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## Helminth parasitic fauna of a cyprinid fish *Devario malabaricus* (Jerdon)

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### Abstract

Parasites are important group of pathogen that causes infection and diseases in fishes which may badly affect the aquaculture industry. *Devario malabaricus* is an ornamental fish commonly found in Kerala. The present investigation was conducted to survey the helminth infection in *D. malabaricus*. A total of 210 fishes were examined during January 2011 to June 2014, for the presence of parasites. Six species of helminth parasites were recovered from the fish host. They include a species of monogenea, *Diplozoon indicum*, an adult digenea *Macrolecithus indicus*, three larval digenea, *Clinostomum complanatum*, *Tetracotyle* sp. and *Centrocestus formosanus* and an adult nematode *Rhabdochona sarana*. *D. malabaricus* constitutes a new host for *D. indicum*, *M. indicus*, *C. complanatum* and *R. sarana*.

**Keywords:** *Devario malabaricus*, Helminth parasites, Monogenea, Digenea, Metacercaria, Nematoda.

### 1. Introduction

*Devario malabaricus* is an aquarium trade fish belonging to the family Cyprinidae. They are commonly found in freshwater bodies of Kerala feeding mainly on insects and their larvae. Due to their carnivorous nature, occurrence of parasitic infection become higher in nature. Diet, feeding habits, vagility of host species are the main factors affecting the parasitic community structure especially for the parasites transmitted to their final host<sup>[1]</sup>. Parasites are metabolically dependent on their host mainly for their nutritional requirements<sup>[2]</sup>. Piscine parasites causes profound pathological changes which lowers the growth rhythm considerably and affect the quality of the fish and often leads to death of fish resulting in enormous economic losses to the fish industry<sup>[3]</sup>. The present study was aimed to analyse helminth parasitic fauna of cyprinid fish *Devario malabaricus* collected from Kannur district of Kerala.

### 2. Materials and methods

The fishes were collected from different freshwater bodies of Kannur district from January 2011 to June 2014. Collected fishes were brought alive to the laboratory and examined immediately for the presence of helminth parasites. The fishes were dissected out and examined under Stereozoom dissecting microscope in a systematic manner. The parasites recovered were collected in a cavity block containing physiological saline. Monogeneans and digeneans were examined alive under compound microscope using vital stain neutral red and were fixed in either 5-10% formalin or AFA (Alcohol Formalin Acetic acid.). After the fixation, the parasites were stained using alum carmine and preparation of permanent whole mounts followed the procedure outlined by Cantwell (1981)<sup>[4]</sup>. Characteristics of metacercarial cysts were examined under phase contrast microscope after which they were excysted by rupturing the cyst wall by mounting it under cover glass and applying gentle pressure over it by using a fine needle. Encysted larvae were removed from their cyst wall by using fine needles.

Adult nematodes collected were washed thoroughly to remove debris. The specimens were fixed in hot 70% alcohol. After fixation the worms were stored in glycerine-70% alcohol mixture. Temporary whole mounts were prepared by clearing the parasite either in lactophenol or in creosote. The parasites were mounted in glycerine. Drawings were made with the aid of camera lucida and measurements were taken by using calibrated ocular micrometer and were presented in micrometer (µm).

### 3. Results and Discussion

A total of 210 host fishes were collected for the present investigation. Six species of parasites were recovered, which include one species of monogenea, one species of adult digenea, three metacercariae and one nematoda.

