



Research Article

Two New Species of *Philometra* (Nematoda: Philometridae) from Edible Fish *Pomadasys maculatus* of Karachi Coast

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Abstract | Globally, fishes are considered as the healthiest food. They consist of all the significant nutriment that are very necessary for human health. Diseases in fishes caused by invasion of parasite especially due to *Philometra* species is considered very much problematic in fish culture and aquaculture. There are number of complications in fishes that arose due to presence of *Philometra* sp. Presence of these parasites directly affect fish reproduction and ultimately decline their population. This research work was done to collect, observe and identify variety of nematodes (Philometrids) from female reproductive organs of marine edible fish *Pomadasys maculatus* (Bloch, 1793). Fishes were collected from Karachi coast, Kemari, further processed in parasitology lab, University of Karachi. Ovaries were inspected to observe presence of *Philometra* sp. and other parasites too. In a year, from February 2021 till January 2022, 120 samples of *Pomadasys maculatus* (Bloch, 1793) were examined out of which only 25 fishes were found to be infected. From *Pomadasys maculatus* (Bloch, 1793) two new gonad infecting *Philometra* sp. were identified as *Philometra pakistani* and *Philometra maculati*.

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Keywords | Helminths, Marine fishes, Nematodes, *Philometra* and Gonads



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Introduction

Fishes are ectothermic poikilotherms aquatic animals that are having streamlined elongated bodies possessing lateral line sense organs (Verma and Prakash, 2020). For the maintenance of good and healthy life style, adding them in our diet is a wise decision because these fishes are rich in macro (such as proteins, lipids, ash) and micro nutrients (such as vitamins and minerals (Srivastava and Srivastava, 2008)). We face huge economic loss in fishes if they

are infested by parasites that are extremely infectious. Gonad infecting parasites are normally observed not only in fishes of the world's largest oceans, but also in brackish water habitats (Moravec et al., 2011). Reproduction in fishes is greatly affected by the presence of large-sized female *Philometra* sp. because of their presence in gonads. Initially these gonad infecting nematode parasites cause huge loss of fry which ultimately result in huge fish population in future. There are a lot of difficulties in studying and identifying Philometrid nematodes especially about

their morphological and biological characteristics, because of this most of these nematode parasites remain poorly known (Moravec, 2004). Globally, a lot of research is done on *Philometra* sp. From the marine water of Iraq, two new *Philometra* sp. (Nematoda: Philometridae) were observed (Moravec and Ali, 2014). From sea snakes and marine fishes of New Caledonia, new species of camallanid nematodes (Nematoda, Camallanidae) were described (Moravec and Justine, 2019). Moreover, new species of *Spirurid* nematodes were discovered in fishes of marine habitat of new Caledonia (Moravec and Justine, 2020). On examining, *Lutjanus lutjanus* and *Platycephalus indicus* from Iraq southern coast discloses the existence of two new *Philometra* species (Costa, 1845) (Moravec et al., 2021). From the sea of Pakistan, *Philometra* sp. (Costa, 1845) were observed infecting *Priacanthus* sp. (Ali et al., 2018). This research work was carried out to observe, identify and recover *Philometra* sp. from marine fish *P. maculatus*, this research will enhance literature of Pakistani fauna.

Materials and Methods

From Karachi coast, Kemari fishes were collected monthly. After the collection, they were saved in ice box till they were transfer to the lab of Parasitology, Zoology Department, University of Karachi. Fishes were examined externally to observe any infection or ectoparasite if present. After that, fishes were dissected out from anal to mouth direction. Gut and gonads were pulled out to observe the presence of parasites. From the infected ovaries nematodes of family Philometridae were separated out and were preserved in the solution of 70% alcohol and glycerin. Infected ovarian tissues were kept in formalin for study in future. Preserved Philometrid nematodes were placed on clean glass slide with a drop of glycerin and lactophenol, covered with cover slip after that it was studied further under light microscope. For the identification and characterization of new species of parasites, measuring size was the most important characteristic. Calibrated ocular micrometer was used to measure the size of specie structure. For the process of micrometry, micrometer in eyepiece along with micrometer in stage was used. Micrometer that is fitted in eyepiece is basically a disc shaped glassware having a scale impression. Calibration is done by comparing ocular micrometer with stage micrometer. Just like ocular micrometer, stage micrometer also consist of divisions impressed on it. The unit for

microscopic measurement is 0.001 mm and it is known as one micron and written 1µm. With the help of Camera Lucida drawing of new species were made.

