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Digenetic trematodes of the Subfamily Aphanurinae Skrjabin & Guschanskaja, 1954 infecting the commercially important fish *Thryssa malabarica* (Bloch, 1795) (Clupeiformes, Engraulidae) from the brackishwater bodies of Kerala, India

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Abstract. Three species of digenetic trematodes of the Family Hemiuridae Looss, 1899, Subfamily Aphanurinae Skrjabin & Guschanskaja, 1954 with their prevalence, intensity of infection and mean abundance are reported *Aphanuroides lethrini*, *Aphanurus stossichii* and *Aphanurus tuberculatus.* A total of 26 specimens of *Thryssa malabarica* (Bloch, 1795) were examined for digenean infection. Prevalence of infection of *A. lethrini*, *A. stossichii* and *A. tuberculatus* were 11.53%, 69.23% and 15.38%, respectively, the intensity of infection were 1.6, 3.1 and 2.5 and the mean abundance were 0.19, 2.15 and 0.38, respectively. The prevalence, intensity and mean abundance of infection were at the maximum level in *A. stossichii* infection. Recovery of these parasites from *T. malabarica* represents a new host record and the first report from Kerala. The characteristic features of the recovered digeneans are discussed.

Keywords: Digenetic trematode; fish; *Thryssa malabarica*; Malabar anchovy; brackishwater; prevalence.

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Introduction

Our knowledge on trematode parasites of brackishwater fishes and their distribution is limited. The brackishwater environment represents an unique ecosystem of high fertility, that supports a rich natural fishery which is of considerable significance in the rural economy of developing countries (Tampi, 1973). The Malabar anchovy *Thryssa malabarica* (Bloch, 1795), a marine, estuarine group fish (Mahima, 2014) is an important food fish in Kerala.

Previous studies on the digeneans of *Thryssa* spp. inhabiting the marine habitat have been reported by Ahmad (1980), Hafeezullah (1980b), Gupta and Jain (1992), Madhavi (2011), and Sailaja and Madhavi (2012). The present study on the digenetic trematodes of the Subfamily Aphanurinae infecting the commercially important fish *T. malabarica* from the brackishwater bodies of Kerala forms the first report from Kerala.

The purpose of this study is to expand our knowledge of the Family Hemiuridae Looss, 1899, Subfamily Aphanurinae Skrjabin & Guschanskaja, 1954 endohelminths of *T. malabarica* from the brackishwater bodies of Kerala.

Materials and methods

Fishes were collected from various brackishwater bodies of Northern Kerala during the period from June 2018 to June 2019. Specimens were immediately brought to the laboratory and examined for digenetic trematodes under a stereozoom dissecting microscope. A total of 26 specimens of *T. malabarica* were examined.

Adults recovered were carefully removed and cleaned in 0.75% saline in separate watch glasses and studied under Nikon ECLIPSE Ni-U phase contrast research microscope with or without vital staining. Permanent whole mounts were prepared after fixing them in 5% formalin under slight cover glass pressure and staining with acetocarmine, following the procedure outlined by Cantwell (1981). Identification of parasites was done following Gibson (2002). Specimens were measured using the Nikon NIS Elements Imaging software. All measurements are in micrometers (μm), as range followed by mean in parentheses. Drawings were made with the aid of Nikon Y-IDT drawing tube attached to the Nikon ECLIPSE Ni-U microscope and the details were added free hand from observations made on live specimens. Photographs were taken with a Nikon Y-TV55 camera. Prevalence, intensity of infection and mean abundance were estimated following Bush et al. (1997).

Results

Three species of digenetic trematodes *Aphanurus lethrini*, *A. stossichii*, and *A. tuberculatus* were found infecting the intestine of the fish *T. malabarica.*

Collection localities: Mattool and Ezhom of Kannur District and Chandragiri backwaters of Kasargod District.

Period of collection: June 2018 to June 2019.

Table 1. Digenean parasites with their prevalence, intensity of infection and mean abundance.

