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Ovarian nematode (Nematoda: *Philometra* sp.) infestation on *Pseudorhombus triocellatus* (Paralichthyidae)

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ABSTRACT

Objective: To study the occurrence, description and prevalence of the *Philometra* sp. infestation in ovaries of *Pseudorhombus triocellatus* from two different landing centers in Tamil Nadu of southeast coast of India for a period of two years from January 2012 to December 2014.

Methods: The samples were collected from Parangipettai and Nagapattinam in the southeast coast of India. The prevalence and mean intensity of nematode infection and description were investigated.

Results: Based on light microscopical examination, this species differs from other *Philometra* spp. in morphological and biometrical measurements by type of the infected fish family and by the ecological distribution. The maximum prevalence (71.7%) of parasitic infestation was observed during summer 2014 in Parangipettai. The higher mean intensity was recorded during post-monsoon 2013 in Nagapattinam. The results of the ANOVA showed that there was no significant variation found prevalence and mean intensity of parasitic infestations between the stations. But there was a significant variation found between the season in the both the station.

Conclusions: This is the first report of *Philometra* sp. in the ovary of *Pseudorhombus triocellatus*. On the basis of nematode infestation may cause serious damage to ovary by slurping the blood, causing atrophy of developing ova, fibrosis, increasing granulocytes and hemorrhages, thus harmfully affect the fish reproduction and indirectly affect the fisher men communities.

1. Introduction

Fish organizes a main component of diet for the people of Southeast India, particularly in Tamilnadu. Fishing is the mainly economic important for the people residing in Parangipettai and Nagapattinam. The order of the flatfishes: Pleuronectiformes (Heterosomata) includes a number of valuable food fishes, marketed as plaice, sole, flounder halibut and turbot[1]. The parasites are highly valuable to marine fishes. Nahhas and Sey[2] has been reported on parasites fauna of marine mammals, sea birds and fish, few reported in Persian Gulf from Pleuronectiformes species and single parasite reported from *Brachirus orientalis* in Iran[3]. Gonad-infecting species of *Philometra* Costa, (1845) (Philometridae, Dracunculoidea) are widely distributed in marine fishes of the Atlantic, Indian and Pacific

Oceans, occasionally also occurring in brackish water fishes[4]. Yet, *Philometra rajani* was measured a substitute of *Philometra lateolabracis* (*P. lateolabracis*), and *Philometra pellucida* reported in fishes from Southern India. From the Indian Ocean region, *Philometra pellucida* Jagerskiold, *P. lateolabracis* Yamaguti, *Philometra rajani* Mukherjee, *Philometra cephalus* Ramachandran, and *Philometra neolateolabracis* Rajyalakshmi. have been reported from a various fishes belonging to different families[5]. Previously, *Philometra terapontis* (Nematoda: Philometridae) have reported from *Terapon jarbua* ovaries from the eastern coast of India[6]. An additional ten *Philometra* parasite infections have been reported in various marine fishes from off New Caledonia, South Pacific and also *Philometra* sp. may severe damage into fish ovaries and it can affect the reproduction[7]. The fauna of *Philometra* sp. parasite in marine fishes of the Indian Ocean, remains little known[8-12]. Few reports only expressed the prevalence and mean intensity of the philometrids infestation on the marine fishes[13-15].

During the anthology, this is the first report of *Philometra* sp. (nematode) infestation in *Pseudorhombus triocellatus* (*P. triocellatus*) ovaries. This study was to inspect the occurrence, description and prevalence of a nematode infestation in the ovaries of the *P. triocellatus*.

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2. Materials and methods

2.1. Sample collection

The normal and infected fish samples were collected from commercial catches landed at 2 different locations (Parangipettai (11°30' N, 79°46' E) and Nagapattinam (10°45' N, 79°50' E) in the southeast coast of India, during January 2012 to December 2014.

2.2. Parasitological examination

Infected ovaries were dissected out from infected fishes and examined the ovary under stereo and light microscope for the presence of oocytes and nematodes. Nematode were removed from the ovary and measured length and width of the body. Nematode were identified the internal structure using under the light microscope (40×, Magnues MLX-DX) and line diagram done by camera lucida attachment.

3. Results

3.1. Location of worm

Nematode (*Philometra* sp.) was infested in the ovary of female fish *P. triocellatus* (Aulopiformes: Sciaenidae, Figure 1A), the fish size was ranged between 80 and 130 mm (total length). The majority of gravid female's worms were found in the ovaries of infected fish. Nematode were found in the center of ova. Approximately 6 worms were observed in the single ovary (Figure 1B).