#### 3.1. Monogenea

##### 3.1.1. *Diplozoon indicum* Dayal, 1941 (Fig.1)

Habitat: Gill filaments

Prevalence of infection: 9.52%

Intensity: 1-3

#### Description

Individual always occurring in permanent pairing, two flukes unite behind fore-end of posterior third of body, in form of a letter 'X'. Body short, measured 1120-2200. Forebody larger than hindbody. Prohaptor dorsoventrally flattened, leaf-like 875-1550x262-633 in size. Opisthaptor terminal, rectangular, concave ventrally 288-650x105-350. Prohaptor comprising two cup-shaped spherical suckers on each side mouth measures 32x23. Mouth situated on ventral side of anterior extremity. Pharynx ovoid, situated just behind the prohaptoral region. Oesophagus short, intestine tubular with dichotomously branched anterior to union of individuals, posterior to union intestine branches in two caeca and unite again posterior to testis and extend as simple tube upto hind sucker. Reproductive organs situated in the anterior part of hindbody. Testis single, oval measure 15x12. Ovary pretesticular, long band, bend twice on itself forming an inverted double 'U'. Opisthaptor with four pairs of lateral clamps, rectangular in shape and concave ventrally. Anterior sucker is slightly larger than others measures 82-100x36-46, second pair 73-91x32-46, third pair 68-91x32-46, last pair 64-86x32-41. Vitelline follicles co-extensive with intestine branches.

#### Remarks

The genera *Diplozoon* with type species *D. paradoxum* Nordmann, 1832 was first described from the gills of *Abramis brama*. Under this genera seven species were reported from India. Pandey and Agarwal (2008) [5] considered two Indian species *D. indicum* Dayal, 1941 and *D. nipponicum* Goto, 1891 as valid. The characters tallies with the original description, but it is smaller in size. Therefore the present fluke reported here as *D. indicum* Dayal, 1941. Recovery of *D. indicum* Dayal, 1941 from *D. malabaricus* in Kannur forms new host and geographical record.

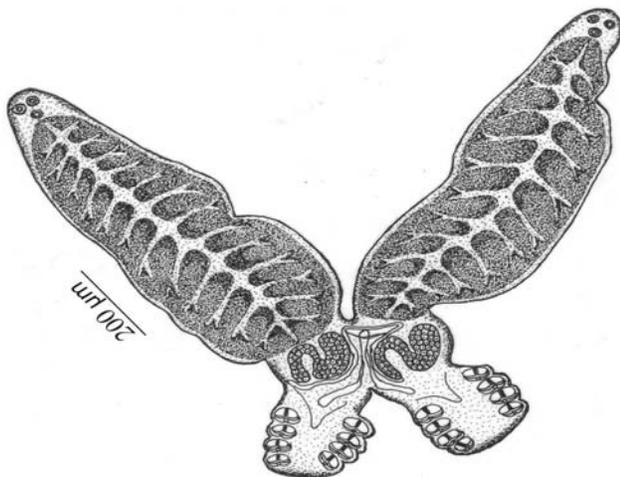


Fig.1. *Diplozoon indicum* Dayal, 1941

### 3.2. Digenea

#### 3.2.1. Adult

##### 3.2.1.1. *Macrolecithus indicus* Gupta & Agrawal, 1967 (Fig.2)

Habitat: Intestine

Prevalence of infection: 1.43%

Intensity of infection: 1

#### Description

Body elongate, aspinose with rounded extremities and measured 2581-3717 x 757-1434. Oral sucker subterminal, globular, measured 189-317x230-350. It is followed by short prepharynx which measured 20-50 in length. Pharynx globular, 135-200x160-230. Oesophagus long, slender and tubular 189-533 long. Two caeca reach the posterior extremity and end blindly. Acetabulum round, slightly larger than oral sucker 229-383x270-433 in size and placed anterior half of the body. Testis two, entire, oval, post-equatorial, obliquely tandem in position. Anterior testis 176-267x108-233. Posterior testis larger than anterior testis, 216-301x108-249. Cirrus pouch present between acetabulum and intestinal bifurcation containing vesicular seminalis, prostatic complex and small muscular cirrus. Genital pore sub-median, ovary sub-spherical, smooth and median, 55-267x 202-301. Uterine coils pass through space between acetabulum and anterior testis and also between intratesticular spaces. Eggs numerous, oval, operculated, 67-98x40-53.