Parasite	Prevalence of infection	Intensity of infection	Mean abundance
Aphanuroides lethrini	3 out of 26 fishes (11.53%)	5 from 3 infected fishes (1.6)	5 in 26 fishes (0.19)
Aphanurus stossichii	18 out of 26 fishes (69.23%)	56 from 18 infected fishes (3.1)	56 in 26 fishes (2.15)
Aphanurus tuberculatus	4 out of 26 fishes (15.38%)	10 from 4 infected fishes (2.5)	10 in 26 fishes (0.38)

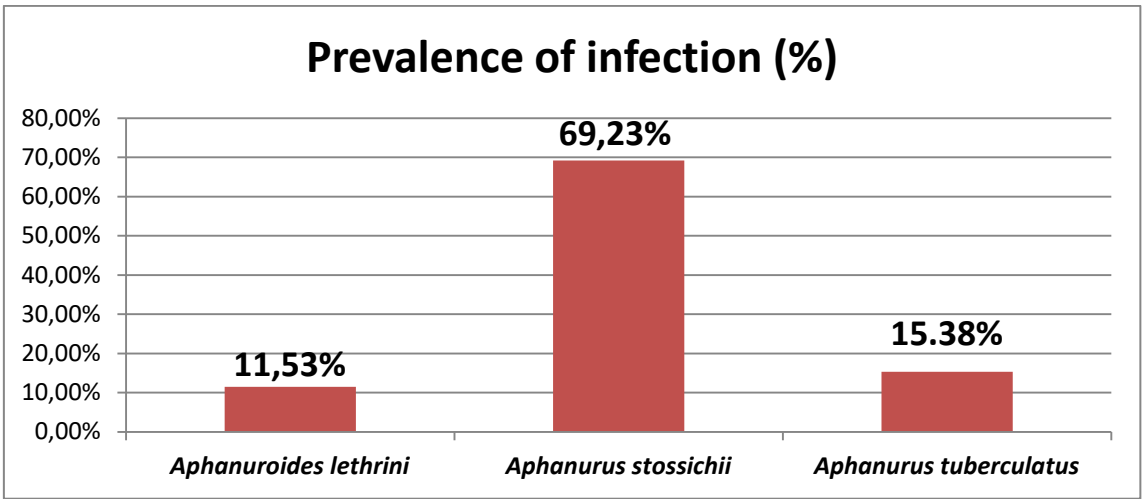

Figure 1. Digenean parasites with their prevalence of infection.

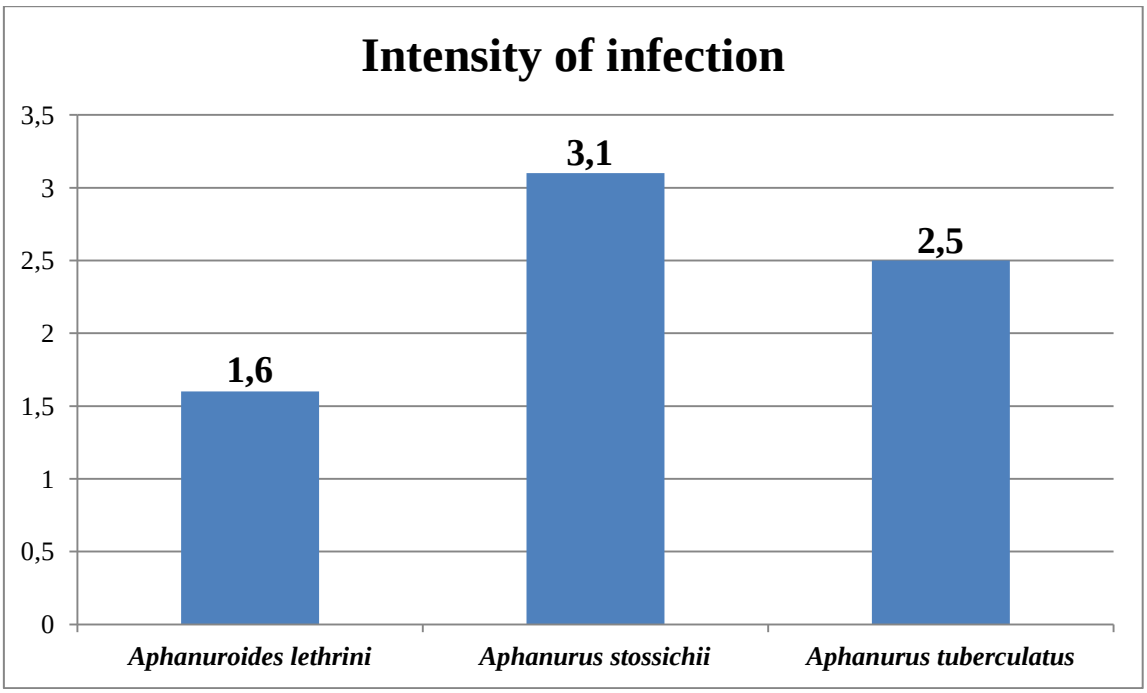

Figure 2. Digenean parasites with their intensity of infection.

