

**CONTRIBUTION TO OUR KNOWLEDGE OF
SOME PARASITES (MONOGENEANS
AND DIGENEANS) OF FISHES**

SUMMARY

THESIS

SUBMITTED TO
LUCKNOW UNIVERSITY,LUCKNOW
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN
ZOOLOGY

BY

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M.Sc.



**DEPARTMENT OF ZOOLOGY
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The thesis entitled "Contribution to our knowledge of some parasites (Monogeneans and Digeneans) of fishes" deals with morphological studies on some important trematode parasites of fresh water fishes and includes an account of 15 species of metacercaria, 8 species of monogenea and 11 species of adult digeneans found infecting some of the fresh water fishes of districts Lucknow, Faizabad, Meerut and Lakhimpur-Kheri, U.P. (Abbrev. used - Lucknow-LKO, Faizabad - FZD, Meerut - MRT and Lakhimpur-Kheri - LMP)

In all about 1460 specimens of piscine hosts were examined during the course of study (1994 - 1997). The fishes for the present investigation, were collected from the local fish markets of Lucknow, Faizabad, Meerut and Lakhimpur-Kheri, U.P. Some of them were also collected from local river or pond with the help of fisherman. Standard methods of killing, fixing, clearing and mounting of trematodes were used. All the figures are original drawn by the writer. Many new hosts and localities have been made in the present work. An exhaustive list of references has been included, camera lucida diagrams and tables have been appended to illustrate the observations. The work is divided into 3 parts viz., Section A, Section B, Section C

SECTION A

This section deals with the description of eight monogenean parasites of fresh water fishes of District Lucknow, Meerut and Faizabad, U.P.

1. *Urocleidus xenentodoni* Jain, 1959 has been recovered from fish *Xenentodon cancila* (Ham.) at Lucknow and Faizabad. Jain,

1959 described this worm from the *Xenentodon cancila* (Ham.) at Lucknow. The worm is briefly recorded. A new locality i.e. Faizabad, U.P. is added for the parasite.

2. *Urocleidus polysporalis* Jain, 1961 has been recovered and described from fish *Mastacembelus armatus* (Lac.) at Lucknow and Faizabad. Jain, 1961 described this worm from *Silondia silondia* at Lucknow. Since some minor variation has been observed in morphology, it is briefly re-described. A new locality, Faizabad, U.P. is added for the parasite.
3. *Bifurcohaptor pedunculata* sp. nov. has been recovered and described from fish *Mystus vittatus* (Bloch.) at Lucknow. The new species is characterised by position of testis, shape of male copulatory complex and a long peduncle.
4. *Ancyrocephalus tripathii* sp. nov. has been recovered and described from fish *Oxygaster bacaila* (Ham.) at Lucknow. The new species is characterised by distribution of cephalic glands, shape of cirrus and its accessory piece.
5. *Thaparocleidus sohani* Pandey and Mehta, 1986 has been recovered and described from fish *Wallago attu* (Bl. and Schn.) at Meerut. Pandey and Mehta (1986) described this worm from same host and from same locality. The specimen is briefly recorded.
6. *Dactylogyroides wallagonius* sp. nov. has been recovered and described from fish *Wallago attu* (Bl. and Schn.) at Meerut. It is characterised by number of head organs, presence of cephalic glands, reproductive glands and an additional transverse bar.

7. *Hamatopeduncularia attui* sp. nov. has been recovered and described from *Wallago attu* (Bloch and Schn) at Lucknow. It is characterised by the shape of haptor anchor, transverse bar and copulatory complex, absence of haptor glands and distribution of cephalic glands.
8. *Silurodiscoides meerutensis* sp. nov. has been recovered and described from fish *Rita rita* (Ham) at Lucknow. It is characterised by the presence of a pair of separate ventral transverse bars, shape of anchors, vagina, cirrus and accessory piece of cirrus.

SECTION B

Section B comprises the description of 11 species of adult digeneans belonging to different genera.

1. *Bucephalopsis karvei* Bhalerao, 1937 has been recovered and described from fish *Xenentodon cancila* (Ham.) at Lucknow, Faizabad and Lakhimpur Kheri U.P. Bhalerao, 1942 described *B. karvei* from Nagpur. The specimens of *B. karvei* at the disposal of the writer shows variation in the body size, disposition and size of gonads, vitellaria and extension of cirrus sac. The present form is therefore briefly re-described. Record of worm from Faizabad and Lakhimpur kheri appears to be new localities for the worm.
2. *Phyllodistomum vachius* Dayal, 1942 has been collected and described from fish *Xenentodon cancila* (Ham.) at Lucknow and Lakhimpur Kheri U.P. Dayal, 1949 described *Phyllodistomum*

vachius form urinary bladder of *Eutropiichthys vacha*. Pandey (1973) recorded it from fish *Heteropneustes fossilis* from type locality. The worm from a new locality i.e Lakhimpur kheri U.P. is recorded.

3. *Nicolla srivastavi* sp. nov. has been collected and described from fish *Xenentodon cancila* (Ham.) at Lucknow. It is characterised by having intestinal cruras united posteriorly, absence of prepharynx, presence of large acetabulum and seminal vesicle entirely enclosed in cirrus pouch.
4. *Peracreadium thapari* sp. nov. has been collected and described from fish *Xenentodon cancila* (Ham.) at Lucknow. It is characterised by having large acetabulum, entire and oval testes, long cirrus pouch, extension of vitellaria and shape of eggs.
5. *Allocreadium chauhani* sp. nov. has been collected and described from the fish *Mastacembelus armatus* (Lace) at Lucknow. It is characterised by the extension of cirrus sac and vitellaria and position of genital pore.
6. *Allocreadium gomtii* sp. nov. has been collected and described from the fish *Heteropneustes fossilis* (Bloch.) at Lucknow. It is characterised by the absence of oesophagus, position of genital pore, ratio of suckers, shape and position of receptaculum seminis and extension of vitelline follicles.
7. *Neopodocotyle singhi* sp. nov. has been collected and described from the fish *Heteropneustes fossilis* (Bloch.) at Lucknow U.P. It is characterised by the absence of prepharynx and oesophagus, ratio of suckers, presence of lobed testes, position of genital pore and extension of cirrus sac.

- 8 *Masenia indica* sp nov has been collected and described from the fish *Clarias batrachus* (Linn) at Lucknow It is characterised by the position of genital pore and extension of vitelline follicles
- 9 *Opisthorchis guptai* sp nov has been collected and described from the fish *Clarias batrachus* (Linn) at Lakhimpur-Kheri It is characterised by the spinose body, small acetabulum shape of testes and excretory bladder absence of cirrus pouch and extension of vitelline follicles
- 10 *Eucreadium oxygasteri* sp nov has been collected and described from the fish *Oxygaster bacaila* at Lucknow and Faizabad U P It is characterised by the presence of deeply lobed testes position of cirrus pouch, genital pore ovary and extension of vitelline follicles
- 11 *Pleurogenoides hanumanthai* sp nov has been collected and described from the fish *Ompak bimaculatus* (Bloch) at Lucknow It is characterised by the spinose body with bifid posterior end absence of prepharynx, position of genital pore and extension of vitelline follicles

SECTION C

This section deals with the account of 15 species of metacercariae belonging to different genera

- 1 *Tetracotyle tridi* sp nov has been collected and described from fish *Xenentodon cancila* (Ham) at district Lucknow It is

characterised by having two pairs of enormously developed pseudosuckers and four masses of genital rudiments

- 2 *Tetracotyle dochoti* sp nov has been collected and described from fish *Xenentodon cancila* (Ham) at district Lucknow It is characterised by the position of ventral sucker shape of hold fast organ, hold fast gland, pseudosuckers, absence of prepharynx and by long oesophagus
- 3 *Neascus srivastavi* sp nov has been collected and described from fish *Xenentodon cancila* (Ham) at Lucknow Lakhimpur Kheri and Faizabad, U P The new species is characterised by having a divided body, absence of pharynx and position of genital rudiments
- 4 *Clinostomum lucknowensis* Pandey, 1968 has been recovered from the fish *Xenentodon cancila* (Ham) at Lucknow, and Lakhimpur Kheri U P and briefly re-described
- 5 *Isoparorchis hypsilobagri* (Billet, 1898), Odhner, 1927 has been recovered from *Xenentodon cancila* (Ham) at Lucknow The occurrence of metacercaria of *Isoparorchis hypselobagri* (Billet 1898) Odhner, 1927 has been recorded in India from a number of fishes by different workers viz Southwell and Prasad (1918), Bhalerao (1926, 1932), Chauhan (1947), Jaiswal (1957) Bharadwaj (1961) and Rai and Pandey (1965) The gross morphology of the metacercaria was described by Pandey (1969) in detail Therefore, it is briefly recorded
- 6 *Tetracotyle madhavii* sp nov has been collected and described from fish *Mastacembelus armatus* (Lace) at district Lucknow It is characterised by having an undivided body by

the stupendous size of pseudosuckers and number of genital rudiments.