Result and Discussion

In this research new species that belong to genus *Philometra* named as *P. pakistanii* and *P. maculati* were observed from infected ovaries of *Pomadasys maculatus* (Bloch, 1793). Total 120 fish were dissected, out of which only 25 were infected.

Philometra pakistanii (n.sp.) (Figure 1A to 1D)

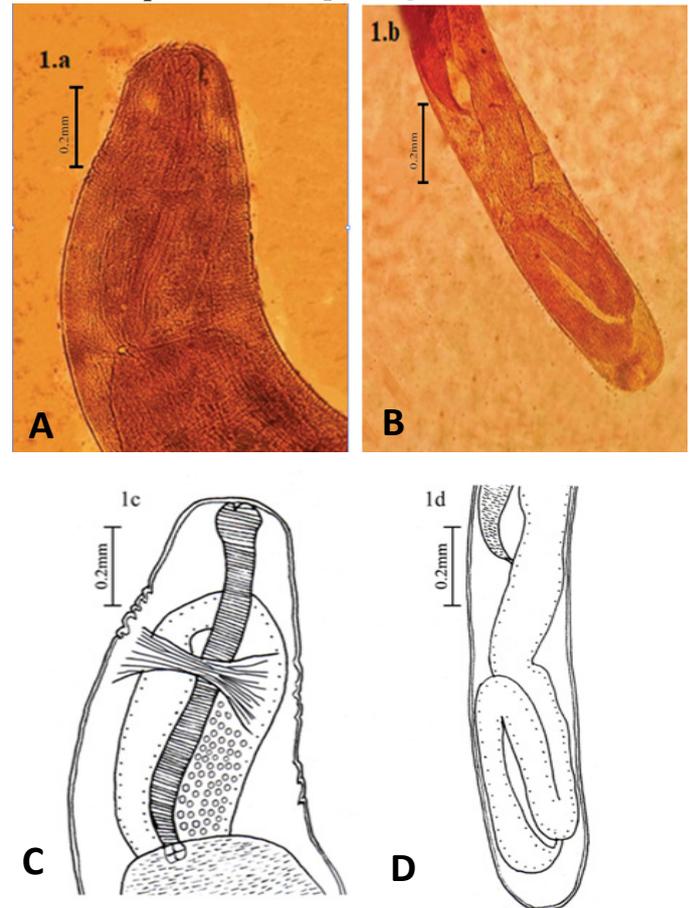


Figure 1: Anterior portion (A), Posterior portion (B), drawing of anterior portion (C) and posterior portion (D) of *Philometra pakistanii* (x10).

Taxonomic character

Family of parasite: Philometridae (Baylis and Daubney, 1926)

Sub-family of parasite: Philometrinae (Baylis and Daubney, 1926)

Genus of parasite: *Philometra* (Costa, 1845)

Host fish: *Pomadasys maculatus* (Bloch, 1793)

Site from where fish was captured: Karachi coast, Pakistan

Habitat: Reproductive organ (Ovary)

No of Specimen recovered: 21

Indonesia in 2012.

Characters of female

On observing, parasite body was found to be reddish brown, elongated. Anterior end of cuticle was found to be striated while in posterior end it was smooth. Both ends were rounded (Figure 1A, B). Posterior end was wider than the anterior end (see description in Table 1).

Male: Unknown.

Etymology

This new discovered specimen was named as *Philometra pakistanii*. This species name was designated on country name from where it was discovered.