#### Remarks

The characters of the present adult fluke suggests that it belongs to the genus *Macrolecithus* Hasegawa & Ozaki, 1926. As far as is known, only six species have been reported under this genus. They are the type species *M. gotoi* Hasegawa & Ozaki, 1926, *M. elongatus* and *M. phoxinusi* Park, 1939, *M. indicus* Gupta and Agrawal, 1967, *M. rasborai* (Srivastava and Ghosh, 1967) and *M. papilliger* Rees (1968). The present parasite agrees with the original description of *M. indicus* in all biometric features and recovery this parasite from *D. malabaricus* in Kannur forms new host and geographical record.

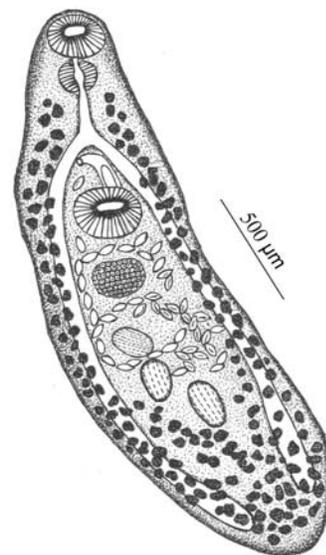


Fig.2. *Macrolecithus indicus* Gupta & Agrawal, 1967

### 3.2.2. Metacercaria

#### 3.2.2.1. *Clinostomum complanatum* Rudolphi, 1819 (Fig.3)

Habitat: Body cavity

Prevalence of infection: 0.48%

Intensity: 1

#### Description

Metacercaria eunycysted in the body cavity of piscine host. Live metacercariae are yellowish white in colour. Body linguiform, aspinose with blunt ends measured 2,677.5-4,305x875-1243.2. Oral sucker sub-terminal, 105-175x157.5-210. Ventral sucker at the anterior third of the body, 525-630x507.5-612.5. Mouth at the center of oral sucker, opens into a small prepharynx and a saccular dilation, the pharyngeal bulb. Caeca occupying greater part of the body on either side; having small lateral diverticula, 2300-3702.7 long. Testes large digitate; anterior testis 122.5-297.5x175-332.5; posterior testis 157.5-402.5x175-459.46. Ovary small, round to oval, intertesticular 81-115x79-115. Excretory bladder small, v-shaped, opens out by a sub-terminal pore.

#### Remarks

Adult parasites of *Clinostomum complanatum* is generally found in piscivorous birds. Most preferable host for the metacercariae of *C. complanatum* is *Pseudosphromenus cupanus*. Only single parasite was collected from *D. malabaricus*. Therefore *D. malabaricus* is considered here as accidental host for this metacercaria. Recovery of the parasite from *D. malabaricus* forms a new host record.

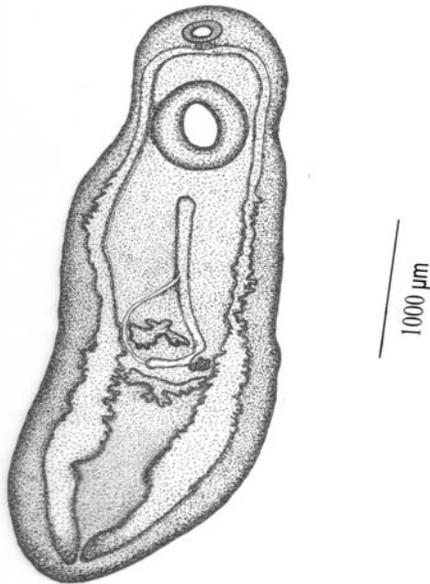


Fig 3 *Clinostomum complanatum* Rudolphi, 1819

#### 3.2.2.2. *Tetracotyle* sp. (Fig. 4 a, b)

Habitat: Muscle

Prevalence of infection: 38.10%

Intensity: 3-11

#### Description

Cyst oval, milky white in colour and have double layered cyst wall. Excysted parasite, body aspinose and oval, divided in to two parts. Forebody large, measured 402.5-1015x 315-857.5. Smaller hind-body measured 70-350x175-332.5. Oral sucker terminal, round to oval, 35-70x52.5-87.5. Acetabulum oval measured 87.5-105x105-122.5. Two prominent accessory

suckers present on either side of oral sucker, measured 70-192.5x35-70. Small, globular pharynx measured 17.5-40x17.5-37.5. Caeca extends upto the posterior third of the body. Well-developed hold fast organ present behind the acetabulum and measured 140-315x52.5-140. Holdfast gland large and measured 385-717.5x35-105. Reproductive organs rudimentary, situated in posterior region of hindbody.