7. *Clinostomum piscidium* Southwell and Prasad, 1918 has been recovered from fish *Mastacembelus armatus* (Lac.) at Lucknow. Southwell and Prasad, 1918 described this worm from *Trichogaster fasciatus* and *Nandus nandus* (Ham.) at Khulna (Now in Bangla desh). Pandey and Baugh (1969) redescribed *C. piscidum* from *T. fasciatus* and *Nandus nandus* (Bloch.) at Lucknow. The specimens at the disposal of writer shows slight variation. Therefore, it is briefly re-described as such.
8. *Tetracotyle chacuti* sp. nov. has been collected and described from fish *Heteropneustes fossilis* (Bloch) at Lucknow. It is characterised by having a cyst, divided body, well developed genital rudiments and shape of the testes.
9. *Diplostomulum ophthalmi* Pandey, 1968 has been collected from fish *Heteropneustes fossilis* (Bloch.) at Lucknow. Pandey 1968 described *Diplostomulum ophthalmi* recovered from the fish *Puntius sophore* (Ham.), *Trichogaster fasciatus* (Bloch. And schn.), *Puntius ticto* (Ham.), *Oxygaster bacaila* (Ham.) and *Heteropneustes fossilis* (Bloch.) at Lucknow. The specimen at the disposal of writer differs from those described earlier in certain minor features besides the measurements.
10. *Diplostomulum indicum* sp. nov. has been collected and described from fish *Heteropneustes fossilis* (Bloch.) at Lucknow. It is characterised by having a divided body and genital rudiments in the form of four masses.

11. *Neascus thapari* sp. nov. has been collected and described from fish *Heteropneustes fossilis* (Ham.) at Lucknow. It is characterised by the absence of a cyst, having a divided body, absence of oesophagus and number of genital rudiments.
12. *Clinostomum dasi* Bhalerao, 1942 has been recovered from fish *Heteropneustes fossilis* (Bloch.) at Lucknow and Lakhimpur-Kheri U.P.. Bhalerao (1942) briefly described this metacercaria from fish *Heteropneustes fossilis* (Bloch.). Subsequently, Pandey (1966) have thoroughly studied the morphology of the worm from the type host at Lucknow. The present specimens at the disposal of writer differs from the those described earlier in some minor morphological features like broad and crenated margin of intestinal caeca through out its length, entire testes and by the opening of uteroduct and position of ventral sucker. Some variation in the measurements of various body organs were also observed. Therefore, it is briefly recorded.
13. *Clinostomoides baughi* sp. nov. has been recovered from fish *Heteropneustes fossilis* (Bloch.) at Lucknow. It is characterised by spinose body, position of gonads and simple uterus.
14. *Clinostomum trichogasteri* Pandey, 1968 has been recovered from fish *Trichogaster fasciatus* (Bloch. & Schn.) at Lucknow. The specimens at the disposal of writer differs from those described earlier by Pandey (1968) in certain morphological features as absence of Oesophagus, shape of oral sucker and

uterine sac. Some minor differences were also observed in various organ measurements . Therefore, it is briefly recorded

15. ***Opisthorchiid metacercaria*** sp. nov. has been recovered and described from fish ***Channa straitus*** (Bloch.) at Faizabad.U.P. It is characterised by extension of intestinal caeca and position of genital rudiments.

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Professor W. A. Nizami
Collection

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1998



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DEDICATED
TO
MY LOVING PARENTS

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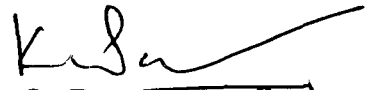
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CERTIFICATE

This is to certify that, the thesis entitled : ***“CONTRIBUTION TO OUR KNOWLEDGE OF SOME PARASITES (MONOGENEANS AND DIGENEANS) OF FISHES”*** submitted for the award of degree of **Doctor of Philosophy in Zoology** to the **Lucknow University**, Lucknow is a bonafied work carried out by **Ms. Neetu Pandey** under my supervision and guidance. This is further certified that she has put in the desired period of attendance in the department.


K. C. Pandey 28/2

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neetu
(NEETU PANDEY)

GENERAL INTRODUCTION

GENERAL INTRODUCTION

Fishes form an important food item for man. A majority of them carry heavy infection of trematode parasites which cause deterioration in the food value and in some cases results in their mortality. Besides, infected fishes acts as a very potent source of trematode infection to man through eating fish infected with certain larval forms. In view of growing importance of fisheries in our country and in furtherance and contemporary growth of multiple approaches to fish parasite and fish pathology, it was suggested to me by Prof. K. C. Pandey, to investigate trematode infection of fishes. A large number of fresh water fishes were therefore, dissected and author has succeeded in making a collection of some larval and adult trematode parasite which form the basis of the present work.

This thesis consists of four main division Section A, Section B, Section C & Section D.

Section A comprises the systematic account of eight monogenean parasites from fresh water fishes. These are as listed below :

Urocleidus xenentodoni Jain, 1959

Urocleidus polysporalis Jain, 1961

Bifurcohaptor pedunculata sp.nov.

Ancyrocephalus tripathii sp.nov.

Thaparocleidus sohani Pandey and Mehta, 1986

Dactylogyroides wallogonius sp.nov.

Hamatopeduncularia attui sp.nov.

Silurodiscoides meerutensis sp.nov.

Section B comprises systematic account of 11 adult digenean trematode parasites as listed below :

Bucephalopsis karvei Bhalerao, 1937

***Phyllodistomum vachius* Dayal, 1949**

***Nicolla srivastavi* sp.nov.**

***Peracreadium thapari* sp.nov.**

***Allocreadium chauhani* sp. nov.**

***Allocreadium gomtii* sp.nov.**

***Neopodocotyle singhi* sp.nov.**

***Masenia indica* sp.nov.**

***Opisthorchis guptai* sp.nov.**

***Eucreadium oxygasteri* sp.nov.**

***Pleurogenoides hanumanthai* sp.nov.**

Section C comprises the systematic account of fifteen metacercaria obtained from fresh water fishes as listed below :-

***Tetracotyle tridi* sp.nov.**

***Tetracotyle dochoti* sp. nov.**

***Neascus srivastavi* sp.nov.**

***Clinostomum lucknowensis* Pandey, 1969**

***Isoparorchis hypselobagri* (Billet, 1898) Odhner, 1927**

***Tetracotyle madavii* sp.nov.**

***Clinostomum piscidium* Southwell and Prasad, 1918**

***Tetracotyle chacuti* sp.nov.**

***Diplostomulum ophthalmi* Pandey, 1968**

***Diplostomulum indicum* sp.nov.**

***Neascus thapari* sp.nov.**

***Clinostomum dasi* Bhalerao, 1942**

***Clinostomoides baughi* sp.nov.**

***Clinostomum trichogasteri* Pandey, 1969**

***Opisthorchiid metacercaria* sp.nov.**

Each section has its own Introduction, Material and Methods, Historical review and References.

Section D comprises the summary of this thesis

**SECTION A
(MONOGENEA)**

INTRODUCTION

Among parasites infecting fishes, the monogeneans constitute a group which plays an important role as pathogens of severe diseases. This is because the monogeneans affect those organs and tissues which are vital to the normal functioning of the fish such as gills and skin, the organs of respiration. The monogeneans affecting internal organs are presently insufficiently known and the role of such species in pathological process has not been adequately studied (Bauer, 1977)

In majority of cases, monogeneans causes dual type of injury to their host. Through their hooks and other organs of attachment, they break the continuity at the site of attachment and cause localised haemorrhages. At the same time, they feed upon the cells of ruptured tissue and blood (Bychowksy, 1957 and Uspenskaya, 1962). Researches have established that the volume of blood sucked from fish is quite appreciable and this leads to certain conditions like anaemia and mortality etc. (Lutta, 1941; Golovina, 1976). Therefore the knowledge of these monogenean parasites is essential for a successful pisciculture. Despite of the fact, monogeneans are almost the least studied group of parasitic worms in general and India in particular. Thus, with a view to enrich our knowledge on fresh water monogenoidea of some commercially important fishes of Lucknow, Faizabad and Meerut regions, the present investigation was started. Almost all monogeneans described here are parasites of commercially important fishes mostly found in Lucknow, Faizabad and Meerut region (U.P.). These are found on the gills of fishes in moderate numbers (2-10 parasites per fish).

HISTORICAL REVIEW

The earliest worker of Indian monogenoidea appears to be that of Bell (1891), who described a new species *Tristomum histiophori* now known as *Capsala laevis* (Verrill, 1874) from *Histophorus brevirostris* at Madras. Von Linstow, 1906, described another new monogenea, *Tristomum megacotyle*, parasitic on sword fish, *Histophorus*. However, Chauhan, 1952 opined that this collection was not only of *Tristomum megacotyle* but was composite and consisted of *Capsala megacotyle* and *C. ovalis*.

Luhe (1906) reported a new species of *Epibdella macrocalpa* (= *Benedina macrocalpa*) from the skin of *Rhinoptera javerica*. Stewart (1914) described *Polystovorum kachuga* from the urinary bladder of the *Kachuga lineata* from the fresh waters of Lucknow. This species is now known as *Polystomoides kachugae*. Later, Thaper (1929) and Thaper and Lal (1933) described the excretory system and morphology of *Discocotyle sagittatum* through abstract only.