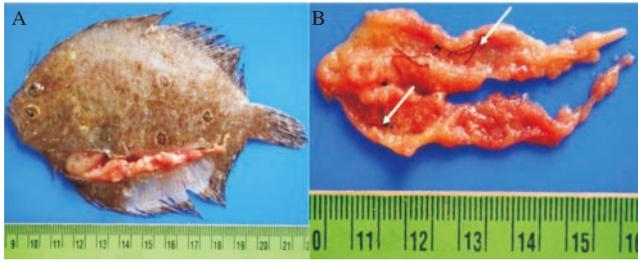


Figure 1. A: *P. triocellatus* infested by *Philometra* sp.; B: Ovaries infested with *Philometra* sp.

3.2. Description of the worm

Philometra sp. of ovarian nematode was infested on host fish of three spotted flounders *P. triocellatus* (Bloch and Schneider, 1801) (Paralichthydiadae) from Bay of Bengal, east coast of India. Totally 21 female specimen of *Philometra* sp. were collected from ovary of *P. triocellatus* during the January 2013 to December 2014. In the present study males were absent.

Description of female worm: anterior and posterior end of gravid female measurements of allotype in parenthesis, body of fixed specimen whitish in color with separate dark-brown intestine visible through cuticle, with rounded ends. The length of body is 218.6 (159–275) mm and the width is 2.43 (1.05–2.78) mm. Figures 2A and 3A showed Anterior end of the body slightly broader than the posterior end. Cuticle excellently segmented, almost smooth, without any separate bosses, length of cuticle is 1:1.34–1.95. Figure 3B showed cephalic end rounded, and cephalic papillae indistinct in lateral view. Oral aperture circular small, bottom of mouth formed by three flat oesophageal lobes and surrounded

by narrow ring of distinctly elevated cuticle. Cephalic surrounded by four pair papillae of external circle and four single papilla of internal circle (Figure 3C). Buccal cavity formed by the external surface of anterior; oesophageal gland narrow; greater, oesophageal bulb spherical, 79 long and 239 wide; posterior part of oesophagus somewhat expanded, opening into oesophagus just posterior to nerve ring, with large cell nucleus in middle. Nerve ring in anterior boundary of oesophagus; small ventriculus present. Brown intestine straight, displaced anterior end of intestine relatively narrow. Posterior end of intestine atrophied attached by ligament ventrally to body wall near caudal end. Oesophagus opening into intestine through distinct valve. Absents of vulva and anus. Ovaries short, reflexed, placed near anterior and posterior end of the body. Uterus occupying most port of the body. Uterus filled with larvae with long, slender tail. Posterior end of female round shaped, 382 wide, without caudal projections (Figure 3D).



Figure 2. Light microscope view showing *Philometra* sp. from *P. triocellatus*. A and B: Anterior end of gravid female; C, D, E and F: Posterior end of the gravid female; Arrow: Oral aperture; Head arrow: Oesophagus; Thickened arrow: Intestine.

