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## Occurrence of a nematode *Philometra* (Costa, 1845) in the ovaries of *Epinephelus malabaricus* (Bloch & Schneider, 1801) in southeast coast of India

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### ABSTRACT

**Objective:** To study the prevalence of philometrid nematode, *Philometra* spp. infected in the ovaries of *Epinephelus malabaricus* (*E. malabaricus*) from southeast coast of India.

**Methods:** Totally 4801 fishes were collected from Mandabam, Tuticorin and Kanyakumari. The normal and infected ovaries were carefully removed from dissected fishes and the prevalence of nematode infection for each fish was examined. Then the nematode were carefully removed and washed in a 0.6% saline solution and fixed in 70% ethanol. Representative nematodes were cleaned with glycerin and fixed in a solution of 95% glacial acetic acid and 5% formalin for identification under light microscopy.

**Results:** Of which 16.8%, 16.2% and 14.7% parasitic prevalence was observed from Mandabam, Tuticorin and Kanyakumari respectively. The intensity of parasitic worms per fish varied from 1 to 8 with an average of  $6.33 \pm 0.84$ . Nematode length varies from 7-22 mm with in average of  $(18.70 \pm 4.57)$  mm. The average length and weight of *E. malabaricus* were  $(332.950 \pm 77.792)$  mm and  $(513.30 \pm 169.46)$  g respectively.

**Conclusions:** It can be assumed that females of this nematode are unable to attain gravidity in this host species, and consequently, *E. malabaricus* does not serve as the true definitive host of *Philometra* spp. Prevalence of infection and intensity of the nematode are highly effected by sucking blood, causing atrophy of developing ova in the ovary, fibrosis of ovarian tissue, increasing granulocytes and haemorrhages, and thus negatively affecting the reproduction of some species of *E. malabaricus*.

## 1. Introduction

*Epinephelus malabaricus* (Bloch & Schneider 1801) (*E. malabaricus*) is one of the most economic groupers in fisheries and aquaculture sector of the Indo-Pacific. It is also one of the most common for live export trade and caught by employing

trawls, long lines, traps, spear and hook and line[1]. Normally known as Malabar grouper, this species is found in the Red Sea, the Indo-Pacific area (South Africa to Japan, Australia, Palau, Yap and Fiji), Southeast Asia and the Northern Territory to New South Wales of Australia. They are protogynous hermaphrodite and do not change sex from female to male until after approximately 10 years of age[2]. Seabass and grouper are the two important marine species being cultured in cages in various parts of the world. Muthukumarana and Weerakoon have done an experiment on the stocking density and diet of *Oreochromis niloticus* in cages in manmade lakes in Sri Lanka[3]. The previous study that has identification of these parasites is often difficult because of their morphological and biological peculiarities. Many species of

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philometrids are known only from the large-sized females, with a body length from a few centimeters up to about 1 m in different species, whereas the conspecific males are generally of much smaller size (usually from 2-5 mm long)[4], and also the fauna of philometrid nematodes (Philometridae) parasitizing marine fishes remains poorly known, despite the fact that some species may be agents of serious diseases of fishes with economic importance or may significantly affect their reproductive success[5]. To date, the following five gonad-infecting species of *Philometra* have been recorded from marine fishes of the families Lethrinidae, Priacanthidae, Serranidae and Tetraodontidae from the South Pacific Ocean off the coast of New Caledonia: *Philometra cyanopodi*[6]. Parasitic problems of grouper in Malaysia, Kuwait, Indonesia and India cause many serious problems[7,8]. Gonad-infecting species of *Philometra* Costa, (1845) (Philometridae, Dracunculoidea) are widely distributed in marine fishes of the Atlantic, Indian and Pacific Oceans, sometimes also occurring in brackish water environments[9]. However, *Philometra rajani* was considered a synonym of *Philometra lateolabracis* (*P. lateolabracis*), and *Philometra pellucida* reported in fishes from Southern India was a misidentification[10]. In the Indian Ocean region, a total of five nominal (*Philometra pellucida*, *P. lateolabracis*, *Philometra rajani*, *Philometra cephalus* and *Philometra neolateolabracis*), gonad-infecting species of *Philometra* have been reported from a variety of marine fishes belonging to different families. In addition, several gonad-infecting philometrids from this same region have been reported only as *Philometra* spp[11]. Quiazon *et al.*[12] described for the first time the male of *P. lateolabracis* from its type-host off Japan and indicated that the numerous records of this species from many other fish hosts (including all those from the Indian Ocean) probably represented other species[13]. The present study investigated the occurrence, prevalence and effect of a nematode (*Philometra* spp., 1963) in the ovaries of *E. malabaricus* in southeast coast of India.