After Stewart, it took about more than two decades for another work to appear. After that a number of workers from different part of our country, contributed to our knowledge on fresh water monogenoidea viz., Price (1936, 1938, 1943, 1943, 1943, 1961); Dayal (1941 and 1942); Thaper (1929, 1929, 1948); Kaw (1950); Chauhan (1945, 1950, 1950, 1952, 1953, 1954); Jain (1952, 1952, 1955, 1957, 1957, 1957, 1958, 1958, 1959, 1959, 1959, 1959, 1959, 1959, 1960, 1961 and 1961); Tripathi (1955, 1955, 1959, 1966 and 1975); Baugh (1957); Gupta and Khullar (1967); Kulkarni (1969, 1969, 1969, 1970, 1971, 1972 and 1980); Fotedar et. al. (1970); Rizvi (1971), Gussev (1955, 1961, 1973, 1976 and 1977); Gussev and Fernando (1973); Pandey (1973); Gussev and Mussellius

(1975); Gupta and Krishna (1975, 1979); Devraj, Subramanyam and Manissery (1977); Swarup (1978); Karyakarte and Das (1978, 1979); Gupta and Sharma (1978); Kumar and Agarwal (1978, 1981, 1981 and 1982); Madhavi (1980); Venkatnarsaiah (1979 and 1981); Venkatnarsaiah and Kulkarni (1980, 1980, 1980, 1980, 1981, 1981 and 1990); Agarwal and Kumar (1977, 1980, 1989, 1990); Agarwal, (1980, 1981 and 1991); Agarwal and Singh (1980, 1980, 1981, 1982, 1982, 1982, 1982, 1982, 1982, 1984, 1984, 1985, 1985, 1986); Agarwal and Pandey (1981); Rajeshwari and Kulkarni (1983, 1985); Siddiqui and Kulkarni (1983); Srivastava and Kumar (1983); Swarup and Jain (1984); Gussev and Fernando (1984) ; Gupta and Masoodi, (1985); Sangahi and Mishra (1985); Gupta (1983, 1986); Pandey and Agarwal (1986, 1989); Pandey and Mehta (1986); Gupta and Sachdeva (1986); Sharma and Sheikh (1986); Tewari and Agarwal (1986); Agarwal and Sharma (1986, 1986, 1986, 1986, 1987, 1988, 1988, 1989 and 1990); Majumdar and Agarwal (1988); Majumdar et.al. (1988) Singh and Jain (1987, 1988, 1989); Rukmini and Madhavi (1991); Pandey and Singh (1990); Singh and Kumari (1991); Singh and Agarwal (1992, 1993); Singh and Sharma (1992); Singh et.al. (1992); Agarwal and Mishra (1992); Gupta and Sachdeva (1992); Singh, Kumari and Agarwal (1992); Dubey, Gupta and Agarwal (1993); Agarwal and Bhatnagar (1994); Singh, Agarwal, kumar and Sharma (1995); Meenakshi and Murughesh (1995);& Agarwal, Chistiolm and Whittengton (1996).

MATERIAL AND METHODS

Fishes for the present investigation were purchased from the local fish markets of Lucknow, Faizabad and Meerut U.P. Fishes were first identified with the help of classical works of Mishra (1959) and Srivastava (1968). Monogeneans were collected by using Mizelle's (1936 and 38) freezing technique. Fishes were kept in refrigerator for 8 - 48 hrs. The low temperature not only relaxes the worm but also help in automatic removal of mucous in which these flukes are entangled. Subsequently, the gills were removed, placed in a tube, half filled with water and shake vigoursly. The solution now poured into a large, clean petridish and diluted with normal saline in order to make the solution clean enough for microscopic examinations.

Sometimes, Hargis (1952 and 53) chloritone method was also employed for the recovery of the flukes. During this process, the gill filaments were taken out and placed in a solution of 1gm of chloritone (a trematode relaxer) dissolved in 250 ml of tap water. It was then shaken vigorously in a tube, poured into a large and clean petridish. This solution was then diluted and examined under binocular microscope. The monogeneans in relaxed conditions were collected with the help of clean, fine glass dropper and washed thoroughly to remove the attached debris, muscous etc. The worms were collected, washed and fixed in hot 70% alcohol. The cuticular structure of taxonomic importance like copulatory complex, vagina and haptoral armature were studied in temporary mounts . Moreover, permanent preperations were also made in Canada balsam, after staining, dehydrating and clearing in xylol. Borex carmine and acetoalum carmine were used as stain for this purpose Camera lucida sketches were made both from temporary and permanent preparations. All the measurements were taken with the help of stage micrometer and oculometer by the method suggested by Mizelle (1936 and 38), Gussev (1955), Malmberg (1957) and Singh (1959). All measurementants are in millimeters.

Table : 1 The appended table shows name and number of fishes examined and name and number of parasites during the course of study (1994 - 1997)

S No.	HOST	No. Of Host Examined	No. Of Host Infected	No. Of Worms Collected	Parasites obtained	Locality
1	<i>Xenentodon cancila</i> (Ham.)	635 (LKO-348) (FZD-187) (LMP-50) (MRT-50)	20 (LKO-15) (FZD-5)	45 (LKO-30) (FZD-15)	<i>Urocleidus xenentodoni</i> Jain, 1959	Lucknow and Faizabad U.P.
2	<i>Mastacembelus armatus</i> (Lace.)	280 (LKO-190) (FZD-60) (LMP-30)	15 (LKO-12) (FZD-3)	25 (LKO-18) (FZD-7)	<i>Urocleidus polysporalis</i> Jain, 1961	Lucknow and Faizabad U.P.
3	<i>Mystus vittatus</i> (Bloch.)	25	2	6	<i>Bifurcohaptor pedunculata</i> sp.nov.	Lucknow U.P.
4	<i>Oxygaster bacaila</i> (Ham.)	50 (LKO-40) (FZD-10)	3	8	<i>Ancyrocephalus tripathii</i> sp.nov.	Lucknow U.P.
5	<i>Wallago attu</i> (Bloch and Schn.)	55 (LKO-20) (FZD-5) (MRT-30)	2	8	<i>Thaparocleidus sohani</i> Pandey and Mehta, 1986	Meerut U.P.
6	"	"	3	10	<i>Dactylogyroides walloganius</i> sp.nov.	Meerut U.P.
7	"	"	8	15	<i>Hamatopeduncularia attu</i> sp.nov.	Lucknow U.P.
8	<i>Rita rita</i> (Ham)	15	2	9	<i>Silurodiscoides meerutensis</i> sp.nov.	Meerut U P

OBSERVATION AND DISCUSSION

***Urocleidus xenentodoni* Jain,1959**

Host	: <i>Xenentodon cancila</i> (Ham.)
No. of host examined	: 635(LKO-348,FZD-187,LMP-50,MRT-50)
No. of host found infected	: 20 (LKO-15,FZD-5)
No. of worms collected	: 45 (LKO-30,FZD-15)
Site of infection	: Gill filament
Locality	: Lucknow and Faizabad

Jain, 1959, described ***Urocleidus xenentodoni*** from the gill filament of ***X. cancila*** at Lucknow for the first time. The author, during the course of study of helminth parasites of fishes came across few specimens of ***X. cancila*** infected with ***Urocleidus xenentodoni*** at Lucknow and Faizabad, U. P.. Since the original description lacks few morphological details, it is therefore briefly redescribed. Record of ***Urocleidus xenentodoni*** Jain, 1959 from Faizabad appears to be a new locality for the worm.

Body (Fig.1) is elongated 0.62 - 0.65 x 0.15 - 0.17mm. Cephalic end of the body is blunt, lobed while posterior end is equipped with discoidal haptor well set off from the body proper. Head is equipped with three pairs of head organs and two pairs of eye spots. Jain (1959), has also reported the presence of three pairs of head organs and two pairs of eye spots. Posterior pair of eye spots are larger as compared to anterior one. Pharynx is rounded, muscular and measures 0.024 - 0.031 x 0.020 - 0.032 mm. Intestinal crura simple and confluent posteriorly.

Testis is elongated, median, intercaecal, post ovarian and measures 0.07 - 0.08 x 0.03 - 0.04 mm. Male copulatory

complex consists of spirally coiled cuticularized cirrus proper (Fig2) with a swollen base and measures 0.12 - 0.15 mm, a pair of prostate glands opens at the distal end of the cirrus. Seminal vesicle well developed, pre-equatorial and pre-ovarian in location, transversely elongated and measures 0.06 - 0.07 x 0.025 - 0.035 mm. Jain (1959), have not observed the presence of seminal vesicle in specimens at his disposal.

Ovary is post-testicular, transversely elongated and measures 0.031 - 0.035 x 0.051 - 0.062 mm. Vitelline follicles are densely distributed throughout the body from the level of intestinal bifurcation and upto the haptoral peduncle and coextensive with intestinal crura.

Haptor (Fig. 4) measures 0.05 - 0.06 x 0.12 - 0.13 mm. Armature of haptor consists of two pairs of anchors, a pair of transverse bar and seven pairs of marginal hooklets. Dorsal anchors are large with slightly bifid root, strong shaft and inwardly pointed tips and measures 0.12 - 0.13 mm in length. They are further strengthened by wings at their shaft. Dorsal anchors are connected to each other with the help of dorsal transverse bars. Dorsal transverse bar is straight, bifurcated at the tips and has a furrow throughout its length and measures 0.06 - 0.07 mm. Ventral anchors are smaller as compared to the dorsal anchors, with deeply bifurcated roots, strong shaft and slightly recurved tips measures 0.05 - 0.06 mm. Ventral anchors are connected with each other with the help of an arched ventral transverse bar having slit throughout of its length and measures 0.11 - 0.12 mm. Marginal hooklets (Fig. 3) are sickle shaped having strong base, elongated shaft and sickle shaped blade and measures 0.03 - 0.04 mm in length.