Type-species: From the female reproductive organs of host *Pomadasy maculatus* (Bloch, 1793) a new species of *Philometra* was found from coast of Karachi. Other type species observed globally were *P. mawsonae* by Moravec and Barton from *Lutjanus malabaricus* in 2018 reported from Australian northern coast, *P. haemulontis* by Moravec et al. recovered from the female reproductive organs of *Haemulon* sp. from Florida coast in Mexican Gulf and Straits of Florida, USA in 2020, *P. brachiri* by Moravec and Ali that was reported from the female reproductive organs of *Brachirus orientalis* from the sea of Southern Iraq (Arabian Gulf) in 2014 and *P. psettoditis* by Moravec et al. was observed from female reproductive organs of *Psettodes erumei* from southwestern coast of Java,

When comparing by other type species, we observed that the new recovered specie of *Philometra* was smaller in size. Overall width of new specie was only smaller than the width of *P. psettoditis* but more wider than that of *P. mawsonae*.

Anterior bulbous portion of esophagus was smaller in length when compare with anterior bulbous portion of above-described species. But wider when compare to that present in *P. haemulontis* and *P. psettoditis*. Posterior cylindrical portion of esophagus was smaller in size when compared to esophagus of *P. mawsonae*, *P. haemulontis* and *P. psettoditis* but on comparison with *P. brachiri*, it was elongated in size. The nerve ring in new specie was located at a distance from anterior bulbous portion of esophagus when compared with that in *P. brachiri*. Ventriculus was greater in size on comparison with above described species. The width of cephalic region was observe to be more than that of *P. mawsonae*, *P. haemulontis* and *P. brachiri* but was compact than that observe in *P. psettoditis*.

The ligament of intestine in the observed species was elongated than that observe in *P. haemulontis* and *P. mawsonae* but was in dwarf size than that observe in *P. brachiri*.

The recovered specie of *Philometra* is designated as a new specie on above differences.

Table 1: Comparing already reported species of *Philometra* with *Philometra pakistanii* (All measurements in mm).

<i>Philometra</i> sp.	<i>Philometra pakistanii</i>	<i>P. mawsonae</i> (Moravec and Barton, 2018)	<i>P. haemulontis</i> (Moravec et al., 2020)	<i>P. brachiri</i> (Moravec and Ali, 2014)	<i>P. psettoditis</i> (Moravec et al., 2012)
Host fish	<i>Pomadasy maculatus</i>	<i>Lutjanus malabaricus</i>	<i>Haemulon plumierii</i> and <i>H. aurolineatum</i>	<i>Brachirus orientalis</i>	<i>Psettodes erumei</i>
Site from where fish was captured	Karachi	Australia	Gulf of Mexico and Straits of Florida, USA	Southern Iraq	Indonesia
Gender	Female	Female	Female	Female	Female
Body measurement of <i>Philometra</i> sp.	(62.6-63.3) (0.54-0.6)	(70-111) (0.7-0.9)	(78-110)(0.4-0.7)	(65-70) (0.5-0.78)	(68) (0.29)
Measurement of anterior inflation	(0.086-0.09) (0.13-0.14)	(0.1-0.2) (0.1-0.151)	(0.078-0.09) (0.06-0.07)	-	(0.096) (0.078)
Measurement of posterior cylindrical-shape of esophagus	(0.982-1) (0.09-0.112)	(1.2-1.4) (0.177-0.204)	(1.09-1.43)	(0.93)	(1.35)
Width of cephalic region	(0.336-0.35)	(0.15-0.23)	(0.109-0.19)	(0.136)	(0.95)
Width of caudal region	(0.28-0.322)	(0.204-0.544)	-	-	-
Position of nerve ring	(0.34)	(0.29-0.34)	(0.258-0.367)	(0.286)	(0.326)
Size of ventriculus	(0.57-0.648)	(0.02-0.05) (0.081-0.1)	(0.03-0.04) (0.05-0.08)	(0.03)(0.07)	(0.009) (0.03)
Size of ligament	(1.75-1.89)	(0.49-1.15)	(0.47-1.2)	(1.8-5.1)	-

Table 2: Comparing already reported species of *Philometra* with *P. maculati* (All measurements in mm).