#### Remarks

The metacercaria under study resembles the larval genus *Tetracotyle* Fillipi, 1857 of the family Strigeidae Railliet, 1919. The organization of the metacercaria collected from the present fish is poorly developed, and therefore, no specific identification was attempted.

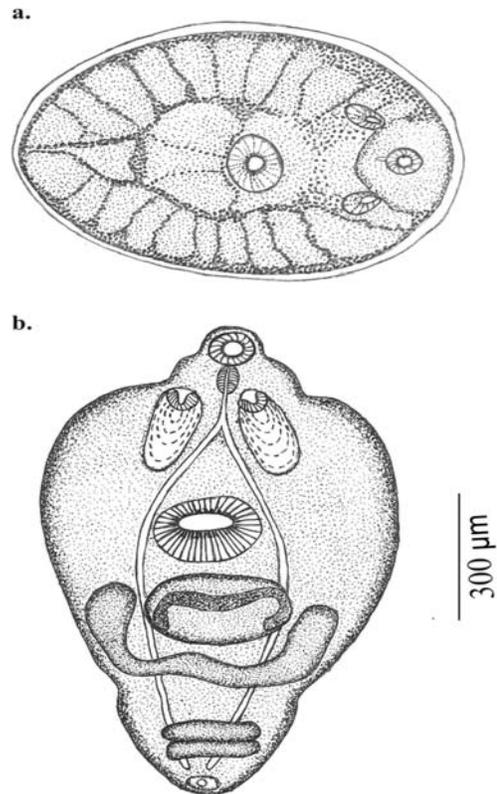


Fig.4. *Tetracotyle* sp. a) Cyst b) Excysted metacercaria

#### 3.2.2.3. *Centrocestus formosanus* (Nishigori, 1924) Price, 1932 (Fig.5 a, b)

Habitat: Gill filaments

Prevalence of infection: 8.10 %

Intensity: 2-7

#### Description

Cyst appeared thin, transparent, oval, double layered, measured 175-210x96-122.5. Excysted body elongated, spinose and measured 240-410x110-160. Body spines larger and prominent at anterior half of the body and progressively smaller towards the posterior region. Oral sucker funnel shaped, terminal, measured 30-80x35-67. Oral sucker provided with thirty four circum oral spines arranged in two alternating rows. Acetabulum post-equatorial, measured 20-37x31-55. Prepharynx short, pharynx muscular and measured 30-42x24-33. Caeca long, terminate just anterior to excretory vesicle. Testis round to oval situated symmetrically at posterior end of the body, enclosed by arms of 'X' shaped

excretory bladder. Ovary oval, lies in front of the right arm of excretory bladder.

**Remarks**

The characters of present metacercaria suggests that it belongs to the genus *Centrocestus* Looss, 1899. Only one species under this genus, *C. formosanus* (Nishigori, 1924) Price, 1932 was reported from India. The present parasite agrees fully with the original description of *C. formosanus*.

