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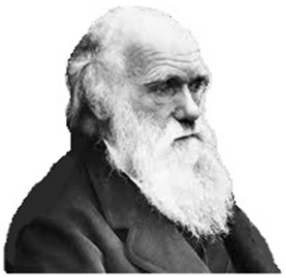

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Occurrence of *Philometra* sp. and its impact on ovary of *Mugil chephalus*

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ABSTRACT

The aim of this work was to study the occurrence and impact of the *Philometra* sp. infestation in ovaries of *Mugil chephalus* from two different landing centers in Tamil Nadu of southeast coast of India. The samples were collected from Parangipettai and Nagapattinam. The prevalence and mean intensity of nematode infection and description were investigated. Based on the light and SEM microscopical examination, this species differs from other *Philometra* sp. in morphological and biometrical measurements by type of the infected fish family and by the ecological distribution. The study reveals that maximum (77%) prevalence of parasitic infestation was observed during monsoon 2017 in Parangipettai, whereas minimum (2%) was during the postmonsoon 2018 in Nagapattinam. The higher (7) mean intensity of parasitic infestation was noted during postmonsoon 2017 in Nagapattinam, whereas minimum (2) was during premonsoon 2018 in Parangipettai. 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 stations. This is the first report of *Philometra* sp. in the ovary of *Mugil chephalus*. On the basis of nematode, infestation may cause a serious damage to ovary by slurping the blood, causing atrophy of developing ova, fibrosis, increasing granulocytes and hemorrhages, thus harmfully affecting the fish reproduction and indirectly affecting the fisher men communities.

***Keywords*:** Prevalence, Mean intensity, *Philometra* sp, *Mugil chephalus*

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1. INTRODUCTION

Gonad-infecting species of *Philometra* Costa, 1845 (Philometridae, Dracunculoidea) is widely distributed in marine fishes of the Atlantic, Indian, and Pacific Oceans and brackish-water environments [1-3].

Nematodes are belonging to the superfamily Dracunculoidea Stiles, 1907, and family Philometridae frequent infest on the abdominal cavity and various body tissues of fresh and marine water fishes. The dracunculoid life cycles involve aquatic crustaceans (copepods, ostracods or branchiurids) as intermediate hosts and consequently, the transmission and the occurrence of these parasites in vertebrate definitive hosts is always associated with the aquatic environment. Therefore, it is not surprising that the absolute majority of dracunculoids is found in fishes, both fresh and marine water.

Off the nine dracunculoid families, eight (89%) include the forms from fishes, whereas the family Dracunculidae Stiles, 1907, contains a few species: parasitic in amphibians (species of the monotypic genera *Kamegainema*, Hasegawa *et al*., (2000), and *Protenema* Petter and Planelles, (1986), birds (species of *Avioserpens* Wehr and Chitwood, 1934) and reptiles and mammals (Dracunculus); the Micropleuridae Baylis and Daubney, 1926, contains four species of *Micropleura* Linstow, 1906, from reptiles and two species of *Granulinema* Moravec et Little, 1988 from fish (sharks) [4].

Of a total number of 36 valid genera of dracunculoid nematodes, with 166 recognized species, 31 (86%) genera with 150 (90%) species are found in fishes.

Belonging to dracunculoid families are: Anguillicolidae, Daniconematidae, Guyanemidae, Lucionematidae, Micropleuridae, Philometridae, Skrjabillanidae, and Tetanonematidae. Because of the difficulties in studying fish dracunculoids, associated with their morphological and natural individualities, most species of these largely histozoic parasites are poorly known and males of the majority of species and of eight genera have not yet been exposed.