Table 2 : The appended table shows the differences in various body measurements of *U. xenentodoni* Jain (1959) and as shown by the present specimens (all measurements are in mm)

S.No.		<i>U. xenentodoni</i> Jain, 1959	Present Specimens
1	Host	<i>X. cancila</i>	<i>X. cancila</i>
2	Locality	Lucknow	Lucknow, Faizabad,U.P
3	Body length	0.35 - 0.56	0.62 - 0.65
4	Body width	0.042 - 0.06	0.15 - 0.17
5	Pharynx	0.025 x 0.02	0.024 - 0.031x0.02- 0.032
6	Testis	0.076-0.084 x 0.01- 0.015	0.07-0.08 x 0.03- 0.04
7	Cirrus proper	0.023	0.12 - 0.15
8	Accessory piece of cirrus	0.014 - 0.15	---
9	Seminal vesicle	- - -	0.06 - 0.07 x 0.025 - 0.035
10	Ovary	0.02 - 0.023 x 0.018 - 0.024	0.031-0.035 x 0.051 x 0.062
11	Haptor	0.08 - 0.15 x 0.04 - 0.065	0.05 - 0.06 x 0.12 - 0.13
12	Dorsal anchor	0.045 - 0.047	0.12 - 0.13
13	Dorsal Transverse bar	0.053 - 0.055	0.06 - 0.07
14	Ventral Anchor	0.034 - 0.038	0.05 - 0.06
15	Ventral Transverse bar	0.075 - 0.083	0.11 - 0.12
16	Marginal hooklets	0.012 - 0.013	0.03 - 0.04

***Urocleidus xenentodoni* Jain, 1959**

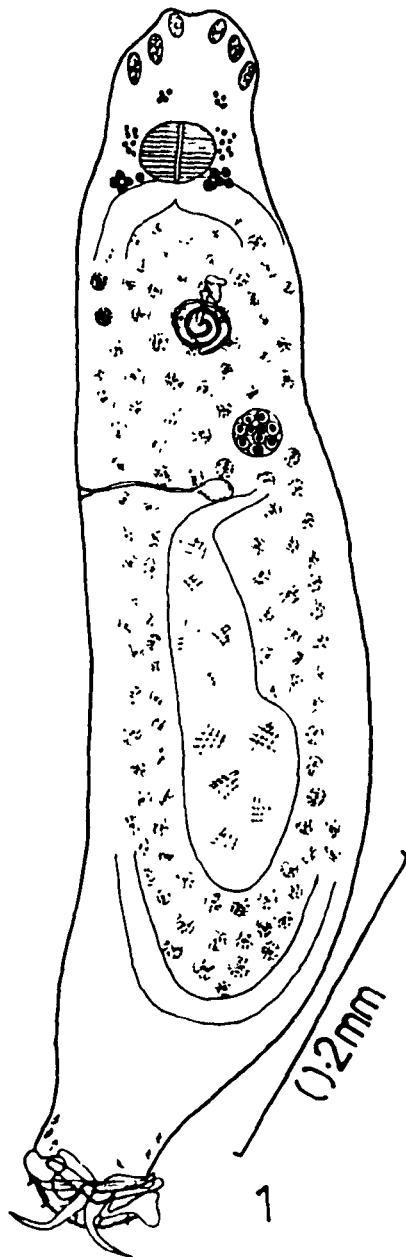


Fig 1 Entire worm (ventral view)

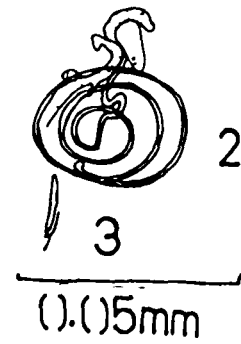


Fig 2 Copulatory complex enlarged

Fig 3 Marginal hooklet enlarged

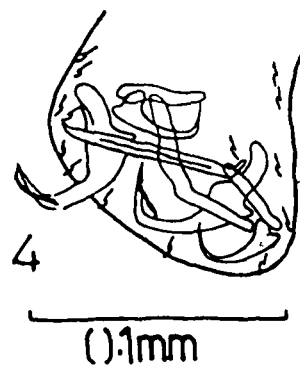


Fig 3 Haptor enlarged

***Urocleidus polysporalis* Jain, 1961**

Host	:	<i>Mastacembelus armatus</i> (Lace)
No. of host examined	:	280 (LKO-190, FZD-60, LMP-30)
No. of host found infected	:	15 (LKO-12, FZD-3)
No. of worms collected	:	25 (LKO-18, FZD-7)
Site of infection	:	Gill filament
Locality	:	Lucknow and Faizabad

Jain (1961), described *Urocleidus polysporalis* from the gill filaments of *Silondia silondia*, at Lucknow. Author during the course of study of helminth parasites of fresh water fishes came across some specimens of *M. armatus* (Lace) infected with *U. polysporalis* Jain 1961 at Lucknow and another new locality Faizabad, U.P.. Since the original description lack some morphological details, it is therefore redescribed herein as such.

Body (Fig. 1) is elongated, cylindrical with pointed anterior and posterior end and measures 0.72 - 0.75 x 0.16 - 0.17 mm in width. Head is bilobed and haptor region is bluntly pointed. Head is equipped with three pairs of head organs and two pairs of eyespots. Posterior pair of eyespot is slightly larger than the anterior. Pharynx is muscular, rounded and measures 0.03 - 0.04 mm in diameter. Two pairs of darkly stained cephalic glands are present on anterolateral and posterolateral sides of pharynx. Intestine is simple, bifurcated and crura are confluent posteriorly.

Testis is elongated, post-ovarian, intercaecal and measures 0.12 - 0.13 x 0.06 - 0.07 mm. Male copulatory complex consist of spirally coiled cirrus and three pieces of

irregular accessory piece (Fig2). Cirrus measures 0.25 - 0.35 mm in length. Accessory piece consists of three different pieces each measures 0.025 - 0.031 mm, 0.014 - 0.016 mm and 0.018 - 0.021 mm respectively. Ovary is sub-median, pre-testicular, intercaecal, pre-equatorial and measures 0.025 - 0.032 x 0.20 - 0.28 mm. Vagina is dextral, funnel shaped and opens into a rounded receptaculum seminalis measuring 0.010 - 0.012 mm in diameter. Vitellaria are co-extensive with intestinal caeca.

Haptor is descoidal in shape and measures 0.04 - 0.05 x 0.05 - 0.06 mm. Haptoral armature consists of two pair of anchors, a pair of transverse bars, a pair of accessory bars and seven pair of marginal hooklets. Dorsal anchors are large, with deeply bifurcated roots and equipped with wings at their tips and measures 0.041 - 0.045 mm in length. Dorsal anchors are connected with each other with the help of an elongated dorsal transverse bar having pointed tips and measures 0.035 - 0.045 mm in length. Ventral anchors are smaller than the dorsal anchor with superficially divided roots, strong shaft and recurved tips each measures 0.021 - 0.025 mm. At the base of ventral anchors an elongated accessory bar is present and measures 0.018 - 0.021 mm. Ventral anchors are attached to each other with the help of ventral transverse bar, slightly bent in the middle and measures 0.04 - 0.05 mm. Marginal hooklets are seven pairs, cravachet shaped with an apposible piece and each measures 0.01 - 0.015 mm.

Table 3: The appended table shows differences in various body measurements of *U. polysporalis* Jain, 1961 and as shown by the present specimens (all measurements are in mm).

S No	<i>U. polysporalis</i> Jain, 1961	Present specimens
1.	Host <i>Silondia silondia</i>	<i>M. armatus</i>
2.	Locality Lucknow	Lucknow and faizabad
3.	Body length 0.56 - 0.73	0.72 - 0.75
4.	Body width 0.42 - 0.89	0.16 - 0.17
5.	Pharynx 0.33 - 0.03	0.03 - 0.04
6.	Testis 0.1 - 0.12 x 0.03 - 0.37	0.12 - 0.13 x 0.06 - 0.07
7.	Cirrus length ---	0.25 - 0.35
8.	Cirrus diameter 0.045 - 0.052	----
9.	Accessory piece 0.006 - 0.01	0.025-0.031,0.014-0.016,0.018 0.021
10.	Ovary 0.029 - 0.033 x 0.02 - 0.023	0.025 - 0.032 x 0.20 - 0.28
11.	Receptaculum seminis - - -	0.010 - 0.012
12.	Haptor 0.046 - 0.082 x 0.062 - 0.094	0.04 - 0.05 x 0.05 - 0.06
13.	Dorsal anchor 0.047 - 0.052	0.041 - 0.045
14.	Dorsal Transverse bar 0.028 - 0.03	0.035 - 0.045
15.	Supporting bar 0.013 - 0.016	0.018 - 0.021
16.	Ventral Anchor 0.015 - 0.018	0.021 - 0.025
17.	Ventral Transverse bar 0.033 - 0.037	0.04 - 0.05
18.	Marginal hooklets 0.006 - 0.008	0.01 - 0.015

