



## Record of Monogenean Parasite *Chauhanellus indicus* in Freshwater Fishes *Mystus seenghala* and *Clarias batrachus* at Muzaffarnagar District (U.P.) India

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### Abstract

Monogeneans, which are primarily ectoparasitic in nature, can seriously damage aquaculture systems, particularly when it comes to fish. 729 freshwater fish of the species *Mystus seenghala* and *Clarias batrachus* were gathered from various freshwater resources in the Indian district of Muzaffarnagar and examined for monogenean infestation. A total of 38 fish hosts yielded 130 monogeneans from the genus *Chauhanellus* (*Dactylogyrus*), with an overall prevalence of 5.21%. Different seasonal conditions affect the prevalence percentage of *Dactylogyrus* infection on fish hosts. *Dactylogyrus* members are oviparous (egg-laying) monogenean trematodes with two pairs of anchors for attachment to the fish host's skin and gills. *Dactylogyrus* can also be found on the fins and buccal cavity of fish with severe infections. The author of this paper used sketches and photomicrographs to examine the morphological details of the parasites. Measurement ranges are displayed in table form along with other authors' comparisons.

**Keywords:** Monogenean, ectoparasite, freshwater fish, *Mystus seenghala*, *Clarias batrachus* etc.

### Introduction:

In recent years, parasitic diseases in aquaculture have become more economically significant (Alvarez-Pellitero, 2008; Dash et al., 2014). Monogenean ectoparasites stand out among other parasites because they can infect a variety of fish species (Dove and Ernst, 1998; Del Rio-Zaragoza et al., 2010). This class of parasites is important because they are serious pathogens which trigger fatal diseases by attacking vital organs like the skin and gills, which are necessary for breathing. (Hoffman, 1979; Srivastava, 1980). According to Mishra and Pande (2008) and Mishra and Surya Prakash (2014 & 2020), monogeneans usually cause two types of damage to their hosts: their hooks and attachment organs cause localized hemorrhages by disrupting tissue integrity at the attachment site. In addition to causing irritation and excessive mucus production, these infestations open the door for bacterial infections. A healthy, mature fish may not get severe harm by few numbers of monogeneans, but moderate infestations can result in high mortality rates. (Pandey and Mehta, 1986).

Fish that are exposed to environmental or behavioral stress suffer the most by monogeneans. Both wild and captive fish populations are impacted by these parasites, which often end in high mortality. Monogeneans quickly search for a host after hatching; this process is facilitated in crowded, captive settings where finding a host is less difficult. The monogenean parasite *Chauhanellus indicus*, which is present in freshwater fish species *Mystus seenghala* and *Clarias batrachus* from the Muzaffarnagar district of Uttar Pradesh, India, is discussed in this study. A simple compound microscope and a motic microscope are used to observe the number of parasites and their morphological structures.

### Material and methods:

In the Muzaffarnagar zone of India, 729 freshwater fish of the species *Mystus seenghala* and *Clarias batrachus* were gathered from various freshwater resources and local fish shops. In the D.A.V. College Muzaffarnagar laboratory, fish were safely transported in container after being captured using a net. We utilized numerous containers with fewer fish and a hard variety of fish to avoid suffocating. In the lab, fish were tested for various helminthes parasites and clove oil was employed as an anesthetic for their inactive lives. Fish gills were removed and studied using a light microscope, a high-power dissecting microscope, and a low-power microscope with various eye pieces and objective lenses. The quantity of parasites and the attachment location were kept up to date.

Monogeneans were collected using Mizelle's (1936 and 1938) freezing method. Because live parasites are mobile, it was easy to identify them. In order to remove mucus or debris adhered to the parasites, live worms were properly washed multiple times using cold, distilled water under pressure. The worms were carefully placed on a slide in glycerin after being fixed in hot 4% neutral formaldehyde for 8 to 12 hours.

Using a camera lucida, a light microscope, and a Motic High Resolution digital compound microscope with several oculars and objective lenses, the sketches were created. Glycerin mounts make it simple to study the hard sections of chitinoids.