The fauna of gonad-infecting species of Philometra parasitizing marine fishes in the region of the Indian Ocean remains little known [5, 6]. Few reports only describe the prevalence and mean intensity of the Philometrids infestation on the marine fishes [7, 8]. Hence, the present study aims to investigate the prevalence and mean intensity of *Philometra s*p. and its impact on ovary of *Mugil chephalus.*

2. MATERIALS AND METHODS

2. 1. Study Area

The present study was aimed to carry out the prevalence and mean intensity of Philometrids infestation in food fishes for two years from January 2017 to December 2018, from two different fish landing centres such as Parangipettai and Nagapattinam.

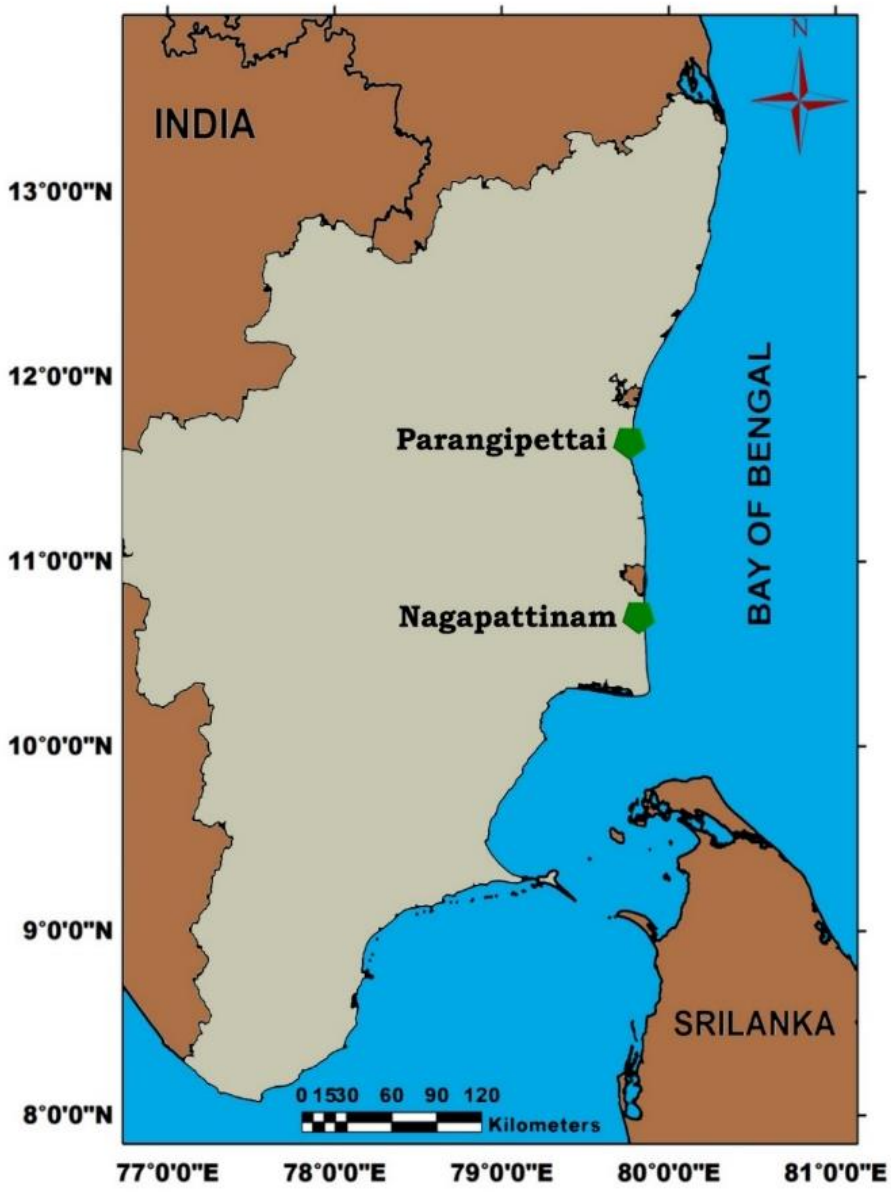

Figure 1. Map showing the study area.