<i>Philometra</i> species	<i>P. maculati</i> (n.sp.)	<i>P. cynoscionis</i> (Moravec et al., 2006)	<i>P. cyanopodi</i> (Moravec and Justine, 2008)	<i>P. bervicollis</i> (Moravec and Justine, 2011)	<i>P. haemulontis</i> (Moravec et al., 2020)
Host	Pomadasy maculatus	Cynoscion nebulosus	Epinephelus cyanopodus	Lutjanus vitta	<i>Haemulon plumierii</i> and <i>H. aurolineatum</i>
Site from where fish was captured	Karachi	South Carolina, USA.	New Caledonia, South Pacific	New Caledonia, South Pacific	Gulf of Mexico and Straits of Florida, USA
Gender	Female	Female	Female	Female	Female
Size of <i>Philometra</i> sp.	(28.2-29.2) (0.4-0.5)	(28.8) (0.96)	(21) (0.4-1.4)	(25) (0.381)	(13) (0.23)
Size of anterior inflation	(0.079-0.09) (0.086-0.097)	(0.12) (0.15)	(0.1-0.12) (0.06-0.18)	(0.084) (0.08)	(0.057) (0.051)
Size of esophagus	(0.969-1.02) (0.05-0.098)	(1.65)	(1.02) (0.15)	(1.09)	(0.73)
Width of Cephalic region	(0.15-0.196)	(0.19)	(0.17-0.3)	-	(0.054)
Width of Caudal region	(0.168-0.182)	-	(0.19-0.47)	-	(0.082)
Position of nerve ring	(0.151-0.19)	(0.27)	(0.24-0.38)	(0.258)	(0.19)
Ligament	(0.378-0.448)	-	(0.09-0.18)	(0.272)	(0.245)

Philometra maculati (n.sp.) (Figure 2A to 2D)

Taxonomic character:

Family of parasite: Philometridae (Baylis and Daubney, 1926)

Sub-family of parasite: Philometrinae (Baylis and Daubney, 1926)

Genus of parasite: *Philometra* (Costa, 1845)

Host fish: *Pomadasy maculatus* (Bloch, 1793)

Site from where fish was captured: Karachi coast, Pakistan

Habitat: Female reproductive organ (Ovary)

No of Specimen reovered: 10

Characters of female

Body was elongated, with a brown color intestine easily visible through cuticle. Cuticle present in anterior portion was segmented while posteriorly it was observed to be smooth (Figure 2A, B). Anterior and posterior ends were rounded. Posterior end was wider than anterior end (see description in Table 2).

Male: Unknown.

Etymology

The observed *Philometra* was named as *P. maculati*. The specie namethat was assigned to this genus is related to the specie name of *Pomadasy maculatus*.

Type-species: From Karachi coast, Pakistan present specimen was collected from female reproductive organs of *Pomadasy maculatus*.