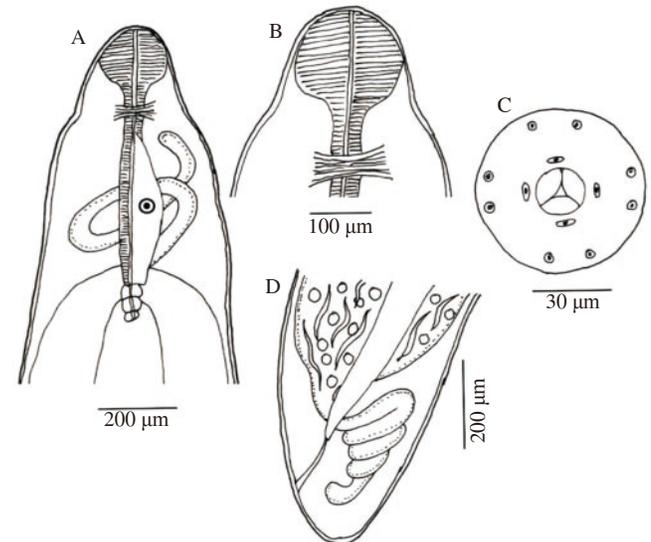
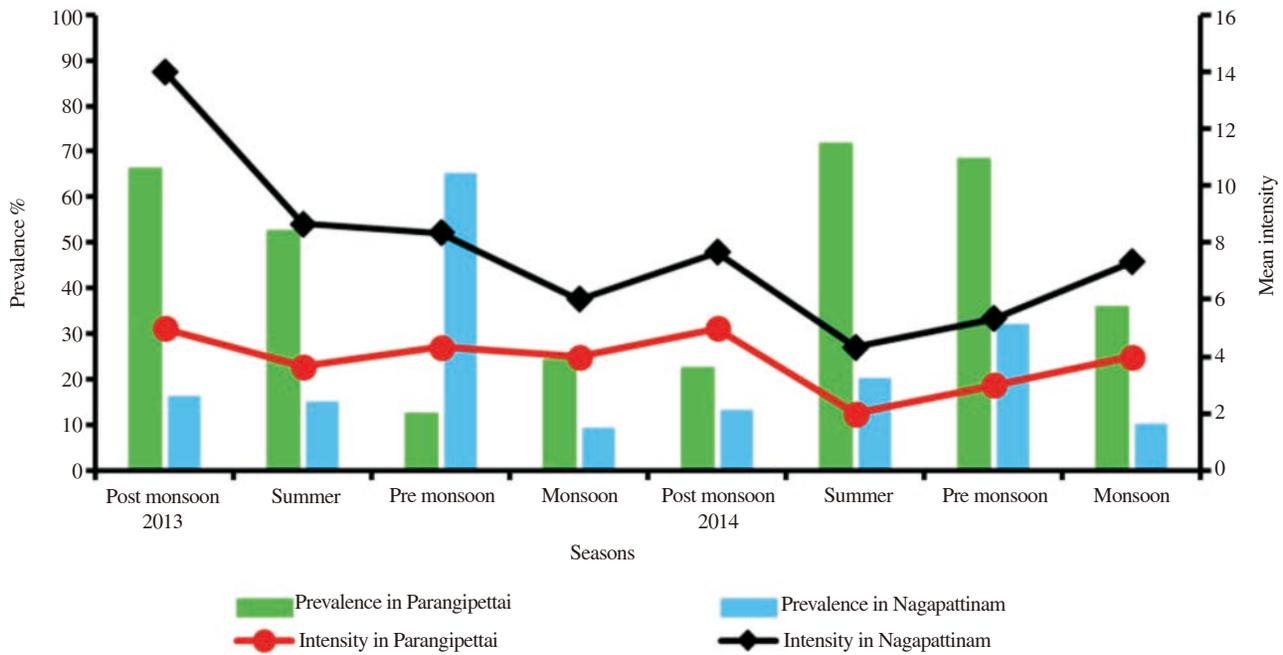


Figure 3. A: *Philometra* sp. from *P. triocellatus*, anterior end of gravid female, lateral view; B: Cephalic end of largest gravid female, lateral and apical views; C: Cephalic end of female, lateral view; D: Posterior end of largest gravid female, lateral view.

Table 1ANOVA table represented the seasonally prevalence and mean intensity of *P. triocellatus*.

Items	Nagapattinam					Parangipettai					
		Sum of squares	df	Mean square	F	Significance	Sum of squares	df	Mean square	F	Significance
Prevalence	Between groups	1 868.000	3	622.667	4.432	0.092	238.500	3	79.500	3.419	0.133
	Within groups	562.000	4	140.500			93.000	4	23.250		
	Total	2 430.000	7				331.500	7			
Mean intensity	Between groups	11.667	3	3.889	0.601	0.648	4.819	3	1.606	2.821	0.171
	Within groups	25.889	4	6.472			2.278	4	0.569		
	Total	37.556	7				7.097	7			

**Figure 4.** Prevalence and mean intensity of *Philometra* sp. infestation from Parangipettai and Nagapattinam (primary axis showing prevalence and secondary axis mean intensity).

3.3. Prevalence and mean intensity

The maximum (71.7%) prevalence of Nematode infestation was observed during summer 2014 in Parangipettai. Whereas minimum (9%) was during the monsoon 2013 in Nagapattinam. The higher mean intensity of Nematode infestation was recorded during post monsoon 2013 in Nagapattinam, whereas lower was during summer 2014 in Parangipettai (Figure 4). The results of the ANOVA showed that there was no significant variation found in prevalence ($P = 0.442$) and mean intensity ($P = 0.442$) of Nematode infestations between the stations. But there was a significant variation found between the season in the both station (Parangipettai; $P = 0.133$) and (Nagapattinam; $P = 0.092$) respectively during the year and the same trend was found in the mean intensity (Parangipettai; $P = 0.171$) and (Nagapattinam; $P = 0.648$) (Table 1).