**Taxonomic status:**

<b>Phylum</b>	:Platyhelminthes
<b>Class</b>	:Monogenea
<b>Order</b>	:Monopisthocotylea
<b>Super-family</b>	:Dactylogyroidea
<b>Family</b>	:Dactylogyridae
<b>Sub-family</b>	:Ancyrocephalinae
<b>Genus</b>	: <i>Chauhanellus</i> (Bychowsky and Nagibina, 1969)
<b>Species</b>	: <i>indicus</i> (Rastogi et. al., 2004)

**Generic diagnosis of *Chauhanellus*:**

The monogenean parasite has an extended body with a characteristic haptor and a morphology that is rarely digitiform. The front pair of its four eye spots is smaller than the posterior. The caeca do not connect at the rear. The anchors are different: dorsal anchors have somewhat enlarged outer roots and may have spines on their main portion; however, this is uncommon. The outer roots of ventral anchors often have a thicker base than the inner roots. The dorsal bar may have a mid-ventral appendix and frequently includes spines at both ends; however, these may occasionally be absent. Although the ventral bar is typically present, protuberances may occasionally be absent. The parasite possesses two different types of hooks: six pairs of adult hooks having varying lengths and one pair of larval hooks. It possesses a single "dactyogyrid" seminal vesicle. The vaginal tube is sclerotized, and the vaginal pore is dextral. The marine ariids of the Indian Ocean are typically the hosts of these parasites.

**Description (Plates 1-3):**

The parasite's body is long and oval, measuring 1.21 to 1.36 mm in length and a maximum width of 0.114 to 0.970 mm at the gonad level. It is easy to distinguish the prohaptor and opisthaptor from the main body. The bilobed prohaptor has nine pairs of head organs and two pairs of eyespots. The posterior eyespots are larger than the anterior ones due to clusters of melanistic granules.

Cephalic glands are located on both the anterolateral and posterolateral sides of the pharynx. The pharynx measures 0.054–0.10 mm in length and 0.059–0.12 mm in breadth. It is tiny, oval, and muscular. During the current examination, the pre-pharynx was not observed. The oesophagus is tiny, measuring 0.019 to 0.028 mm in length. The intestinal crura is a straightforward structure that ends blindly, bifurcates shortly after its start, and continues somewhat anterior to the peduncle.

The male reproductive system consists of the testis, vas deferens, seminal vesicle, vasa efferentia, and cirrus. The testis is an intercaecal, post-equatorial, post-ovarian, elongated, elliptical structure with a blunt posterior end. Its measurements are 0.16–0.25 mm in length and 0.09–0.272 mm in breadth. At its anterior end, the testis tapers into a thin vas deferens. The vas deferens, which circles the right intestine caecum, is 0.20–1.628 mm long and runs anteriorly. The vas deferens grows into a bipartite, sigmoid-shaped seminal vesicle in the pre-equatorial, intercaecal area. The distal part of the seminal vesicle is 0.06–0.09 mm in length and 0.046–0.194 mm in width, whereas the proximal part is 0.065–0.360 mm long and 0.04–0.214 mm wide. The proximal and distal parts linked via a cylindrical duct. The seminal vesicle opens at the base of the male copulatory organ via a somewhat long vasa efferentia or ejaculatory duct.

The male copulatory apparatus consists of an accessory component and a straight-type cirrus. The cirrus is a two-walled, sclerotized tube with an enlarged, funnel-shaped base. About one-third of the way from the base, the spine is oriented anteriorly, and there is a deep constriction at two-thirds of its length. The total length of the cirrus ranges from 0.127 to 0.396 mm. The Cirrus auxiliary piece consists of two parts. The first section is attached to the base of the cirrus, forming a fork-like structure with a slightly curved and lengthened handle. This component extends somewhat posterior to the cirrus base and has a length range of 0.067 to 0.382 mm. The second part is horseshoe-shaped, 0.054–0.312 mm length, and has inflated extremities. It is attached to the distal end of the cirrus.

The female reproductive system includes the ovary, oviduct, ootype complex, receptaculum seminis, vagina, and vaginal duct. The ovary is pre-equatorial, intercaecal, pre-testicular, and oval in shape, measuring 0.08–1.724 mm in length and 0.06–0.314 mm in width. It connects to the ootype complex via the oviduct. The ootype complex has an oval form and measures 0.045 mm in length and 0.04 mm in width. Before joining the ootype complex, the 0.12 mm long oviduct creates a loop. The ootype complex opens into the receptaculum seminis by a very intricate tube. The bean-shaped receptaculum seminis is located post-bifurcally, intercaecally, and on the right side (dextral). A short vaginal duct connects the vagina to the receptaculum seminis. The vagina is located pre-ovarian and post-bifurcally, with a funnel-shaped aperture. Clusters of darkly stained reproductive glands surround the female reproductive organs. The follicular vitellaria extend from the throat to the base of the haptoral peduncle. Anterolaterally to the ovary, these vitellaria create tiny vitelline ducts that unite to form a single vitelline reservoir.

