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 6.3±0.84. Nematode length varies from 7-22 mm with an average of (18.7±4.57) mm. The average length and weight of *E. malabaricus* were (332.9±77.792) mm and (513.3±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 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
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, Dracunculoida) 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 neolatolabracis), 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]. Quiason 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 4,801 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.

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 (332.95±77.792) mm and (513.30±169.46) g respectively (Table 1). The prevalence and intensity of infection in E. malabaricus was significantly, and 6.33±0.84 nematode were found in per single ovary. Philometra spp. average length (162.35±25.29) mm was recorded in study (Table 1).
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. | Length (mm) *E. malabaricus* | Weight (g) | Worm length (mm) *Philometra* spp. |
|--------|-----------------------------|------------|-------------------------------|
| 1      | 245                         | 475        | 120                           |
| 2      | 236                         | 365        | 160                           |
| 3      | 453                         | 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 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).

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±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 affected 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.

The results of the present study clearly shows that the average length and weight of fishes were (332.950±77.792) mm and (513.30±169.46) g respectively. The intensity of infections was 6.33±0.84 nematode per single ovary. Philometra spp. average length was (162.35±25.29) mm. Lopez-Neyra considered and described a new philometrid species, Sanguinofilaria 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 belengeri ruber having 48% of infection and 8 intensity were recorded[16], M oreover, 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 sphyraeae 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 ootolithi 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

### 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±77.792) mm and (513.30±169.46) g respectively. The intensity of infections was 6.33±0.84 nematode per single ovary. Philometra spp. average length was (162.35±25.29) mm. Lopez-Neyra considered and described a new philometrid species, Sanguinofilaria 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].
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.

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