4. Discussion

Philometra sp. (Philometridae), has been described from ovary of the *P. triocellatus* in the present study. Rodrigues and Saraiva[16] reported finding of *P. lateolabracis* in the the Javan flounder *Pseudorhombus javanicus* (Paralichthyidae) from Palawan, Philippines. Present *Philometra* sp. exposed length of the female 159–275 mm. Oral aperture circular small, inside mouth formed with three flat oesophageal lobes; surrounded by narrow ring of distinctly elevated cuticle. However, present specimen exposed different

morphology, which are characteristic of many other *Philometra* spp. In Indian waters, little published information is available in the west coast of India, in the east coast, our team has recently discovered a new species which is new to science namely, *Philometra terapontis*[6]. Philometrids (Nematoda) have been described from various marine perciform fishes of southeast coast of India; like *Sphyræna jello*, *Gerres filamentosus*, *Otolithes ruber*, *Johnius belangerii* and *Eleutheronema tetradactylum*[10]and also been described *Philometra indica* from the ovary of *Epinephelus merra*, *Philometra tropica* from the *Epinephelus bleekeri* and *Philometra* sp. from the *Epinephelus erythrurus*. Moravec and Manoharan[11] also reported *Philometra* spp. from the ovaries of *Epinephelus malabaricus* from southeast coast of India. Moravec and Manoharan[12] has been reported *Philometra* sp. described from marine fishes of *Lutjanus argentimaculatus* and *Lutjanus fulvus* in the Bay of Bengal, India.

In the present report, prevalence of the infestation by *Philometra* sp. according to Selvakumar et al.[13-15] was examined. The present study revealed that there was a significant variation found in the prevalence of *Philometra* infestation between the seasons, but no significant variation between the stations. Among the season, the higher *Philometra* infestation was found during the post monsoon, it may due to the higher nutrient drainage from the land at the end of the monsoon season and optimum temperature between to season monsoon and summer. Many researchers insisted on the importance of temperature as one of the factor controlling the parasitic infestation[17-20]. Moravec and Manoharan[10] have been

reported on prevalence and mean intensity in *Philometra sphyraenae* in *Sphyraena jello*, *Philometra gerrei* in *Gerres filamentosus*, *Philometra otolithi* in *Otolithes ruber* and *Philometra* sp. in *Johnius belengerii* was 69% and 9, 91% and 11, 47% and 6, 48% and 8 were recorded respectively. The result of the present study clearly showed that the prevalence and intensity of infection is higher in post monsoon compare with earlier reports. The previous report by Moravec et al.[21] showed taht prevalence and intensity of *Philometra genypteri* in *Genypterus chilensis* was 11% and 14 respectively. Moravec and Justine[22] also reported of the prevalence and intensity of *Philometra brevicollis* in *Lutjanus vitta* was 34% and 14 specimens per fish. The result of the present study clearly showed that the prevalence and mean intensity of infestation is moderate to compare to the previous reports and it may conclude that the temperature play a major role in *Philometra* infestation in the study area and reduction of the fish population.

This is the first representative report of the presence of *Philometra* sp. in *P. triocellatus*. Among the season, the higher *Philometra* infestation was found during the post monsoon. On the basis of *Philometra* sp. infection may cause serious damage to ovary by slurping the blood, causing atrophy of developing ova, fibrosis, increasing granulocytes and hemorrhages. Thus harmfully affect the reproduction of *P. triocellatus*.

Conflict of interest statement

We declare that we have no conflict of interest.