An extended inner root and a wider, wing-like outer root can be separated from the broad base of the "Pterocleidus" type dorsal anchoring. The base has a powerfully curved, hook-like process on its inner surface, and it tapers abruptly into a curved shaft that finishes in a pointy tip. A sleeve sclerite connects the dorsal anchors' hook and shaft area. These anchors are linked by a dorsal transverse bar of the "Wunderoid" type, which creates a wide, V-shaped structure with tapering ends. The terminalia are pointed and directed inward.

The 'Merus' type ventral anchors have a broad base and are robust. The base can be separated into indistinguishable inner and outer roots. The outer root is connected to a capitulum that resembles wings. The anchor's base quickly narrows into a sharply curved shaft before tapering into a lengthy point. In the shaft area, a sleeve sclerite gives the anchor additional stability. The 'Widened' variety of ventral transverse bar features a strong shaft and a conical anterior-medial protuberance. It is bifurcated and has a rearward terminal end point. The antero-lateral processes of the transverse bar are wider than the postero-lateral processes. The ventral anchors are articulated with the transverse bar by means of two accessory pieces, one shaped like a "fist" and the other like a "boxer's glove". Papillae, a handle, and hooklets make up the "Definitive" variety of marginal hooklets. They also have an obvious filament loop.

The opisthaptor and main body are clearly separated by a slender peduncle. Its measurements are 0.038–0.34 mm in length and 0.17–0.40 mm in breadth. The haptor's armature consists of four transverse sclerotized folds on the ventral surface of the peduncle, two pairs of unequal and separate (dorsal and ventral) anchors, two transverse connecting bars, and seven pairs of marginal hooklets. The blunt, rounded extremities of the sclerotized folds are slightly curled and resemble cylindrical bars. Peduncular plates spread laterally along the margins of the peduncle, measuring 0.17–0.19 mm in length and 0.002–0.009 mm in width.

Two large reservoirs are visible on either end of the haptoral peduncle in the haptor area. Above the sclerotized folds are six pairs of unicellular glands, each of which radiates posteriorly by a separate duct. Additionally, there are two pairs of large cells with distinct nuclei on either side of the peduncle. Different ducts originate from the back border of these cells, albeit their full extent is unknown.

In addition to these glands, there are three clusters of multinucleated glands inside the reservoirs and sclerotized folds. A band of intrinsic muscles is positioned just above the anchors to aid in their function. This band's muscle fibers feature striations, which is uncommon in Platyhelminthes, according to Rastogi et al. (2004).

The following are specifics of the haptoral armature measures (in millimetres):

#### **Haptor**

Length : 0.038 - 0.34  
Width : 0.17 - 0.40

#### **Dorsal anchor**

Total length : 0.064 - 0.32  
Dorso-apical length : 0.036 - 0.23  
Ventro-apical length : 0.061 - 0.19  
Length of shaft : 0.030 - 0.13  
Length of point : 0.020 - 0.11

#### **Dorsal transverse bar**

Total length : 0.032 - 0.198  
Total width : 0.009 - 0.034

#### **Ventral anchor**

Total length : 0.089 - 0.245  
Dorso apical length : 0.045 - 0.196  
Ventro apical length : 0.043 - 0.188  
Length of shaft : 0.039 - 0.263  
Length of point : 0.030 - 0.234  
Length of capitulum : 0.025 - 0.314  
Width of capitulum : 0.010 - 0.019

#### **Ventral transverse bar**

Total length of ventral transverse bar : 0.114 - 0.412  
Width of ventral transverse bar : 0.013 - 0.030  
Length of I accessory piece : 0.018 - 0.085  
Width of I accessory piece : 0.010 - 0.042  
Length of II accessory piece : 0.018 - 0.089  
Width of II accessory piece : 0.009 - 0.028

#### **Marginal hooklets**

Total length : 0.023 - 0.027  
Length of hooklet : 0.004 - 0.007  
Length of handle : 0.017 - 0.021  
Length of papillae : 0.009 - 0.013  
Length of loop : 0.010 - 0.013

#### **Discussion:**

*Chauhanellus indicus* was first recognized by Rastogi et al. (2004) from the gills of *Wallago attu* (Bl. and Schn.) and *Mystus tengara* (Ham.) in Meerut. The same species from *Mystus seenghala* was later redescribed by Mishra (2005). Some morphological information about the female reproductive system, egg structure, and other hard features in the

haptor was missing from the first description. Based on new information by the author, a succinct redescription of the species is given here to fill in these gaps. The body measurements of *C. indicus* vary, as shown in Table 1 (appended). The author's accessible specimens show slight differences in the dimensions of several structures when compared to the original description. These discrepancies may be explained by the parasites' presence in a different host or ecological niche, or by variances in the worms' level of maturation.