2. 2. Morphological Studies

2. 2. 1. Sources of Philometrid nematodes

Philometrid nematodes were collected from the gonads of the keystone fishes in Parangipettai and Nagapattinam coastal waters.

Females were collected macroscopically. Finding and collection of male and female philometrids from the fish ovaries were done, whereas collection of philometrids in fish ovaries were dissected and washing the ovaries with physiological saline solution and collection was

aided with stereomicroscope. Collected male and female philometrids were fixed in 70% ethanol. Nematodes were washed with glycerin.

After clearing, philometrids were mounted on slides. For long and coiled females, only the anterior and posterior portions were mounted on slides after measuring the total body length.

Measurement and observations were performed using LM. The general features of males, females, and first-stage larvae in the uterus of a fully gravid female philometrid were drawn using a compound LM with a camera Lucida drawing attachment. Females were categorized as gravid, subgravid and non-gravid. All measurements were in millimeters. Lengths of each morphological features examined were expressed in comparative values in the body length. Identification up to species level was initially carried out using the morphological keys reported [1-5]. Measurements of some morphological structures difficult to examine under LM were carried out using SEM. Specimens to be examined using SEM were fixed with 70% ethanol, post-fixed in 1.25-1.5% glutaraldehyde, post-fixed in 1% osmium tetroxide, and dehydrated through the series of ascending ethanol concentrations. Samples were subjected to three changes of absolute butyl alcohol and freeze-dried. Freeze-dried samples were subsequently sputter-coated with gold and observed under a scanning electron microscope (EOL JSM-7401F).

2. 3. Prevalence and Mean intensity

The host fishes were collected from two landing centres of Tamilnadu, southeast of India (Nagapattinam - 10.4500° N, 79.4600° E and Parangipettai - 11.4900° N, 79.7600° E) (**Figure 1**). All the fish species were identified based on the description given by [9]. The hosts were measured for length, weight and examined for the sex. However prevalence and mean intensity were calculated according to the methods given by [10, 11].

3. RESULTS AND DISCUSSION

Type locality: Bay of Bengal, southeast coast of India
Site of infestation: ovary

3. 1. Material examined

13 ♀ specimen from ovary of *Mugil cephalus* (Linnaeus, 1758) during the January 2012-December 2014.

3. 2. Description

Male♂

Unknown

Gravid female ♀

Anterior and posterior end of gravid female measurements of allotype in parenthesis, body of fixed specimen brownish in color with separate dark-coloured intestine observable through cuticle, with rounded ends were done. Body 215.4 (186-250) mm length and 1.18 (1.06-

1.23) mm width were measured. Posterior part of the body is narrower than anterior part; maximum width in region, posterior to oesophagus. Smooth cuticles are present. Oral aperture narrower; bounded by four pairs and two single of submedian cephalic papillae of external circle and two pairs papillae of internal circle are presented in **Fig. 2**. **A** and **B** and C; **Fig. 3**. **A** and **B**. Buccal cavity formed by the internal surface of anterior oesophageal gland is relatively narrow, opening into oesophagus just posterior to nerve ring, with large cell nucleus in middle. Nerve ring is present from anterior boundary of oesophagus. Intestines are brown, attached by tendon ventrally to body wall near caudal end. Oesophagus opening into intestine through distinct valve, 32 long and 109 wide (Fig. 1 **E**). Absents of vulva and anus are observed. Ovaries short, reflexed, placed near anterior and posterior end of the body are visible (Fig. 3 A and **D**). Uterus filled with numerous larvae with long, slender tail; posterior end of female is round shaped, 328 wide, caudal projections is not found (Fig. 3. **D**).