## 2. Materials and methods

Totally 4801 commercial fish of *E. malabaricus* (25-55 cm) were collected from landing centers of Mandapam, Tuticorin and Kanyakumari (Figure 1). These fish were kept on ice and brought to the laboratory. All the fishes were subjected for morphometric analysis. The normal and infected ovaries were carefully removed from dissected fishes and the prevalence of nematode infection for each fish was examined. Then the nematode were carefully removed and washed in a 0.6% saline solution and fixed in 70% ethanol. Representative nematodes were cleaned with glycerin and fixed in a solution of 95% glacial acetic acid and 5% formalin for identification under light microscopy. Drawings were made using Lucida camera. Specimens used were measured.

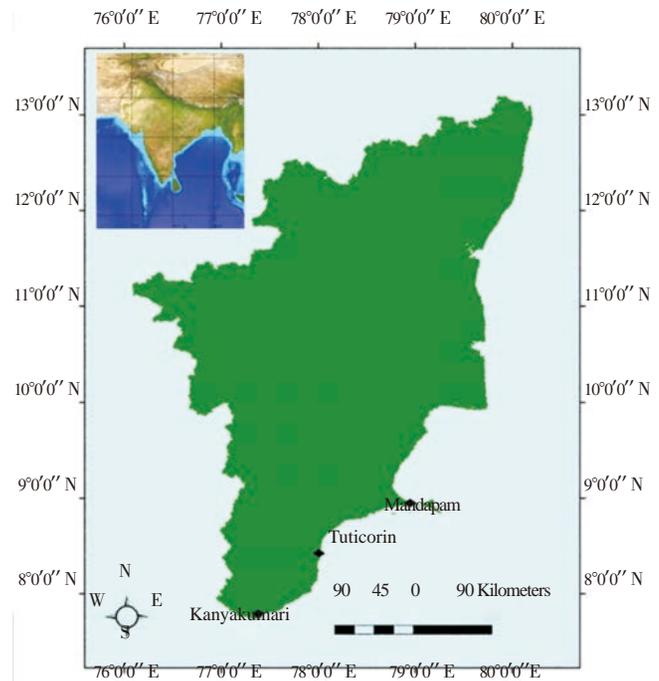


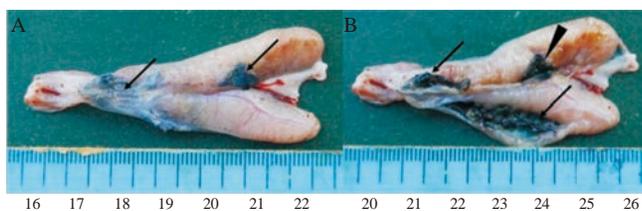
Figure 1. Studied area.

## 3. Results

The fishes collected during the present investigation was used for identification of the ovarian nematode infection currently occurring on *E. malabaricus* in the southeast bay of Bengal region, India, and also for estimating the prevalence and intensity of infestation of fish. *Philometra* spp. were found in the ovary of dissected fish. Normal ovary and severely infected ovary were compared (Figures 2 and 3). Pooled by mouth of capture, the prevalence of infection varied seasonally during the two sampling seasons (2012 and 2013). The average length and weight of fishes were  $(332.950 \pm 77.792)$  mm and  $(513.30 \pm 169.46)$  g respectively (Table 1). The prevalence and intensity of infection in *E. malabaricus* was significantly, and  $6.33 \pm 0.84$  nematode were found in per single ovary. *Philometra* spp. average length  $(162.35 \pm 25.29)$  mm was recorded in study (Table 1).



Figure 2. Normal ovary of *E. malabaricus*.



**Figure 3.** Infected *E. malabaricus* ovary.

A: arrow showing nematode present in the ovary sac; B: arrow showing live worm and head arrow showing dead worm.

**Table 1**

Average length and weight of the *E. malabaricus* and worm length of *Philometra* spp.