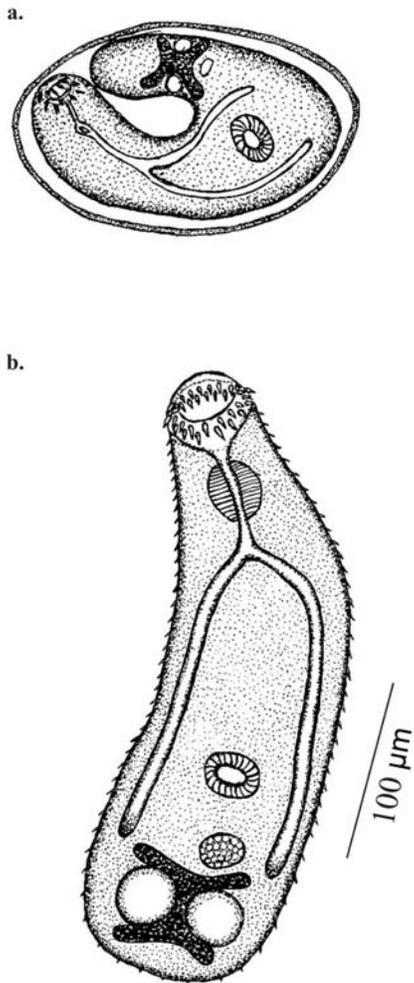


Fig.5. *Centrocestus formosanus* (Nishigori, 1924) Price, 1932  
a) Cyst b) Excysted metacercaria

**3.3. Nematoda**

**3.3.1. *Rhabdochona sarana* Karve and Naik, 1951 (Fig.6 a, b, c)**

Habitat: Intestine  
Prevalence of infection: 7.62 %  
Intensity: 2-5

**Description**

Body small, truncated and flattened anteriorly and measured, 9200-11000x70-280. Tranversecuticular striations, extremely fine. Mouth concave, bell shaped, portion of pharynx measured 13-18x9-14. Tubular pharynx 50-90x10-13. Muscular oesophagus 143-218, glandular oesophagus 2100-3000. Nerve ring situated at 200-280 from anterior part. Conspicuous cervical papillae 60-100. Vulva pre-equatorial, situated at 4200-5290 from posterior end. Uterine branches

opposed. Eggs thick shelled, 13-27x 9-14 containing fully formed larva at deposition. Tail 124-137 with rounded end having a stumpy projection with three blunt ends.

**Remarks**

The morphology of the present worm is in accordance with the genus *Rhabdochona* Railliet, 1916. Moravec (2010) [6] considered 92 species under this genus to be possibly valid. Thirty two nominal species was reported from India and the present worm resembles with *R. sarana* Karve and Naik, 1951 in all aspects. Recovery of the parasite from *D. malabaricus* collected from Kannur forms new host and geographical records.

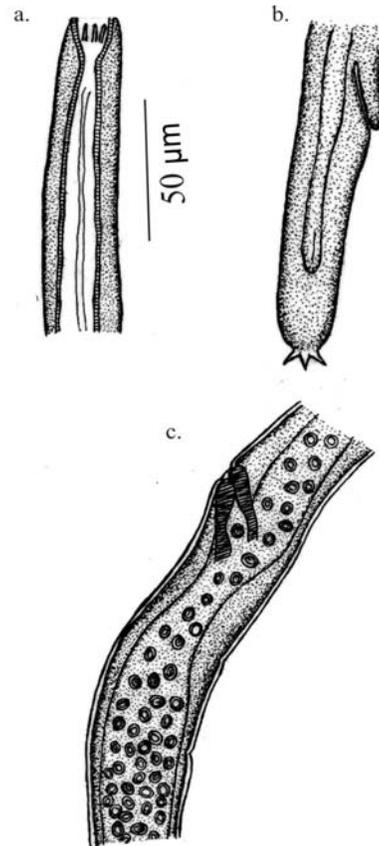


Fig. 6. *Rhabdochona sarana* Karve & Naik, 1951 - Female  
a) Anterior end b) Posterior end c) Vulvar region

**4. Conclusions**

During the course of present investigation, 210 *Devario malabaricus* were analysed for helminth parasitic survey. A total of 6 species of parasites including one species of monogenea, one adult and three larval digenea and one nematode were recovered. Four new host records and three new geographical records were observed. Among the parasites recovered *Tetracotyle* sp. showed highest prevalence of infection. Multiple infection was also common among *D. malabaricus*. Single fish was infected with *D. indicum*, *M. indicum*, *C. complanatum* and *Tetracotyle* sp. It is concluded that helminth infection was very common among *Devario malabaricus* and that can affect quality of the fish and economic losses in aquaculture.

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