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References

- [1] Bardach JE, Ryther JH, Meharny WO. *Aquaculture. The farming and husbandry of freshwater and marine organisms*. New York: Wiley-Inter Science; 1972, p. 868.
- [2] Nahhas FM, Sey O. Digenetic Trematodes from marine fishes off the coast of Kuwait, Persian Gulf: superfamily Hemiuroidea. *Acta Zool Acad Sci Hungar* 2002; **48**(1): 1-20.
- [3] Bagherpour A, Afsharnasab M, Mobedi I, Jalali B, Mesbah M. Prevalence and intensity of internal parasitic helminthes infected black sole fish, *Brachirus orientalis* (Bloch and Schneider, 1801) in the Persian Gulf. *Iran J Fish Sci* 2011; **10**(4): 570-84.
- [4] Moravec F, Justine JL. Two new gonad-infecting *Philometra* species (nematoda: Philometridae) from the marine fish *Lutjanus vitta* (Perciformes: lutjanidae) off New Caledonia. *Folia Parasitol (Praha)* 2011; **58**(4): 302-10.
- [5] Moravec F. *Dracunculoid and anguillicoloid nematodes parasitic in vertebrates*. Prague: Academia; 2006.
- [6] Moravec F, Gopalakrishnan A, Rajkumar M, Saravanakumar A, Sinduja K. A new gonad-infecting species of *Philometra* Costa, 1845 (Nematoda: Philometridae) from the marine fish *Terapon jarbua* (Forsskal) (Terapontidae) off the eastern coast of India. *Syst Parasitol* 2011; **80**: 23-33.
- [7] Moravec F, de buron I. A synthesis of our current understanding of philometrids (Philometridae), a group of growingly important fish parasites. *Folia Parasitol (Praha)* 2013; **60**: 80-101.
- [8] Moravec F, Ali AH. *Philometra johnii* sp. nov. (Nematoda, Philometridae), a new gonad-infecting philometrid from the sin croaker *Johnius dussumieri* (Cuvier) (Perciformes, Sciaenidae) from marine waters of Iraq. *Acta Parasitol* 2013; **58**: 263-8.
- [9] Moravec F, Bakenhaster M, Fajer-Avila EJ. Three new gonad-infecting species of *Philometra* (Nematoda: Philometridae) parasitic in *Lutjanus* spp. (Lutjanidae) in the northern Gulf of Mexico off Florida, USA. *Folia Parasitol (Praha)* 2014; **61**: 353-68.
- [10] 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): 105-22.
- [11] Moravec F, Manoharan J. Gonad-infecting species of *Philometra* (Nematoda: Philometridae) from groupers *Epinephelus* spp. (Osteichthyes: Serranidae) in the Bay of Bengal, India. *Acta Parasitol* 2014; **59**: 596-605.
- [12] Moravec F, Manoharan J. Two new gonad-infecting species of *Philometra* (Nematoda: Philometridae) parasitic in *Lutjanus* spp. (Osteichthyes: Lutjanidae) in the Bay of Bengal, India. *Parasitol Res* 2014; **113**: 3299-307.
- [13] Selvakumar P, Sakthivel A, Gopalakrishnan A. Prevalence, intensity and gonadosomatic index of a nematode (*Philometra* sp.) infested in ovaries of *Otolithes ruber* from Southeast coast of India. *Asian Pac J Trop Dis* 2014; **4**(Suppl 2): S743-7.
- [14] Selvakumar P, Gopalakrishnan A, Sakthivel A. Occurrence and prevalence of *Philometra* sp. (Nematoda: Philometridae) infection in the ovary of *Lutjanus russelli* (Bleeker, 1849) in the southeast coast of India. *Indian Geo-marine Sci* 2015; **44**(8): 1245-51.
- [15] Selvakumar P, Sakthivel A, Gopalakrishnan A. Occurrence of a nematode *Philometra* (Costa, 1845) in the ovaries of *Epinephelus malabaricus* (Bloch & Schneider, 1801) in southeast coast of India. *J Coast Life Med* 2015; **3**(4): 290-4.
- [16] Rodrigues AA, Saraiva A. Spatial distribution and seasonality of *Pseudodactylogyrus anguillae* and *P. bini* (Monogenea: Pseudodactylogyridae) on the gills of the European eel *Anguilla anguilla* from Portugal. *Bull Eur Assoc Fish Pathol* 1996; **63**: 85-8.
- [17] Chapman LJ, Lanciani CA, Chapman CA. Ecology of a diplozoon parasite on the gills of the African cyprinid *Barbus neumayeri*. *Afr J Ecol* 2000; **38**: 312-20.
- [18] Turner HM. Seasonality of *Alloglossoides caridicola* (Trematoda: Macroderoididae) infection in the crayfish *Procambarus acutus*. *Southwestern Naturalist* 2000; **45**: 69-71.
- [19] Wang GT, Yao WJ, Nie P. Seasonal occurrence of *Dollfustrema vaneyi* (Digenea: Bucephalidae) metacercariae in the bullhead catfish *Pseudobagrus fulvidraco* in a reservoir in China. *Dis Aquat Organ* 2001; **44**: 127-31.
- [20] Mouritsen KN, Poulin R. Parasitism, climate oscillations and the structure of natural communities. *Oikos* 2002; **97**: 462-8.
- [21] Moravec F, Rosa AC, 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**: 227-32.
- [22] Moravec F, Justine JL. Two new gonad-infecting *Philometra* species (Nematoda: Philometridae) from the marine fish *Lutjanus vitta* (Perciformes: Lutjanidae) off New Caledonia. *Folia Parasitol Praha* 2011; **58**: 302-10.