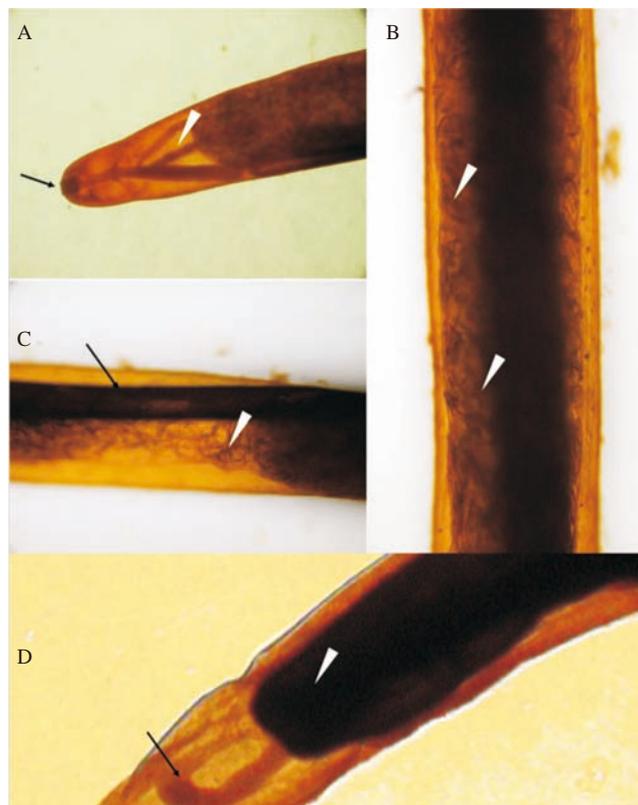
S. No.	<i>E. malabaricus</i>		<i>Philometra</i> spp.
	Length (mm)	Weight (g)	Worm length (mm)
1	245	475	120
2	236	365	160
3	455	730	156
4	446	681	198
5	412	756	175
6	298	356	125
7	295	325	215
8	265	422	198
9	256	452	155
10	365	329	156
11	263	314	175
12	321	455	136
13	359	654	155
14	445	866	146
15	239	369	165
16	365	529	135
17	358	565	156
18	312	411	184
19	265	459	189
20	459	753	148
Average	332.950±77.792	513.30±169.46	162.35±25.29

Average numbers are expressed as mean±SD, n=20.

### 3.1. Description of *Philometra* spp.

The characteristics of *Philometra* spp. are including body filiform, cephalic end smoothed, cephalic papillae unclear, oesophagus long, opening into intestine through separate valve with a touch bounded anterior bulb, nerve ring 105 from anterior end of body [anterior end of the gravid female body-block arrow: oral aperture (mouth) and head arrow: oesophagus] (Figure 4A); small ventriculus present, anterior end of intestine fairly broad, intestine ending dimly, presence attached by muscle to ventral body wall near caudal end; vulva post equatorial, located from anterior extremity, short vagina fixed anteriorly from vulva (mid body of the nematode-block arrow: intestine, head arrow: larva from uterus) (Figure 4B and C); uterus filled with larvae, ovaries long; posterior end of body rounded, without any projections (posterior end of body-block arrow: uterus tube and head arrow:

excretory pore) (Figure 4D).



**Figure 4.** Light microscopic view of *Philometra* spp.

A: anterior end of the gravid female body (block arrow: oral aperture, head arrow: oesophagus); B and C: mid body of the nematode (block arrow: intestine, head arrow: larva from uterus); D: posterior end of body, (block arrow: uterus tube, head arrow: excretory pore).

### 3.2. Prevalence and intensity

In Mandapam, the maximum prevalence of nematode infection was 85.7% in December 2012, while the minimum prevalence of nematode infection was 24% in July 2012. In Tuticorin, the maximum prevalence of nematode infection was 90% in February 2013, while the minimum prevalence of nematode infection was 24% in April 2012. In Kanyakumari, the maximum prevalence of nematode infection was 73.3% in February 2013, and the minimum prevalence of nematode infection was 20% in July 2012 (Figures 5 and 6).