***Urocleidus polysporalis* Jain, 1961**

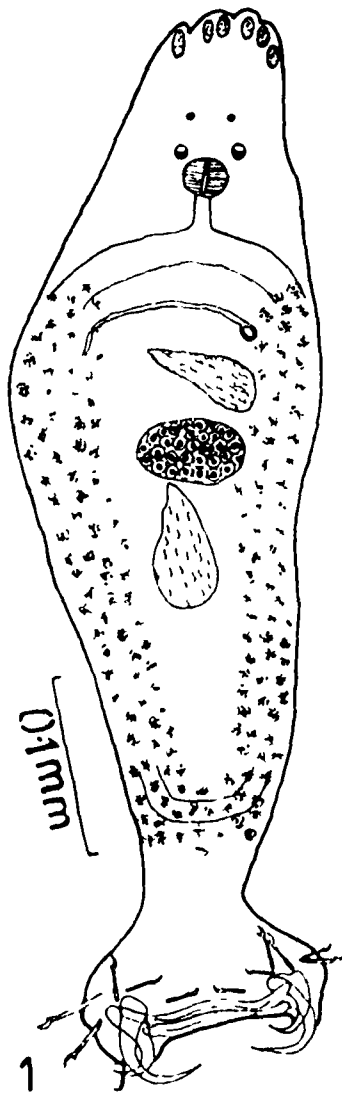


Fig 1 Entire worm (ventral view)

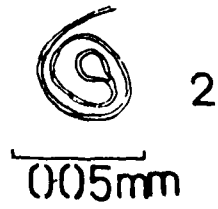


Fig 2 Copulatory complex enlarged

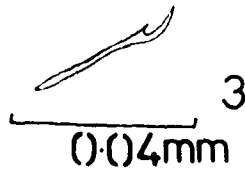


Fig 3 Marginal hooklet enlarged

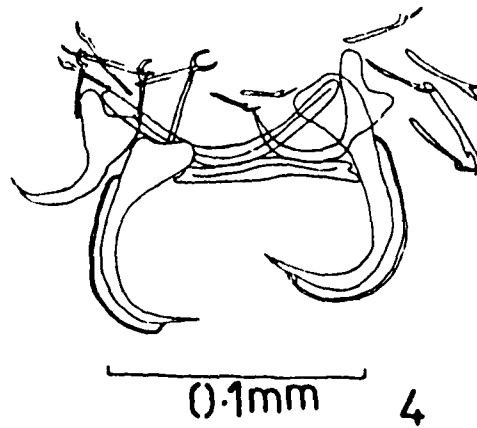


Fig 4 Haptor enlarged

***Bifurcohaptor pedunculata* sp.nov.**

Host	:	<i>Mystus vittatus</i> (Bloch)
No. of host examined	:	25
No. of host found infected	:	2
No. of worms collected	:	6
Site of infection	:	Gill filament
Locality	:	Lucknow

Body (Fig. 1) is elongated, cylindrical and measures 0.601 - 0.625 x 0.06 - 0.063. Head is not well marked from the body and is bilobed bears three pairs of elongated head organs and two pairs of eye spots. Posterior pair of eye spots is larger than the anterior one due to the greater number of melanistic granules. Pharynx is well developed large, spherical and muscular measuring 0.018 - 0.021 x 0.016 - 0.018 mm. Oesophagus is not visible. Intestinal caeca are simple, crura united posteriorly.

Testis oval in shape, pre-equatorial, postovarian and measures 0.016 - 0.019 - 0.020 - 0.026 mm. An elongated, pyriform seminal vesicle is present between ovary and testis and measures 0.01 - 0.02 - 0.003 - 0.005 mm. Male copulatory complex is fairly developed consist of cirrus proper (Fig. 2) and an accessory piece. Cirrus proper is in the form of chitinoid tube, swollen at the base and at its distal most part it is smoothly transformed into ax head shape blade and measures 0.05 - 0.08 - 0.002 - 0.003 mm. Accessory piece is also in the form of chitinoid tube, distally terminating into a tuning forck like structure and measures 0.09 - 0.11 - 0.001 - 0.002mm. At the distal most end of cirrus, a pair of prostate glands are present.

Female reproductive organs comprises of an ovary and vagina. Ovary is single, oval in shape, pre-equatorial, pre-testicular, intercaecal in position and measures 0.01 - 0.03 x 0.015 - 0.019 mm. Vitelline follicles are distributed throughout the body. Vagina (Fig. 4) is rounded, chitinoid opening present either on left or right lateral margin of the body and measures 0.01 - 0.015 x 0.003 - 0.005 mm.

Haptor (Fig. 3) is well set off from the body proper with the help of a long peduncle and measures 0.21 - 0.25 x 0.05 - 0.06 mm. It has 2 pair of unequal anchors, a stout, median dorsal transverse bar and a pair of small ventral bars. Dorsal anchors are large, curved, rootless and several times larger than the ventral anchors. Base of dorsal anchor is provided with 3 elongated, conspicuous plates. Wings are absent. Dorsal anchors measures 0.212 - 0.229 x 0.020 - 0.025 mm. A stout, median rectangular dorsal transverse bar joins the dorsal anchors with each other. Corners of the dorsal bar are elevated with small furrow in the center and measures 0.02 - 0.03 x 0.03 - 0.04 mm. Ventral anchors are found attached to the posterior extremity of the dorsal anchors with the help of small, rod like ventral transverse bar. Ventral transverse bar measures 0.015 - 0.026 x 0.002 - 0.003 mm. Ventral anchors measures 0.032 - 0.039 x 0.010 - 0.011 mm.

Discussion

Jain (1958) erected the genus *Bifurcohaptor* with *B. indicus* as type species, for the worms collected from *Mystus vittatus* (Bloch), at Lucknow.

Pandey and Singh (1989) made a comprehensive review of the genus *Bifurcohaptor* and identified that characters like body size, ratio of body and haptor, number and pattern of head organs, presence or absence of cephalic glands, shape of testis, shape of seminal vesicle, shape of male copulatory complex, shape of ovary, shape of receptaculum seminis, shape of vagina, shape of egg (presence or absence of polar filaments) ratio of dorsal and ventral anchor, presence or absence of wings on anchors and presence or absence of marginal hooklets variable. On the basis of above they synonymized all the fourteen species of the genus *Bifurcohaptor* viz., 1. *B. indicus* Jain, 1958; *B. giganticus* Jain 1958; *B. son* (Tripathi 1959), Yamaguti 1961; *B. minutum* Kulkarni, 1969; *B. lanki* Gussev, 1973; *B. vishwanathi* Agarwal and Kumar, 1977; *B. mulleri* Gupta and Sharma, 1981; *B. tripathi* Gupta and Sharma, 1981; *B. gorakhnathi* Kumar and Agarwal, 1982; *B. sohani* Agarwal and Singh, 1982; *B. hemlatae* Gupta, 1983; *B. chauhani* Swarup and Jain, 1984; *B. ramaligami* Swarup and Jain, 1984; *B. kulkarni* Swarup and Jain, 1984; and *B. chauhani* Agarwal and Sharma, 1986. with *B. indicus* Jain, 1958. I also agree with these workers on this issue.

The present form differs from *B. indicus* by the position of testis (pre-equatorial in the present form and post-equatorial in *B. indicus*), difference in the shape of male copulatory complex (ax head shaped distal part of the cirrus proper and chitinoid tube like accessory piece having tuning fork like distal part in the present form). Moreover, the present form also possess significantly long haptoral peduncle. On the basis of above diagnostic characters the present form is described as a new species of the genus *Bifurcohaptor* viz., *Bifurcohaptor pedunculata* sp.nov. on account of having long haptoral peduncle.

***Bifurcohaptor pedunculata* sp. nov.**

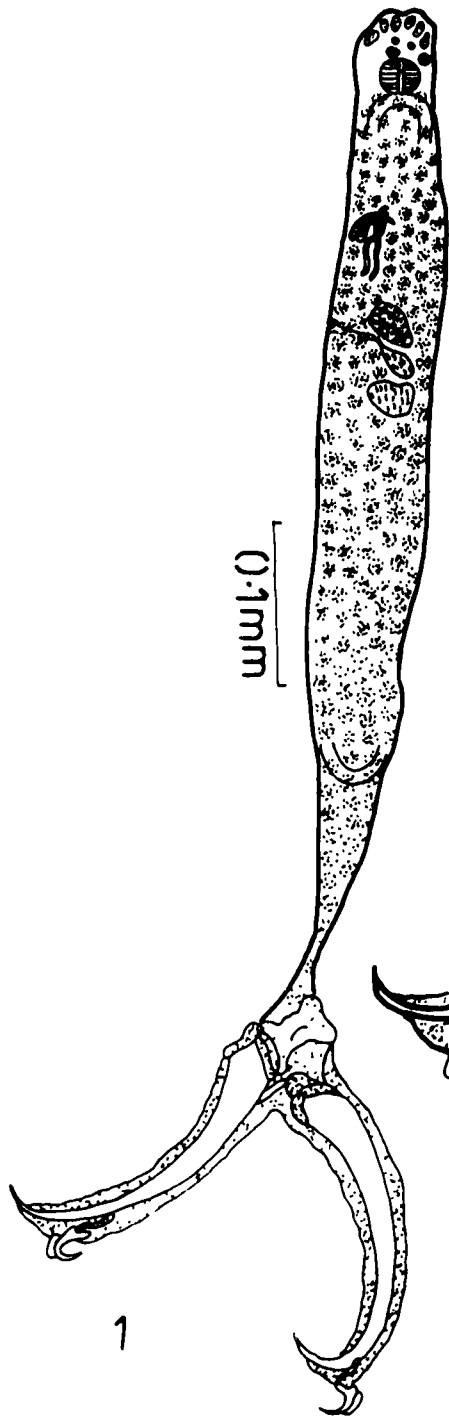


Fig 1 Entire worm (ventral view)