**Table 1: A comparative account of *C. indicus* Rastogi et. al. (2004), Mishra (2005) and the Present study**

Character	<i>Chauhanellus indicus</i> Rastogiet al.,2004 (measurements in mm)	<i>Chauhanellus indicus</i> Mishra, 2005 (measurements in mm)	<i>Chauhanellus indicus</i> Present study (measurements in mm)
Host	<i>Mystustengara, Wallago attu</i>	<i>Mystusseenghala</i>	<i>Mystusseenghala, Clarias batrachus</i>
Locality	Meerut (U.P.) India	Meerut (U.P.) India	Muzaffarnagar
Head organs	9 pairs	9 pairs	9 pairs
Eye spots	2 pairs		2 pairs
Total length	1.20-1.350	0.900-6.2731	1.21-1.36
Maximum width	0.60-1.70	0.129-0.700	0.114 – 0.970
Pharynx	Oval, 0.030-0.058 x 0.035 -0.062	Oval, 0.044-0.058 x 0.048-0.062	Oval, 0.054-0.10 x0.059 - 0.12
Pre-pharynx	0.129	-	-
Oesophagus	0.0026-0.0031	0.0018-0.0124	0.019 - 0.028
Position shape and size of testis	Post-equatorial, post-ovarian, intercaecal, conical; 0.225-0.275 x 0.065-0.073	Post-equatorial, post- ovarian, intercaecal, elliptical; 0.106-1.104 x 0.038-0.262	Post-equatorial, post-ovarian, intercaecal, elliptical; 0.16-0.25 x 0.09 – 0.272
Vas deferens	0.159-0.163	0.22-1.518	0.20 – 1.628
Size of proximal seminal vesicle	0.023-0.022 x 0.008-0.050	0.05-0.345 x 0.029-0.200	0.065 – 0.360 x 0.04–0.214
Size of distal seminal vesicle	-	0.06-0.414 x 0.028-0.1932	0.06 - 0.09 x 0.046-0.194
Duct connecting proximal & distal seminal vesicle	0.004-0.006	-	-
Vasa efferentia	0.120-0.125	-	-
Cirrus	0.075-0.088	0.057-0.393	0.127 – 0.396
I accessory piece	0.70-0.76	0.049-0.338	0.067 – 0.382
II accessory piece	0.041-0.045	0.031-0.214	0.054 – 0.312
Position shape and size of ovary	Pre-equatorial,pre- testicular, intercaecal, oval; 0.120-0.132 x 0.049-0.055	Pre-equatorial, pre- testicular, intercaecal, oval;0.070-1.311 x 0.056-0.234	Pre-equatorial, pre- testicular, intercaecal, oval; 0.08 – 1.724 x 0.06 – 0.314
Oviduct	-	0.114	
Ootype complex	-	0.061 x 0.047	0.045 x 0.04
Receptaculumseminis	0.022-0.026	0.050-0.345	-
Vaginal opening	0.023-0.027 x 0.010-0.014	0.01-0.030 x 0.008-0.0621	-