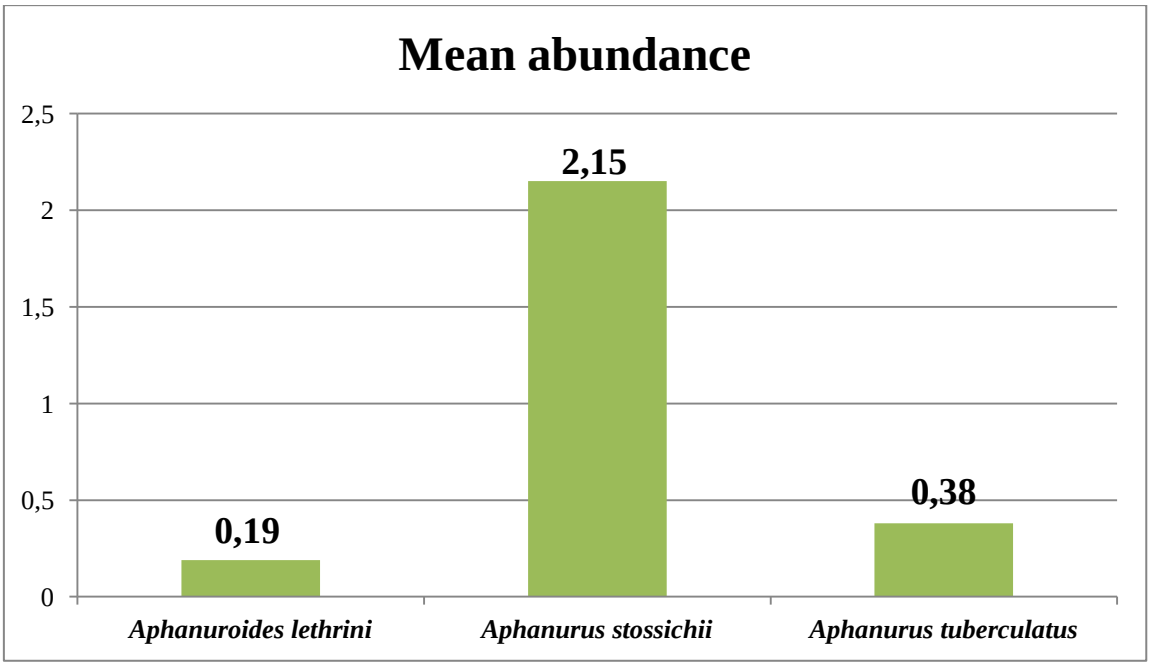

Figure 3. Digenean parasites with their mean abundance.

Family Hemiuridae Looss, 1899
Subfamily Aphanurinae Skrjabin & Guschanskaja, 1954

The members of the Aphanurinesare hemiurids without an ecsoma are characterized by cuticular plications and one or two compact vitellaria (Gibson, 2002). The genus *Aphanuroides* of the subfamily Aphanurinae was established by Nagaty and Abdel-Aal (1962). The establishment of this genus was based on the characters such as tandem testis, vitellaria composed of two lobes anteriorly attenuated seminal vesicle and a hermaphroditic duct which is not enclosed in a sac. *Aphanuroides*, Nagaty and Abdel-Aal, 1962 is a small hemiurid genus which is represented by one species *A. lethrini* Nagaty and Abdel-Aal (1962).

The genus *Aphanurus* was erected by Looss in 1907, with *A. stossichi* (Monticelli, 1891) as type species. Trematodes of the genus *Aphanurus* are intestinal parasites of different teleosts in seas and brackishwaters. The genus *Aphanurus* is represented by 14 species (Kostadinova, 2004). Gibson in 2002 explained that in the Aphanurinae, *Neoaphanurus* Tang et al. (1983) is considered to be a synonym of *Aphanurus* Looss, 1907. Madhavi (2018) recorded five species belonging to this genus from clupeiod fishes of India; they are *A. stossichii* (Monticelli, 1891) Looss, 1907, *A. haraengulae* Yamaguti, 1938, *A. microrchis* Chauhan, 1945, and *A. tuberculatus* Hafeezullah, 1981, and *A. dussumierii* Hussain, Hanumantha Rao & Shyamasundari, 1984.

***Aphanuroides lethrini* Nagaty and Abdel-Aal, 1962**

Remarks: The species is characterized by highly plicated body surface. Ventral sucker is near the anterior extremity and is larger than oral sucker. Pharynx is small. Caeca terminates near posterior extremity. Testes are oval, two in number and located at the middle third of body. Ovary is post testicular and seminal vesicle is long, bipartite and attenuated anteriorly. Uterine coils extend up to the hind end of

body. Vitellaria are post ovarian and have two compact lobes. Eggs are large and oval. Rudiments of ecsoma are clearly visible.

