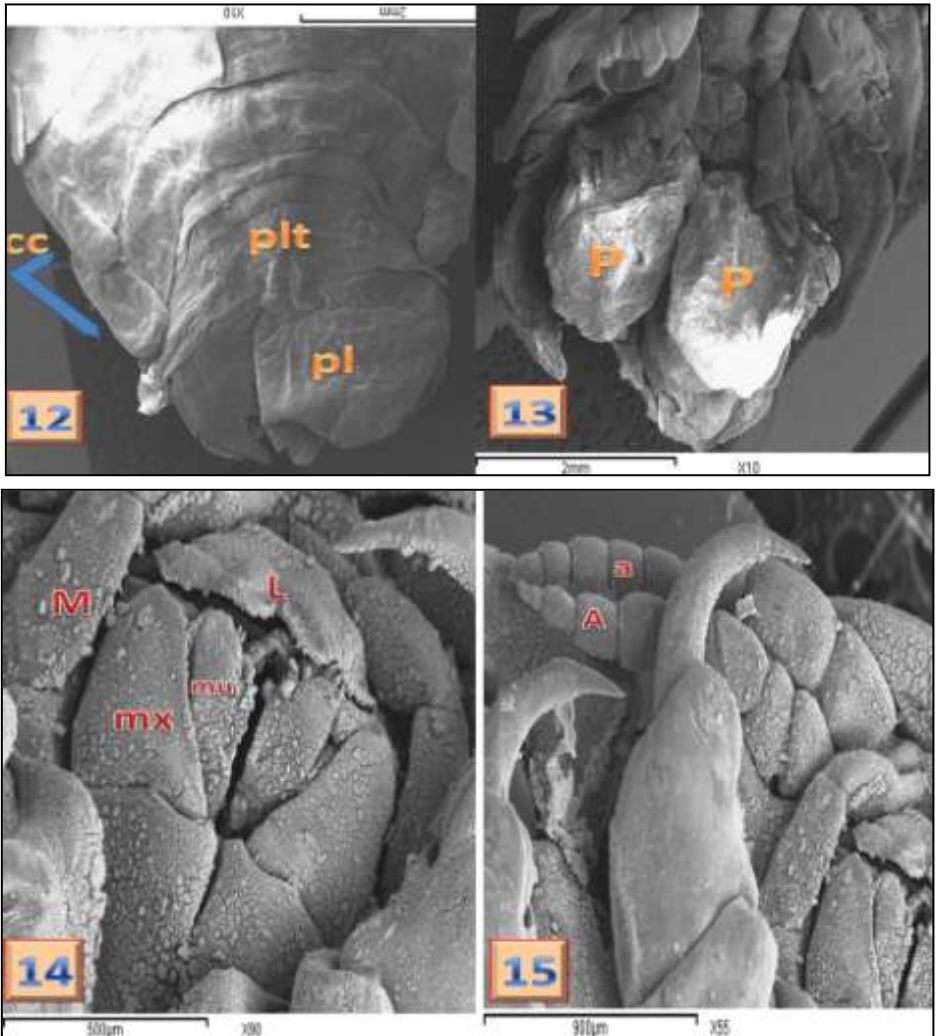
Fig. (14) Magnified anterior ventral view of the head showing mouth parts labrium (L), Mandible (M), Maxilla (Mx), Maxillula (Mu)) X 90.

Fig. (15) Magnified anterior ventral view of the head showing Antennule (a) and Antenna (A) X 55.



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دراسة مورفولوجية بالمجهر الإلكتروني الماسح على طفيل متماثلة الأرجل البحرية سيموثوا سبيني بالبا (متماثلة الأرجل: سيموثيدي)

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الملخص العربى

يعتبر الاستزراع البحرى من الأنشطة الواعدة والصاعدة فى مصر. أُجريت هذه الدراسة على عدد 100 سمكة من أسماك المرجان البرية البحرية بهدف الكشف عن الإصابة بطفيل الأيزوبودا. كانت نسبة الإصابة الكلية بطفيل سيموثوا سبيني بالبا هي 9% وقد لوحظ وجود طفيل واحد لكل سمكة مصابة. ينتمى هذا الطفيل الى قشريات متساوية الأرجل (الأيزوبودا). تمثلت العلامات المرضية والصفة التشريحية على شكل بروز فى الغطاء الخيشومى ووجود الطفيل فى الفم أو التجويف الخيشومى. تم وصف الطفيل بالتفصيل شاملاً الطفيل البالغ بالإضافة لمرحل النمو المختلفة (البويضات الى المنكا الكاملة) باستخدام الميكروسكوب الضوئى والإلكترونى الماسح ومناقشة النتائج.