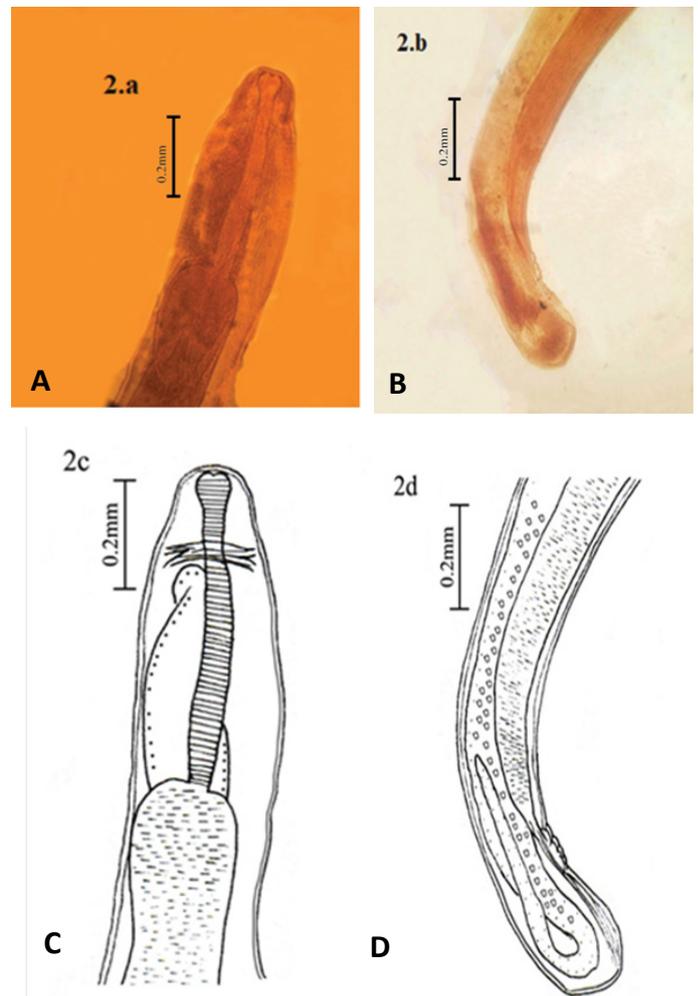


Figure 2: Anterior portion (A), Posterior portion (B), Drawing of anterior portion (C) and drawing of posterior portion (D) of *Philometra maculati* (x10).

Different *Philometra* species observed globally were

Philometra cynoscionis (Moravec *et al.*, 2006), from female reproductive organ of *Cynoscion nebulosus* reported from the Atlantic coast of South Carolina, USA.; *Philometra brevicolis* by Moravec and Justine from the female reproductive organ of *Lutjanus vitta*, discovered from the South Pacific Ocean of New Caledonia in 2011; *Philometra cyanopodi* by Moravec and Justine was recovered from the ovaries of *Epinephelus cyanopodus* (Richardson), from the water of New Caledonia, South Pacific in 2008; *Philometra haemulontis* by Moravec *et al.* from the female reproductive organ of *Haemulon plumierii* and *H. aurolineatum* (Cuvier), described from the coast of Florida in the Gulf of Mexico and Straits of Florida, USA in 2020.

On comparing the size of body, the length of newly described *Philometra* sp. is larger than that observed in *Philometra cyanopodi*, *Philometra brevicolis* and *Philometra haemulontis*. New recovered species is thinner than *Philometra cynoscionis* and *Philometra cyanopodi* and thicker than that of *Philometra brevicolis* and *Philometra haemulontis*.

Anterior bulbous region of esophagus was compacted when compared with that observed in *Philometra cynoscionis* and *Philometra cyanopodi* but larger than that observed in *Philometra haemulontis*. Posterior cylindrical shape of esophagus was smaller when compared with that of *Philometra cynoscionis*, *Philometra cyanopodi* and *Philometra brevicolis* but elongated in size when compared with that of *Philometra haemulontis*. On comparison we observe that nerve ring is located anteriorly on esophagus. Cephalic width was larger than that observed in *Philometra haemulontis* while width of caudal region was smaller when compared with the caudal width of *Philometra cyanopodi* and was wider than the caudal width of *Philometra haemulontis*. On comparison it was observed that intestinal ligament was larger than that observed in other described species. The recovered species of *Philometra* is designated as a new species on above differences.

Conclusion and Recommendations

The findings of these nematodes in marine waters of Pakistan represent new host and new geographical records. In present research these nematodes were seen attached with ovarian tissues causing tissue disturbance. Due to infestation of these nematodes in

economical important fish it is very necessary to control and prevent these parasites from invading fishes.

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Novelty Statement

The present study would provide the information about the new species of Philometrid nematode parasites which infect gonads of edible fish *Pomadasys maculatus* of Karachi Coast. This work would be an addition with reference to the severe infection on gonads and also affect on the fertility of fishes caused by described nematodes.

Author's Contribution

Sumbul Zulfqar: Collected data and processed, aid in mounting and then did their micrometry, Prepared manuscript.

A.G. Rizwana: Did identification of nematode species and aid in micrometry, helped in manuscript writing.

Conflict of interest

The authors have declared no conflict of interest.

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