Three out of 26 *T. malabarica* were infected with *A. lethrini* and the prevalence of infection is 11.53%. Five *A. lethrini* were recovered from three infected fishes so the intensity of infection is 1.6 and five *A. lethrini* were recovered from a total of 26 fishes so the mean abundance is 0.19 (Table 1).

Collection localities: Mattool, Kannur District.

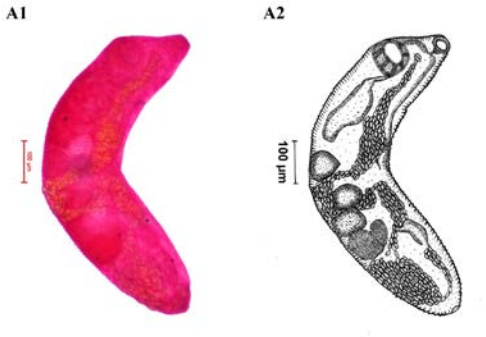

Figure4. *A. lethrini*(A1 and A2).

***Aphanurus stossichii* (Monticelli, 1891) Looss, 1907 (Figure 5)**

Remarks: This species is characterised by anteriorly tapered, elongate and plicate body. Forebody is short; oral sucker is small and ventral sucker is large & muscular. Pre pharynx is absent. Caeca reach up to the posterior extremity. Testes are tandem. Seminal vesicle lies anterior to the anterior testis. Sinus sac is tubular, narrow. Ovary is post testicular. Vitellarium is single, large, post ovarian and slightly larger than ovary. Uterine coils reach up to the posterior extremity. Eggs are thin shelled. Rudiments of ecsoma are absent. Eighteen out of 26 *T. malabarica* were infected with *A. stossichii* and the prevalence of infection is 69.23%. Fifty six *A. stossichii* were recovered from 18 infected fishes and the intensity of infection is 3.1 and 56 *A. stossichii* were recovered from a total of 26 fishes, so the mean abundance is 2.15 (Table 1).

Collection localities: Mattool and Ezhom of Kannur District and Chandragiri backwaters of Kasargod District.

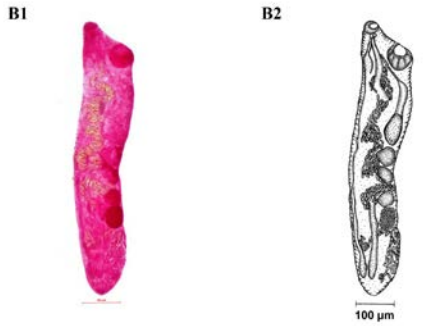

Figure 5. *A. stossichii* (B1 and B2).

***Aphanurus tuberculatus* (Hafeezullah, 1981) (Figure 6)**

Remarks: Body is elongate; plications can be seen more conspicuously in the anterior region extending up to the vitelline area. Oral sucker is smaller than the ventral sucker. Caeca are long, extending up to the posterior end of body. Seminal vesicle is elongate with thick muscular wall and found between the anterior testis and the posterior region of the ventral sucker. Testes are almost equatorial. Tubular sinus sac extends from the anterior border of the ventral sucker to the posterior end of the oral sucker and encloses knob -like sinus organ with fine tubercles. Ovary is post testicular. Vitellarium is post ovarian and indented anteriorly. Eggs are elongate and numerous.

Four out of 26 *T. malabarica* were infected with *A. tuberculatus* so the prevalence of infection is 15.38%. Ten *A. tuberculatus* were recovered from four

fishes and the intensity of infection is 2.5 and 10*A. tuberculatus* were recovered from a total of 26 fishes so the mean abundance is 0.38 (Table 1).

Collection localities: Mattool and Ezhom of Kannur District.

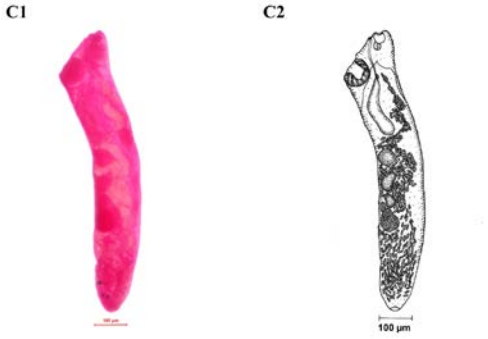

Figure 6. *A.tuberculatus* (C1 and C2).

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Conflict of interest

Authors declare that there are no conflicts of interest.

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