In Mandapam, the maximum prevalence of nematode infection was 75% in post-monsoon season 2012, and the minimum prevalence of nematode infection was 27.5% in monsoon season 2012. While in Tuticorin, the maximum prevalence of nematode infection was 75.4% in summer season 2012, and the minimum prevalence of nematode infection was 38.7% in pre-monsoon season 2013. In Kanyakumari, the maximum prevalence of nematode infection was 67.5% in post-monsoon season 2012, while the minimum prevalence of nematode infection was 37.3% in monsoon season 2012 (Figure 7). The maximum intensity 8 per fish was recorded in December 2013 and the minimum was 5.1

recorded in March 2013. The average of intensity was  $6.33 \pm 0.84$  (Figure 8). It can be assumed that females of this nematode are unable to attain gravidity in this host species, and consequently, *E. malabaricus* does not serve as the true definitive host of *Philometra* spp. Another possibility is that *Philometra* spp. are also specific parasites of *E. malabaricus*, whose gravid females have a different localization in the host than those of *Philometra* spp. The prevalence of infection and intensity of the nematode are highly effected by sucking blood, causing atrophy of developing ova in the ovary, fibrosis of ovarian tissue, increasing granulocytes and haemorrhages, and thus negatively affecting the reproduction of some species of *E. malabaricus*.

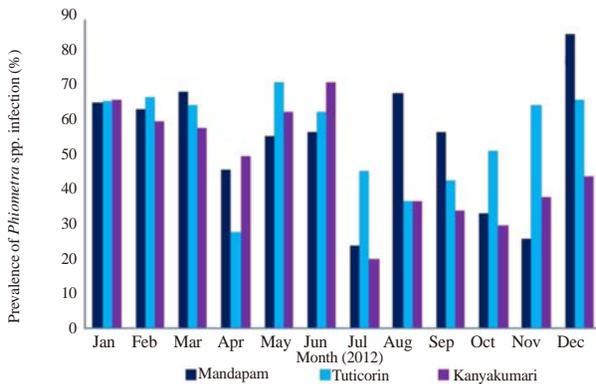


Figure 5. Monthly prevalence of nematode infection in year of 2012.

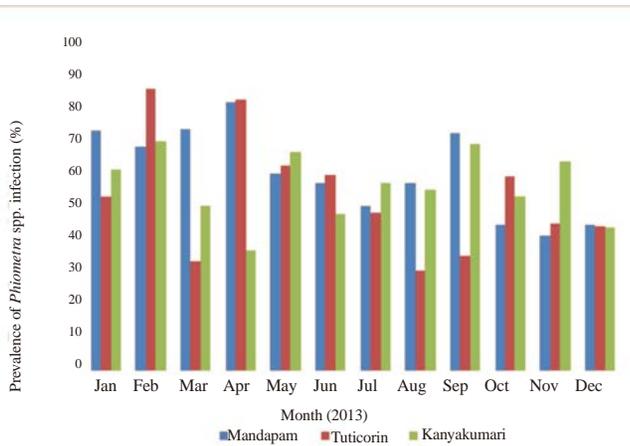


Figure 6. Monthly prevalence of nematode infection in year of 2013.

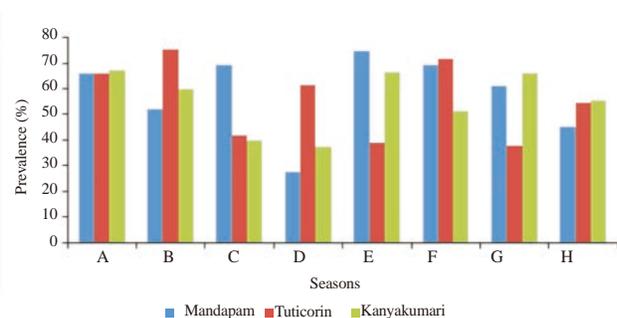


Figure 7. Seasonally prevalence of *Philometra* sp. infection. A: post-monsoon 2012, B: summer, C: pre-monsoon, D: monsoon, E: post-monsoon 2013, F: summer, G: pre-monsoon, H: monsoon.

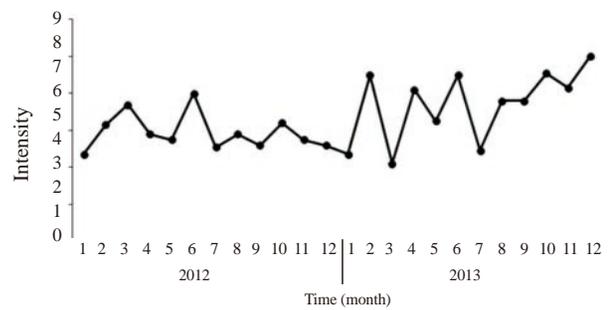


Figure 8. Intensity of nematode infection in the ovary of *E. malabaricus*.