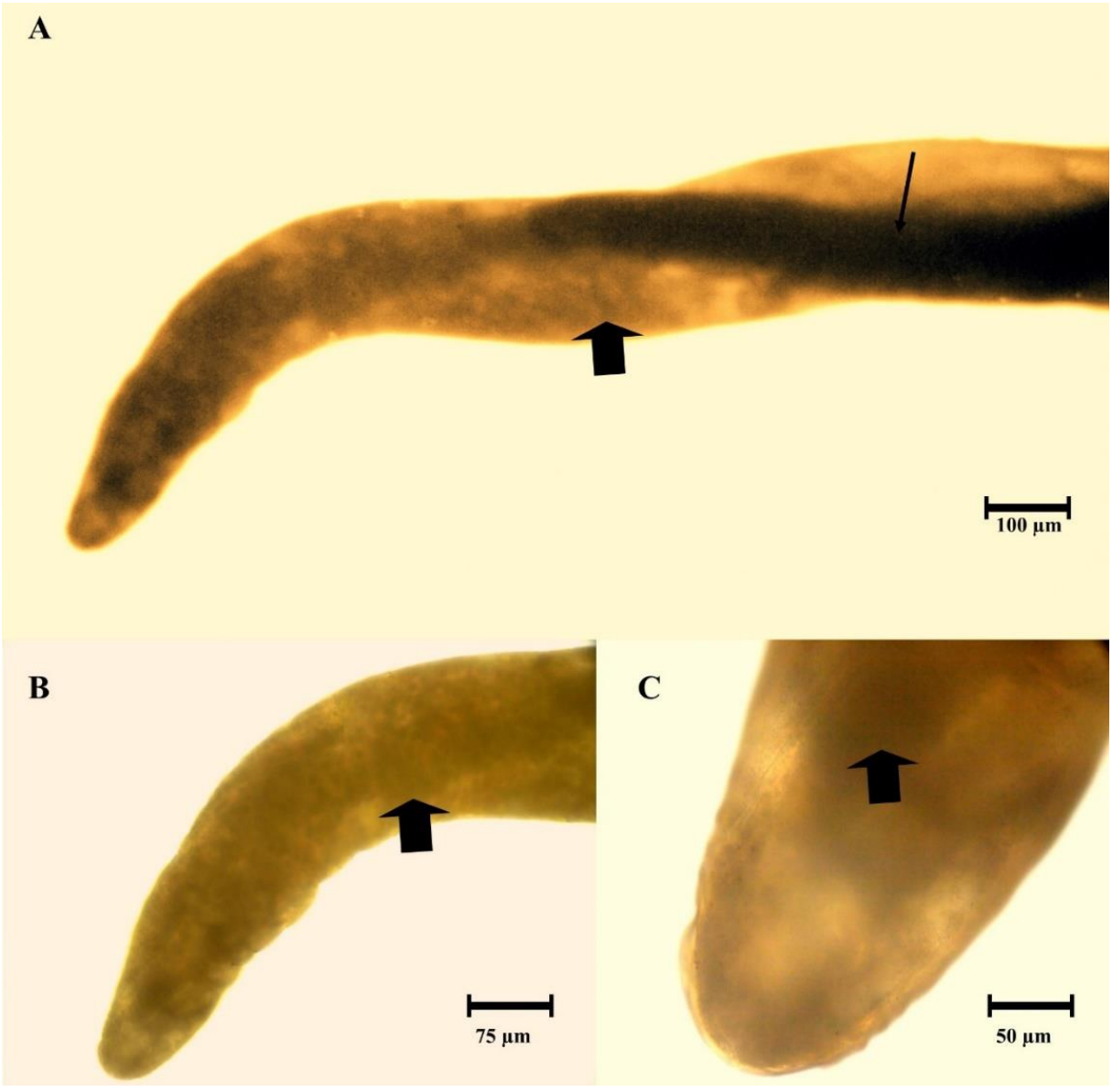

Figure 2. Light microscope view showing *Philometra* sp from *Arothron immaculatus.* Posterior end (A, B and C). (Arrow – intestine; thickened arrow – ovary)