Vaginal duct	0.260-0.300 x 0.008-0.013	0.018-1.81	-
<b>Haptor</b>			
Length	0.166-0.220	0.165-1.151	0.038 - 0.34
Width	0.175-0.225	0.129-0.700	0.17 - 0.40
<b>Peduncular plates</b>			
Length	0.073-0.11	0.051-0.068	0.17-0.19
Width	0.005-0.007	0.002-0.005	0.002 - 0.009
<b>Dorsal anchor</b>			
Total length	0.093-0.11	0.063-0.435	0.064 - 0.32
Dorso apical length	0.092-0.10	0.035-0.242	0.036 - 0.23
Ventro apical length	0.088-0.098	0.030-0.207	0.061 - 0.19
Length of shaft	0.049-0.059	0.021-0.145	0.030 - 0.13
Length of Point	0.025-0.028	0.019-0.0131	0.020 - 0.11
<b>Dorsal transverse bar</b>			
Length	0.078-0.081	0.008-0.0552	0.032 - 0.198
Width	0.07-0.009	0.007-0.12	0.009 - 0.034
<b>Ventral anchor</b>			
Total length	0.063-0.068	0.075-0.518	0.089 - 0.245
Dorso apical length	0.028-0.50	0.034-0.235	0.045 - 0.196
Ventro apical length	0.025-0.031	0.035-0.241	0.043 - 0.188
Length of shaft	0.051-0.054	0.051-0.351	0.039 - 0.263
Length of point	0.045-0.049	0.038-0.241	0.030 - 0.234
Capitulum	0.051-0.053 x 0.014-0.016	0.05-0.325 x 0.01-0.024	0.025 - 0.314x 0.010 - 0.019
<b>Ventral transverse bar</b>			
Length	0.125-0.127	0.116-0.72	0.114 - 0.412
Width	0.012-0.013	0.02-0.04	0.013 - 0.030
Size of I accessory piece	0.019-0.021 x 0.012-0.014	0.01-0.07 x 0.008-0.05	0.018-0.085x 0.010 - 0.042
Size of II accessory piece	0.019-0.022 x 0.007-0.013	0.016-0.098 x 0.0095-0.03	0.018 - 0.089x0.009 - 0.028
<b>Marginal hooklet</b>			

Total length	0.002-0.024	0.019-0.051	0.023 - 0.027
Length of hooklet	0.004-0.008	0.002-0.007	0.004-0.007
Length of handle	0.006-0.018	0.005-0.009	0.017 - 0.021
Length of papilla	0.017-0.021 I and II pair only	0.008-0.045	0.009 – 0.013
Length of loop	-	0.01-0.045	0.01-0.013

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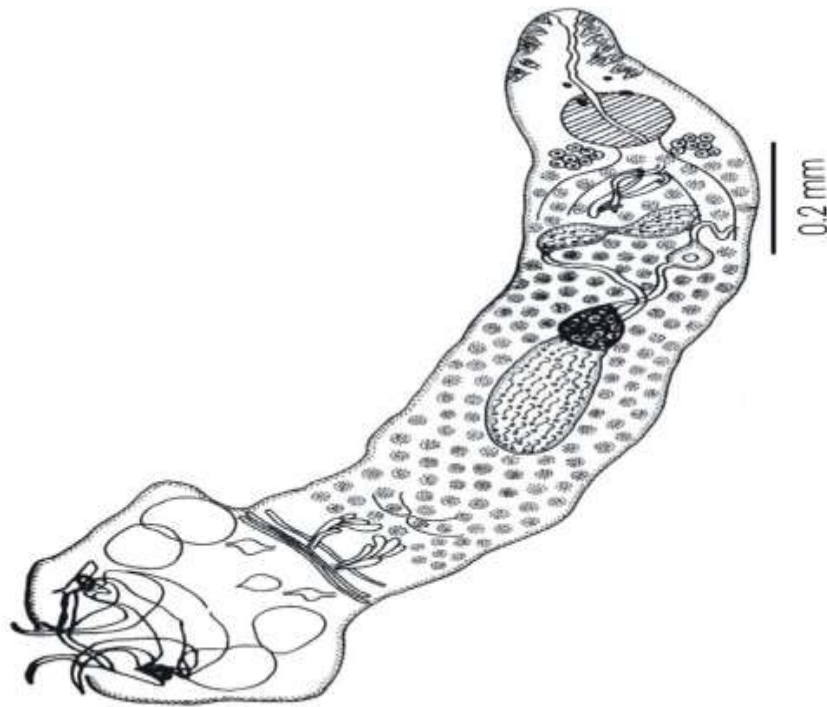


PLATE -1  
*Chauhanellus indicus* W.M. (400x)