#### 4. Discussion

*E. malabaricus* along the southeast coast of the India appear to be heavily infected with the ovarian nematode *Philometra* spp. Although many studies provide descriptions of various philometrid species, very limited information exists about the occurrence and prevalence or effect of these nematodes. The result of the present study clearly shows that the average length and weight of fishes were  $(332.950 \pm 77.792)$  mm and  $(513.30 \pm 169.46)$  g respectively. The intensity of infections was  $6.33 \pm 0.84$  nematode per single ovary. *Philometra* spp. average length was  $(162.35 \pm 25.29)$  mm. Lopez-Neyra considered and described a new philometrid species, *Sanguinifilaria jordanoi*, from the females found in the ovary of *Epinephelus gigas* (or *Epinephelus marginatus*) obtained from the market in Tetuan, Morocco[14]. Justine suggested *Pseudorhabdosynochus malabaricus* described from the *Epinephelus malabaricus* in gill lamella, and prevalence was 50% with intensity 7[15].

The results of the present investigation revealed that the prevalence increasing mainly summer season because this season has high temperature. Besides, the prevalence was also increased in post-monsoon season due to the pollution there. Other studies have been reported that *Philometra genypteri* in *Genypterus chilensis* having 11% of infection and 1-99 (mean 11) intensity were recorded, and *Philometra* sp. in *Johnius belengerii* ruber having 48% of infection and 8 intensity were recorded[16]. Moreover, prevalence and intensity of *Paraseuratoides ophisterni* in *Ophisternon aenigmaticum* had 11% of infection and 2 nematode per fish, and prevalence and intensity of *Philometra ophisterni* in *Ophisternon aenigmaticum* had 56% of infection and 1-5 (mean 3) nematode per fish[17]. Also, it was recorded that *Philometra sphyraenae* in *Sphyraena jello* had 69% of infection and 9 intensity, *Philometra gerrei* in *Gerres filamentosus* had 91% of infection and 7-11 intensity, and *Philometra otolithi* in *Otolithes ruber* had 47% of infection and 6 intensity[18]. Also, recently, the prevalence 2% of *Philometroides acanthopagri* infection and intensity altogether 26 nematode specimens were found in the musculature of *Acanthopagrus latus* from marine waters of Iraq[19]. Cárdenas et al. had reported *Philometra Costa*, from the freshwater fish of *Pygocentrus nattereri* having 12% of prevalence and 1-3 intensity of nematode in Kner (Characidae) in Amazonia, Brazil[20]. The result of the present study clearly shows that the

prevalence of infection is higher and intensity is lower than the previously reports. Moravec *et al.* studied philometrids parasitizing in the gonads of their fish hosts that may cause serious damage to these organs (by sucking blood, causing atrophy of developing ova in the ovary, fibrosis of ovarian tissue, increasing granulocytes and haemorrhages), thus negatively affecting the reproduction of some species of marine fishes[21].

### Conflict of interest statement

We declare that we have no conflict of interest.