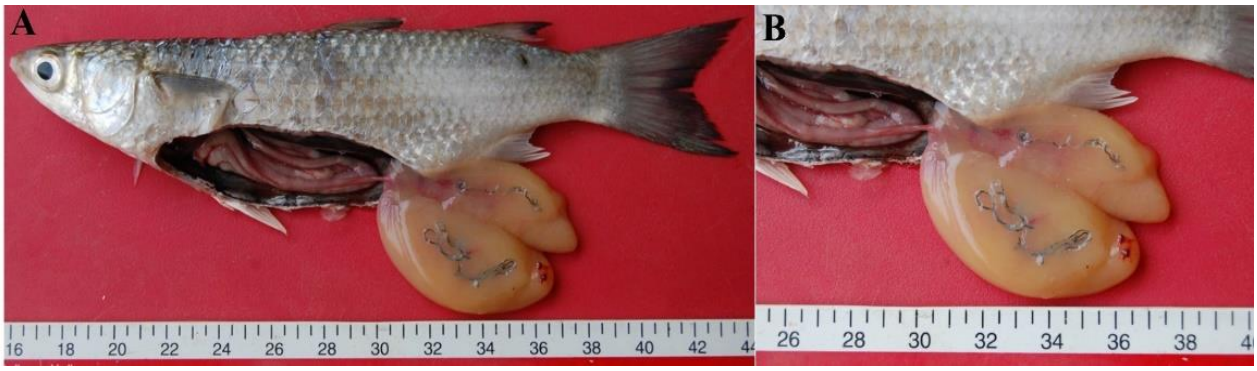

Figure 3. *Mugil cephalus* infested by *Philometra* sp. (A), Ovaries infested with parasites (B)

3. 3. *Philometra cephalus* (Ramachandran, 1975)

Host: Flathead grey mullet *Mugil cephalus* (Linnaeus, 1758)