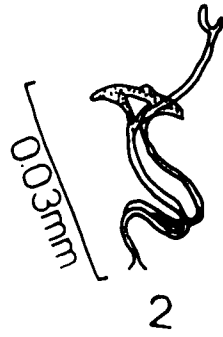


Fig 2 Copulatory complex enlarged

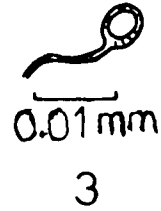


Fig 3 Vagina enlarged

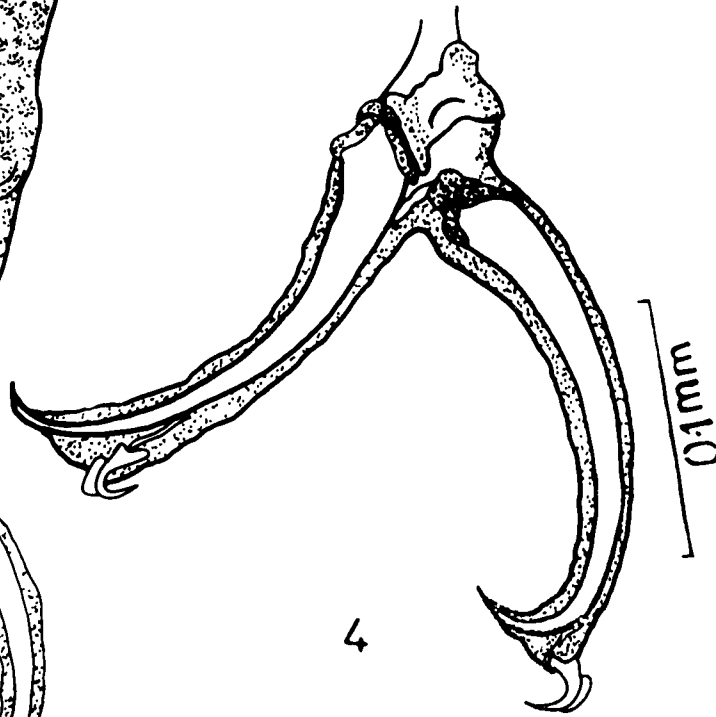


Fig 4 Haptor enlarged

***Ancyrocephalus tripathii* sp.nov.**

Host	:	<i>Oxygaster bacaila</i> (Ham)
No. of host examined	:	50
No. of host found infected	:	3
No. of worms collected	:	8
Site of infection	:	Gill filament
Locality	:	Lucknow

Body (Fig. 1) is elongated, cylindrical and measures 0.49 - 0.53 x 0.05 - 0.09 mm. Haptor is distinctly set off from the body proper. Head is lobed and equipped with four pairs of elongated head organs which are darkly stained and two pairs of eye spots. Posterior pair of eye spots is larger than the anterior ones because of greater number of melanistic granules. Pharynx well developed, muscular and measures 0.020 - 0.025 x 0.022 - 0.026 mm. Intestine is simple and crura are confluent posteriorly. Two pairs of cephalic glands are present in the form of patches, anterior one smaller and present on the lateral side of the anterior eyespot while the posterior larger one on the posterolateral side of the pharynx.

Testis single (Fig. 1) large, oval to rounded in shape, postovarian, post-equatorial and measures 0.040 - 0.046 x 0.025 - 0.028 mm. Male copulatory complex well developed, consisting of cirrus proper and an accessory piece (Fig. 2). Cirrus proper is in the form of a chitinoid tube swollen at the base and measures 0.030 - 0.034 x 0.01 - 0.02 mm. At the distal end of the cirrus a pair of prostrate glands are present. Accessory piece is in the form of chitinoid tube overlapping the cirrus proper and measures 0.028 - 0.030 mm.

Female reproductive organs comprises of an ovary and vagina. Ovary is oval, rounded in shape, pretesticular, equatorial, intercaecal and measures 0.018 - 0.021 x 0.024 - 0.028 mm. Vagina is funnel shaped situated on the left side of the body, crossing the left intestinal caecum. Distal end of vagina is swollen to form a sac like structure, the seminal receptacle. Vagina measures 0.02 - 0.03 x 0.005 - 0.01 mm in size. Seminal receptacle measures 0.010 - 0.012 x 0.018 - 0.020 mm in size. An oval, large, single egg (Fig. 3) is visible just below the cirrus proper. It is double layered and measures 0.028 - 0.034 x 0.016 - 0.021 mm in size. Vitelline follicle are distributed in all the available space in the body and coextensive with intestinal caeca.

Haptor (Fig. 4) is distinctly set off from the body proper and measures 0.040 - 0.045 x 0.079 - 0.085 mm in size. Armature of the haptor consist of two pairs of anchors, one dorsal transverse bar, one ventral transverse bar and seven pairs of marginal hooklets. Dorsal anchors are curved, rootless, pointed and almost equal to the ventral anchors and measures 0.049 - 0.053 x 0.009 - 0.015 mm in size. Both the dorsal anchors are joined to each other with the help of a rod like, elongated, dorsal transverse bar with bifid tips and having furrow in middle and measures 0.050 - 0.058 x 0.004 - 0.006. Ventral anchors are curved, pointed, rooted and measures 0.050 - 0.055 x 0.015 - 0.020 mm in size. They are joined to each other with the help of an elongated ventral transverse bar with downward tips and notch in the middle and furrow through out its length and measures 0.045 - 0.054 x 0.006 - 0.009. Seven pair of marginal hooks are present. They are small, sickle shaped and measures 0.025 - 0.035 x 0.001 mm.

Discussion

The genus *Ancyrocephalus* Creplin, 1839 has following species described so far, *A. alatus* Chauhan, 1954 ; *A. bam* Tripathi, 1959 ; *A. indicum* Tripathi, 1959 ; *A. johni* Tripathi, 1959 ; *A. nengi* Tripathi, 1959 ; *A. pseudorhombi* Tripathi, 1959 ; *A. triacanthi* Tripathi, 1959 and *A. unicirrus* Tripathi, 1959. The present form chiefly differs from all these species in having cephalic glands distributed in two groups. Moreover it comes closer to *Ancyrocephalus nengi* Tripathi, 1959 in having similar shape and organization of heptoral armature, but differs from the same in having different shape of cirrus and its accessory piece.

Therefore, the present form is described as a new species and named as *Ancyrocephalus tripathii* sp.nov.

***Ancyrocephalus tripathii* sp. nov.**

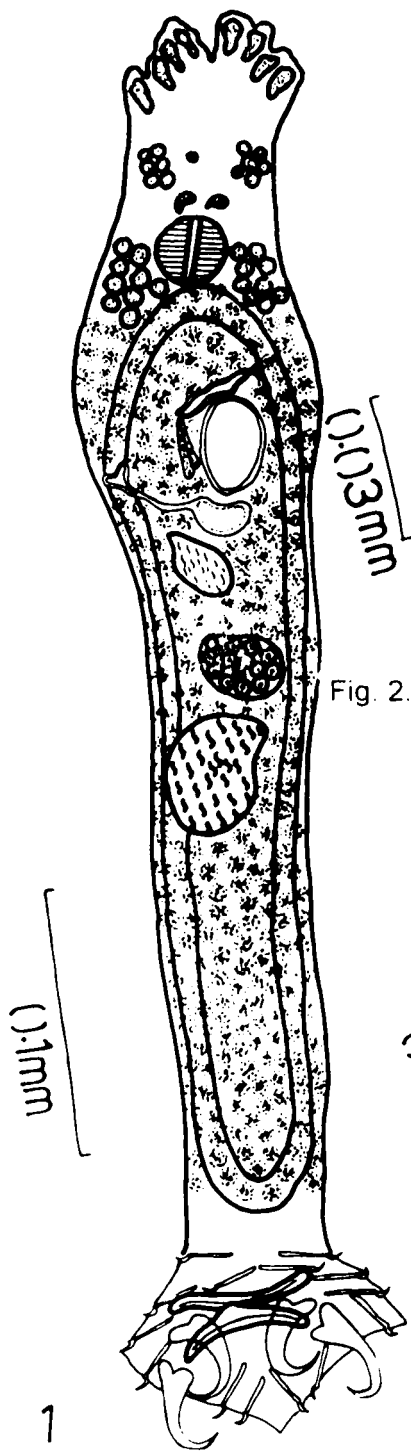


Fig. 1. Entire worm (ventral view)