### Acknowledgements

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### References

- [1] Heemstra PC, Randall JE. An annotated and illustrated catalogue of the grouper, rock cod, hind, coral grouper and lyre tail species known to date. FAO species catalogue: vol. 16. Groupers of the world (family Serranidae, subfamily Epinephelinae). Rome: Food and Agriculture Organization of the United Nations; 1993.
- [2] Murata R, Karimata H, Alam MA, Nakamura M. Precocious sex change and spermatogenesis in the underyearling Malabar grouper *Epinephelus malabaricus* by androgen treatment. *Aquac Res* 2010; **41**: 303-308.
- [3] Muthukumarana G, Weerakoon DE. Stocking density and diet of *Oreochromis niloticus* in cages in manmade lakes in Sri Lanka (II). In: Maclean JL, Asian Fisheries Forum, editors. Proceeding of the first Asian fisheries forum. Manila, Philippines: Asian Fisheries Forum; 1986.
- [4] Moravec F. Some aspects of the taxonomy and biology of dracunculoid nematodes parasitic in fishes: a review. *Folia Parasitol (Praha)* 2004; **51**: 1-13.
- [5] Clarke LM, Dove AD, Conover DO. Prevalence, intensity, and effect of a nematode (*Philometra saltatrix*) in the ovaries of bluefish (*Pomatomus saltatrix*). *Fish Bull* 2006; **104**: 118-124.
- [6] Moravec F, Justine J. New data on dracunculoid nematodes from fishes off New Caledonia, including four new species of *Philometra* (Philometridae) and *Ichthyofilaria* (Guyanemidae). *Folia Parasitol (Praha)* 2009; **56**: 129-142.
- [7] Eissa IA. *Parasitic fish diseases in Egypt*. Cairo, Egypt: El-Nahda El-Arabia Publisher; 2002, p. 32.
- [8] Al-Marzouq A, Al-Rifae K. *Benedenia* sp. a monogenetic parasite of cultured brown-spotted grouper, *Epinephelus tauvina*, in Kuwait. *J Aquac Trop* 1994; **9**: 255-258.
- [9] Perez GR, Roumillat WA, Levesque EM, Connors VA, de Buron I. Synchronization of occurrence of the ovarian philometrid, *Philometra carolinensis*, with the spawning season of its host, the spotted seatrout, *Cynoscion nebulosus*. *Parasitol Res* 2009; **104**: 1079-1085.
- [10] Koesharyani I, Zafran K, Yuasa, Hatai K. Two species of capsalid monogeneans infecting cultured humpback grouper *Cromileptes altivelis* in Indonesia. *Fish Pathol* 1999; **34**: 165-166.
- [11] Moravec F. *Dracunculoid and anguillicoloid nematodes parasitic in vertebrates*. Prague: Academia; 2006, p. 634.
- [12] Quiazon KM, Yoshinaga T, Ogawa K. Taxonomical study into two new species of *Philometra* (Nematoda: Philometridae) previously identified as *Philometra lateolabracis* (Yamaguti, 1935). *Folia Parasitol (Praha)* 2008; **55**: 29-41.
- [13] Moravec F. Systematic status of *Philometra jordanoi* (Lopez-Neyra, 1951) and some other congeneric species previously identified as *Philometra lateolabracis* (Yamaguti, 1935) (Nematoda: Philometridae). *Folia Parasitol (Praha)* 2008; **55**: 159-160.
- [14] Lopez-Neyra CR. *Sanguinifilaria jordanoi* n. sp. (Nematoda: Filaroidea). Granada: Bol Univ Granada, Farmacia; 1951, p. 291-293.
- [15] Justine JL, Sigura A. Monogeneans of the malabar grouper *Epinephelus malabaricus* (Perciformes, Serranidae) off New Caledonia, with a description of six new species of *Pseudorhabdosynochus* (Monogenea: Diplectanidae). *Zootaxa* 2007; **15**(43): 1-44.
- [16] Moravec F, Chávez RA, Oliva ME. A new gonad-infecting species of *Philometra* (Nematoda: Philometridae) from the red cusk-eel *Genypterus chilensis* (Osteichthyes: Ophidiidae) off Chile. *Parasitol Res* 2011; **108**: 227-232.
- [17] Moravec F, Salgado-Maldonado G, Aguilar R. Two new nematodes, *Paraseuratoides ophisterni* gen. et sp. n. (Quimperiidae) and *Philometra ophisterni* sp. n. (Philometridae), from the swamp-eel *Ophisternon aenigmaticum* in Mexico. *Folia Parasitol (Praha)* 2002; **49**: 109-117.
- [18] Moravec F, Manoharan J. Gonad-infecting philometrids (Nematoda: Philometridae) including four new species from marine fishes off the eastern coast of India. *Folia Parasitol (Praha)* 2013; **60**(2): 105-122.
- [19] Moravec F, Jassim AA, Al-Salim NK. *Philometroides acanthopagri* sp. nov., a new philometrid (Nematoda, Philometridae) from the musculature of *Acanthopagrus latus* (Sparidae) from marine waters of Iraq. *Acta Parasitol* 2012; **57**(4): 372-377.
- [20] Cárdenas MQ, Moravec F, Fernandes BM, Morais AM. A new species of *Philometra* *Costa*, 1845 (Nematoda: Philometridae) from the freshwater fish (red piranha) *Pygocentrus nattereri* Kner (Characidae) in Amazonia, Brazil. *Syst Parasitol* 2012; **83**: 137-144.
- [21] Moravec F, Ogawa K, Suzuki M, Miyazahi K, Donai H. On two species of *Philometra* (Nematoda, Philometridae) from the serranid fish *Epinephelus fasciatus* in Japan. *Acta Parasitol* 2002; **47**: 34-40.