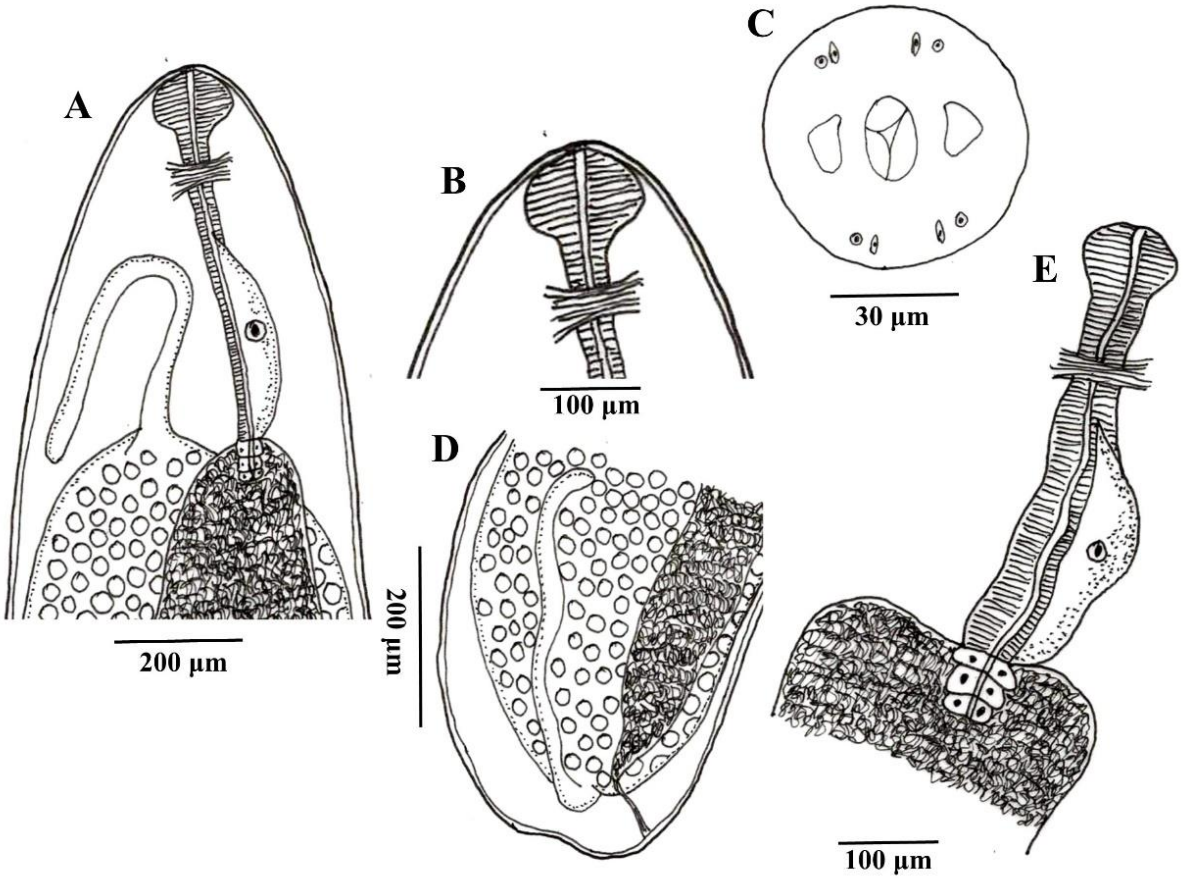

Figure 4. *Philometra cephalus*. Anterior end of gravid female, lateral view (A); cephalic end of gravid female, apical and lateral views (B and C), posterior end of mature female, lateral view (D) and Oesophagus with intestine (E)

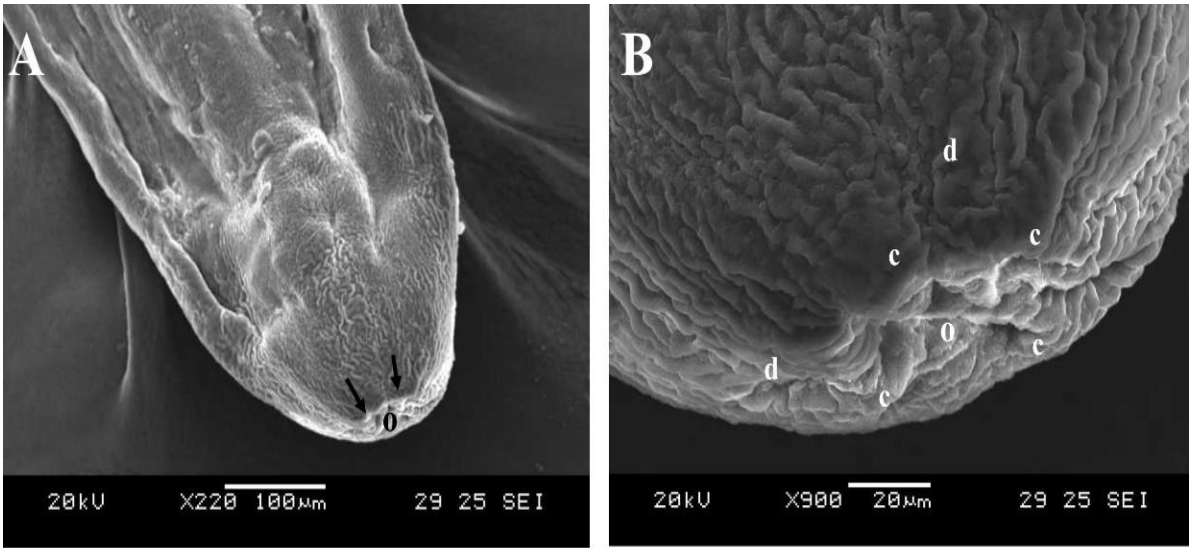

Figure 4. SEM image showing *Philometra cephalus* from *Mugil cephalus*. Anterior end of gravid female lateral view (A). Cephalic end of female lateral view (B) (o – oral aperture, e - submedian cephalic papilla of external circle lateral, d – amphid).