Fig. 2. Copulatory complex enlarged

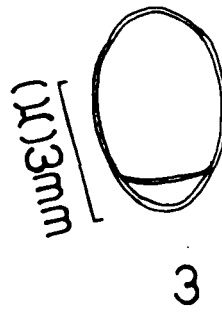


Fig. 3. Egg enlarged

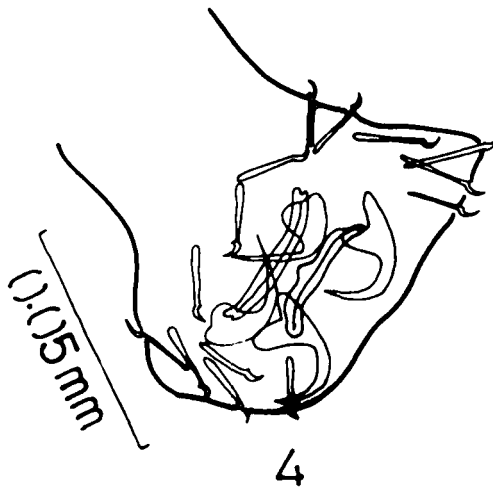


Fig. 4. Haptor enlarged

***Thaparocleidus sohani* Pandey and Mehta, 1986**

Host	<i>Wallago attu</i> (Bl and Schn)
No. of host examined	55 (LKO-20, FZD-5, MRT-30)
No. of host found infected	2
No. of worms collected	8
Site of infection	Gill filament
Locality	Meerut

Thaparocleidus sohani has been described from ***Wallago attu*** at district Meerut by Pandey and Mehta (1986). Specimens at the disposal of the writer, differ from those described earlier in having different shape of vagina, head organs pattern and absence of cement glands, beside other minor difference including measurements. It is therefore, redescribed herein, as such.

Body (Fig 1) is elongated, spindle shaped, measures 0.44 - 0.45 x 0.14 - 0.16 mm. Head is bilobed bearing six pair of head organs and two pairs of eye spots. Posterior pair of eye spot is larger than the anterior due to the presence of greater number of melanistic capsule. Pandey and Mehta (1986) have observed four pair of head organ and larger posterior pair of eye spots as observed by the author in the present specimens. Pharynx is oval and muscular measures 0.025 - 0.027 x 0.031 - 0.035 mm. Intestinal caeca are simple and confluent posteriorly as observed by Pandey & Mehta (1986). A mass of darkly stained cephalic glands present at the postero lateral sides of the pharynx. However in the original account of ***T. sohani*** these glands are absent.

Testis is simple, oval, post-equatorial imposed over the ovary, intercaecal and measuring 0.05 - 0.06 x 0.02 - 0.03 mm as observed by Pandey and Mehta, 1986. Vas deferens is straight which dilate at the level of vagina to form an elongate oval vesicula seminalis measuring 0.02 - 0.03 x 0.01 - 0.02 mm as observed by Pandey and Mehta, 1986. Cirrus (fig. 2) is thin, swollen and coiled at the base, distal end is free and provided with a pair of accessory pieces and prostrate glands. Cirrus proper measures 0.08 - 0.09 mm in length while each accessory piece measures 0.015 - 0.017 x 0.02 - 0.03 mm.

Ovary is oval, elongated inter-caecal, post equatorial and measures 0.11 - 0.12 x 0.04 - 0.05 mm. Receptaculum seminis is rounded, equatorial in position and surrounded by a large hyaline gland with granular cytoplasm. Pandey and Mehta (1986), also observed similar structures. Receptaculum seminis measures 0.02 - 0.03 x 0.01 - 0.02 mm in diameter. Vagina (Fig. 3) open at the level of seminal vesicle at right lateral margin of the body and internally opens into receptaculum seminis by a fine duct. Eggs are absent. Vitellaria are coextensive with the intestinal caeca.

Haptor (fig4) is quadrangular in shape and demarcated from the body proper and measures 0.05 - 0.06 x 0.02 - 0.03 mm. It is armed with two pairs of anchors, a pair of transverse bar and seven pair of marginal hooklets. Pandey and Mehta (1986), observed 6-10 pair of marginal hooklets. Dorsal anchors are with broad and bifid base, strong shaft and curved tips and measures 0.03 - 0.04 mm in length. They are connected by

strong dorsal transverse bar having groove of 'V' shaped and measures 0.025 - 0.032 mm like that of Pandey and Mehta's (1986) specimens. Ventral anchors are small, rod like, without any demarcation in the base and shaft with curved tips and measures 0.007 - 0.009 mm. Ventral transverse bars are feebly developed, two in numbers, free medially and measures 0.006 - 0.007 mm. Marginal hooklets are small, embedded in the margins of hapter and each measures 0.003 - 0.005 mm. Cement gland absent.

Table 4 : The appended table shows differences in body measurements of *T. sohani* Pandey and Mehta, 1986 and as observed in the present specimens (all measurements are in mm)

S.No.	Body Organ	<i>T. sohani</i> Pandey and Mehta, 1986	Present specimens
1.	Body size	0.70-0.80x0.10-0.17	0.44-0.45x0.14-0.16
2.	Pharynx	0.05-0.06x0.06-0.08	0.025-0.027x0.031-0.035
3.	Testis	0.09-0.12x0.03-0.05	0.05-0.06x0.02-0.03
4.	Seminal vesicle	-	0.02-0.03x0.01-0.02
5.	Cirrus	-	0.08-0.09
6.	Accessory piece	-	0.015-0.017x0.02-0.03
7.	Ovary	-	0.11-0.12x0.04-0.05
8.	Seminal receptacle	-	0.02-0.03 x 0.01 - 0.02
9.	Eggs	0.02x0.03	Absent
10.	Haptor	0.08-0.10x0.06-0.08	0.05-0.06x0.02-0.03
11.	Dorsal anchor	0.06-0.07	0.03-0.04
12.	Ventral anchor	0.02-0.03	0.007-0.009
13.	Dorsal transverse bar	-	0.025-0.032
14.	Ventral transverse bar	-	0.006-0.007
15.	Marginal hooklets	-	0.003-0.005

***Thaparocleidus sohani* Pandey and Mehta, 1986**

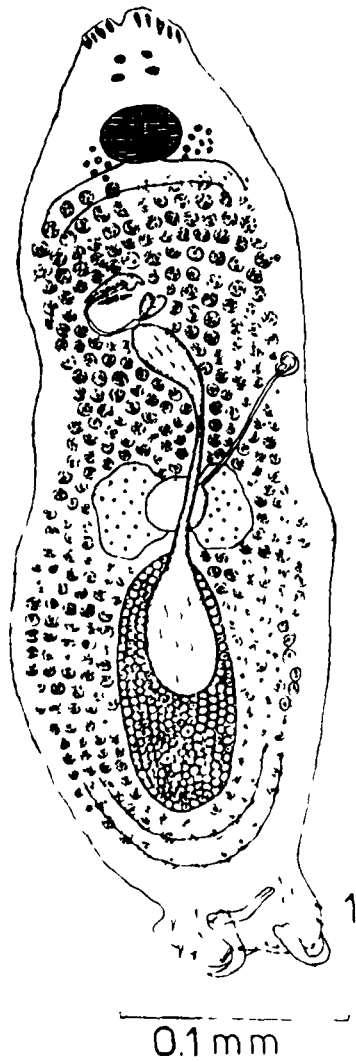


Fig 1 Entire worm (ventral view)

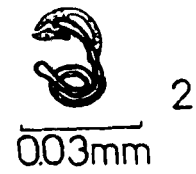


Fig 2 Copulatory complex enlarged

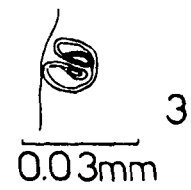


Fig 3 Vagina enlarged

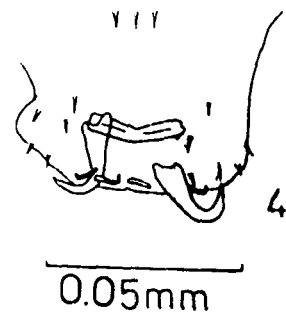


Fig 4 Haptor enlarged

***Dactylogyroides wallagonius* sp.nov.**

Host	:	<i>Wallago attu</i> (Bloch. and Schn.)
No. of host examined	:	55 (LKO-20, FZD-5, MRT-30)
No. of host found infected	:	3
No. of worms collected	:	10
Site of infection	:	Gill filament
Locality	:	Meerut

Body (fig. 1) is very much elongated with variations in its body form, being broad and narrow at positions and measures 0.92 - 0.95 x 0.11 - 0.12 mm. Head is lobed, with ten pairs of head organs. They are inconspicuously paired and some of them are fused and connected with fine ducts which passes down. Two pairs of eye spots are present in head region, posterior pair being larger than the anterior, present above the pharynx. Mouth is placed slightly above the anterior eye spot, just behind the head organ and opens into the pharynx. Pharynx is elongated, oval, muscular and measures 0.07 - 0.08 x 0.04 - 0.05 mm. At the lateral side of the pharynx, on its anterior and posterior borders, two bunches of darkly stained cephalic gland are present. Posterior pair of cephalic gland is considerably large in comparison to the anterior. Intestinal caeca are simple and confluent posteriorly behind the testis.