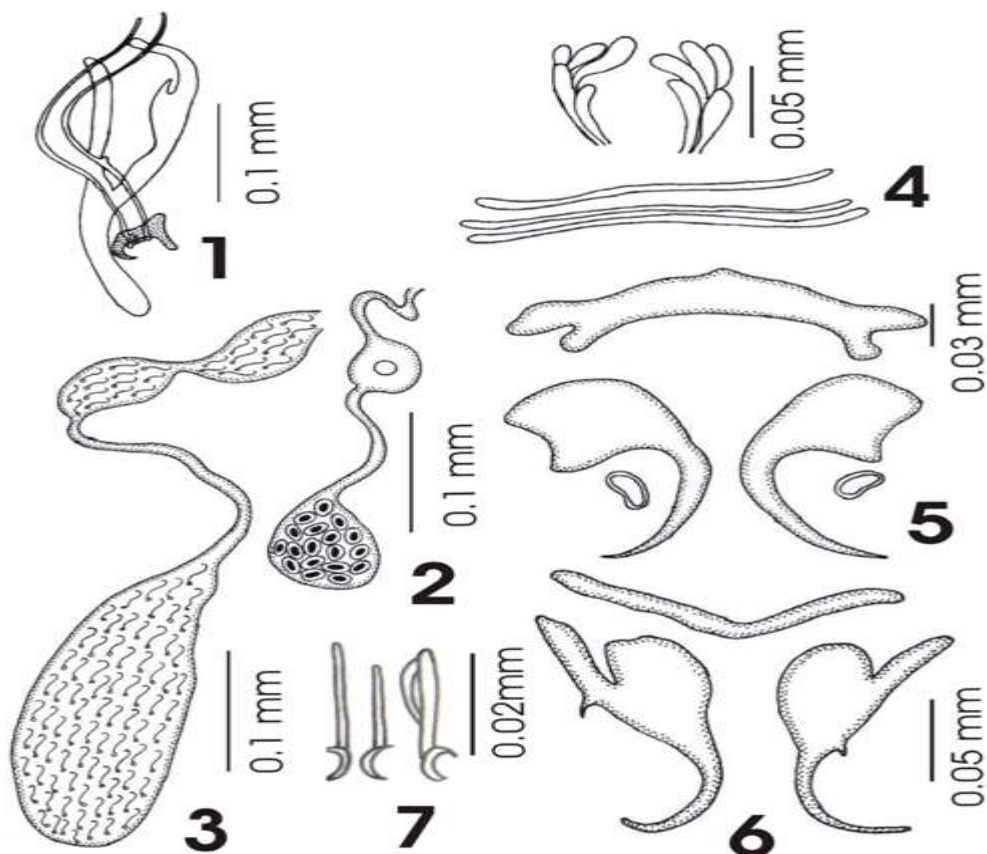


PLATE -2

***Chauhanellus indicus*** 1. Male copulatory complex (1000x) 2. Ovary and oocyte (400x) 3. Testis and seminal vesicle (400x) 4. Sclerotised folds (bar) with unicellular gland (400x) 5. Ventral transverse bar and ventral anchor (400x) 6. Dorsal transverse bar and dorsal anchor (400x) 7. Hooks (1000x)

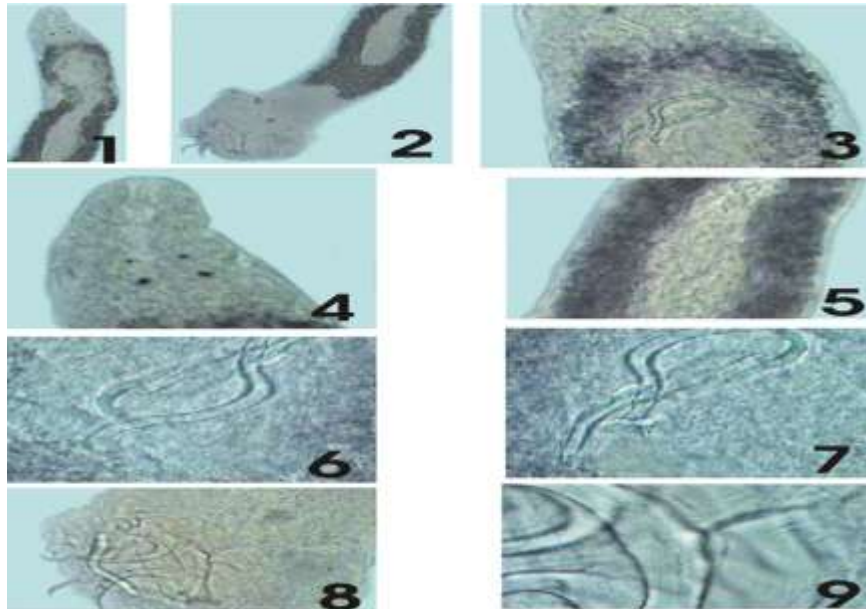


Plate-3

Photographs of *Chauhanellus indicus* 1. Anterior region (100X) 2. Posterior region (100X) 3. Anterior region (400X) 4. Cirrus (400X) 5. Ovary (400X) 6-7. Cirrus (1000X) 8. Posterior region showing anchors (400X) 9. Anchors and muscle (1000X)