3. 4. Remarks

The morphology and measurements of the present specimens are, more or less, in agreement with the original description of *Philometra cephalus* (reported in India) based on LM and SEM, provided by Ramachandran, (1975), external circle showed four pairs of submedian cephalic papillae and internal circle showed six single papillae. However, present specimen exposed different morphology, which are characteristic of many other *Philometra* spp. [1, 11, 12].

To date, there is only one report being made about Mugilidae family, *P. cephalus* (only males) from pectoral fin muscle of the crevalle jack *Caranx hippos;* but in the present study *Philometra cephalus* (Ramachandran, 1975) from ovary of the *Mugil cephalus.* Mainly this species are characterized using SEM, provided which of the gravid females by external circle showed four pairs of submedian cephalic papillae and internal circle showed six single papillae and their locality in the host [1, 2]. However, present specimens exposed different morphology, which are characteristic of many other *Philometra* spp. [13, 14].

3. 5. Prevalence and Mean intensity

Moravec *et al*. (2011) report 98% of prevalence and mean intensity 6 of *Philometra terapontis* from the marine fish *Terapon jarbua* of the southeast coast of India. Previous study has reported The *Otolithes ruber* infested by *Philometra* sp. showed overall prevalence is 47% and 28.66±10.17%; the mean intensity of 6 and 1.5 nematodes per fish were recorded, respectively [7, 9, 14].

In the present study, the maximum (77%) prevalence of parasitic infestation was observed during monsoon 2013 in Parangipettai, whereas minimum (2%) -- was during the postmonsoon 2014 in Nagapattinam. The higher (7) mean intensity of parasitic infestation was noted during postmonsoon 2013 in Nagapattinam, whereas minimum (2) was during premonsoon 2014 in Parangipettai. The results of the ANOVA show that there was no significant variation found in prevalence (P = 1.000) and mean intensity (P = 0.130) of parasitic infestations between the stations. But there was a significant variation found between the seasons in the both stations, (Parangipettai; P = 0.066), and (Nagapattinam; P = 0.297), respectively, during the year and the same trend was observed in the mean intensity (Parangipettai; P = 0.37) and (Nagapattinam; P = 0.18). Many researchers insisted on the importance of temperature as one of the factors controlling the parasitic infestation [12-14]. Ref. [9] reported *Philometra sphyraenae* in *Sphyraena jello* showing 69% of infestation and mean intensity 9, *Philometra gerrei* in *Gerres filamentosus* showed 91% of infestation and mean intensity 9, and *Philometra* sp. in *Johnius belengerii* showed 48% of infestation and 8 intensity were recorded. Here Philometrids infestation rate was dependent upon the fish feeding habitat and climatic parameters. These variations in the rate of the parasitism could be attributed to abiotic and biotic conditions of the environments where the studies were carried out.

4. CONCLUSIONS

The present study revealed that there was a significant variation found in the prevalence of *Philometra* infestation between the seasons, and higher *Philometra* infestation was found during the monsoon and low level recorded in post monsoon. Here, mainly other factors, such as intermediate host like copepod, crustaceans and bivalves play a significant role in the parasitic infestation and diversity. Also [15, 16] reported 45% of infestation and mean intensity 8 in *L. argentimaculatus*, 28% of infestation and mean intensity 7 in *L. fulvus*, 20% of infestation and mean intensity 7 in *Epinephelus merra*, 6% of infestation and mean intensity 11 in *Epinephelus bleekeri*, and 5% of infestation and mean intensity 5 *Epinephelus erythrurus*. The results of the present study clearly show that the prevalence and mean intensity of infestation is moderate to compare to the previous reports, and it may be concluded that the temperature play a major role in *Philometra* infestation in the study area and reduction of the fish population.

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