Testis (Fig.1) is single, elongated, oval and post equatorial, post-ovarian, inter-caecal and measures 0.13 - 0.14 x 0.05 - 0.06 mm. A pear shaped seminal vesicle is present in the equatorial region of the body just behind the cirrus and measuring 0.05 - 0.06 x 0.01 - 0.02 mm. Cirrus (Fig.2) is a doubled walled long tube with a swollen base measures 0.05 -

0.06 mm. A double walled accessory piece of cirrus runs along its half of the length and measures 0.03 - 0.04 mm. Six pairs of darkly stained reproductive glands are present in the region of copulatory complex. Ovary (fig. 1) is round to oval, post-equatorial, pre-testicular, inter caecal and measures 0.17 - 0.18 x 0.15 - 0.16 mm in diameter. Vagina is (fig. 3) funnel shaped, coiled, tubular, cuticularised and measures 0.06 - 0.08 mm. Eggs are absent. Vitelline follicles are coexistence with intestinal crura.

Haptor (fig. 4) is well marked from the body proper, discoidal and measures 0.13 - 0.14 x 0.05 - 0.07 mm. Armature of haptor (fig. 5) consist of six pairs of marginal hooklets, a pair of anchors, a set of two transverse bars and a pair of cement glands. Anchors are large, with broad base, strong and long shaft with pointed curved tips and each measures 0.07 - 0.08 mm. These are provided with wings at their shaft. Transverse bars are individually connected with each anchor, semilunar in shape and each measures 0.027 - 0.032 mm. Marginal hooklets are sharply pointed embedded in the margin of haptor and each measures 0.007 - 0.012 mm. A pair of cement glands are present at the base of either anchor.

Discussion

Genus *Dactylogyroides* was erected by Gussev (1973), for *Dactylogyrus machracanthus* (Tripathi, 1959). The worm was originally collected from *Puntius ticto* at Dehri-on-son. The type species *D. macracanthus* has received new name by Tripathi (1975), viz *D. gussevi* Gussev (1973). To the best of my knowledge following more species are known from Sino-Indian region viz., *D. vittati* Gussev, 1973; *D. bimaculati*

Gussev, 1973; *D. tripathi* (Tripathi, 1959, Yamaguti, 1961); Gussev, 1973 and *D. longicirrus* (Tripathi, 1959) Gussev, 1973. Besides these 3 more species have been described from African region by Paperna, 1973 viz., *D. paryiphallus*; *D. mahecoli* and *D. filamentosi*.

The present form chiefly differs from all the African species by the presence of cement glands and reproductive glands. Moreover, it differs from *D. gussevi*, *D. vittati* and *D. bimaculati* in having greater number of head organs, presence of cephalic glands, presence of reproductive gland, cement glands and wings on the dorsal anchors. Moreover from *D. tripathi* in having different shape of copulatory complex particularly accessory piece of cirrus, presence of additional transverse bar and reproductive glands and from *D. longicirrus* in having different shape of dorsal transverse bar and having an additional transverse bar.

Therefore, the present form is regarded as a new species and named as *Dactylogyroides wallagonius* sp. nov.

Dactylogyroides wallagonius sp. nov.

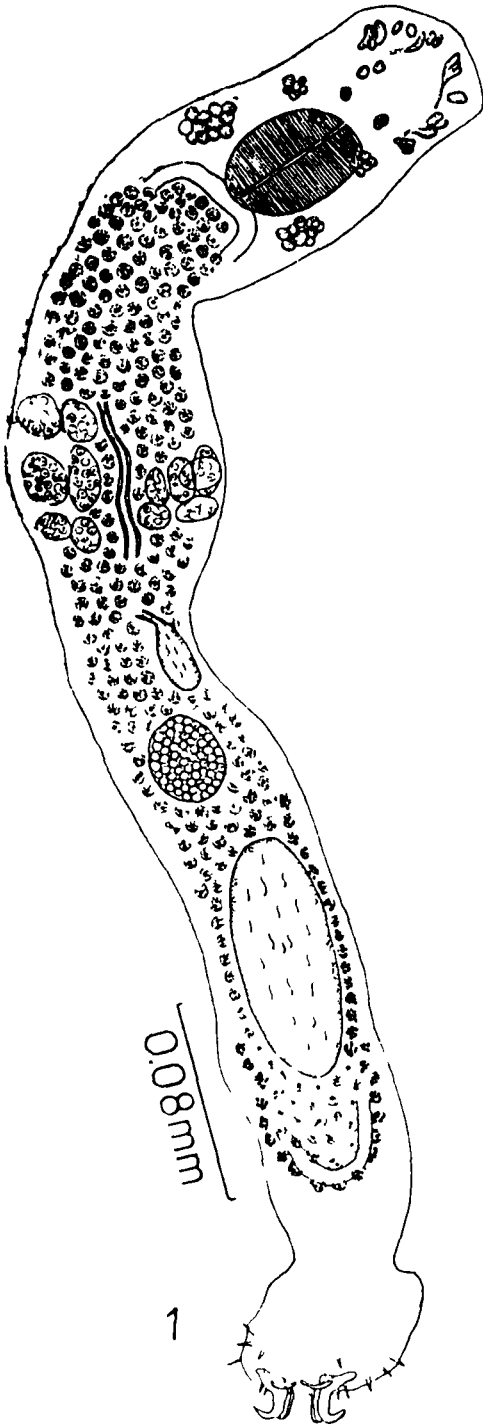


Fig 1 Entire worm (ventral view)

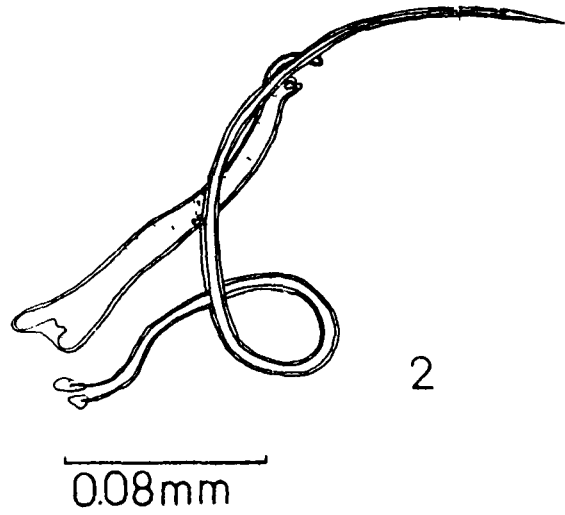


Fig 2 Copulatory complex enlarged

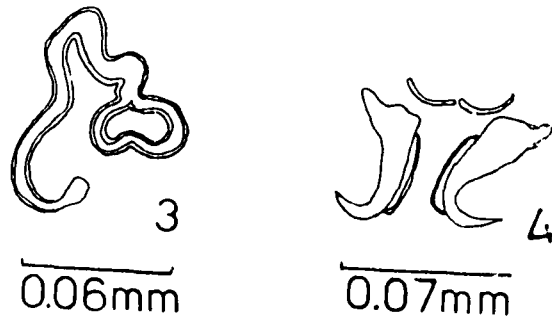


Fig 3 Vagina enlarged Fig 4 Haptor armature enlarged

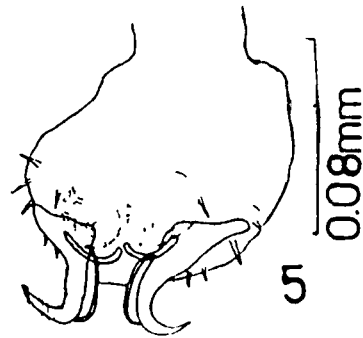


Fig 5 Haptor enlarged

***Hamatopeduncularia attui* sp.nov.**

Host	:	<i>Wallago attu</i> (Bloch & Schn)
No. of host examined	:	55 (LKO-20,FZD-5,MRT-30)
No. of host found infected	:	8
No. of worms collected	:	15
Site of infection	:	Gill filament
Locality	:	Lucknow

Body (fig. 1) is elongated with narrow anterior and broad posterior end and measures 1.55 - 1.60 x 0.25 - 0.25 mm. Haptor is distinctly set off from the body proper. Head is bilobed and provided with eight pairs of head organs. In some specimens these head organs are freely distributed while in others they show a precise pattern of distribution. Two pairs of eye spot are present in the head region, posterior pair slightly larger than the anterior due to presence of greater number of melanistic granules. Pharynx is oval, muscular and measures 0.08 - 0.09 x 0.06 - 0.07 mm. Intestine is simple, bifurcated and caeca are united posteriorly.

Testis is single, elongated, equatorial, post-ovarian, intercaecal and measures 0.30 - 0.33 x 0.05 - 0.08 mm. A fine vas deference arises from the anterior border of the testis, proceeds anteriorly and in the region of the copulatory complex, dilate to form an elongated oval seminal vesicle measures 0.11 - 0.39 x 0.02 - 0.06 mm. Copulatory complex consist of cirrus, accessory piece of cirrus and prostatic reservoir (fig. 4). Cirrus proper is horse shoe shaped, curved, chitinous, double walled structure measures 0.04 - 0.05 mm. Accessory piece of cirrus is elongated, dumbbell shaped with curved tip and measures 0.03 - 0.04 mm. Prostatic reservoir open at the base of cirrus.

Ovary (fig. 3) is oval, pre-equatorial, pre-testicular, inter caecal in position and measures 0.07 - 0.10 x 0.051 - 0.061 mm. A small, rounded seminal vesicle is present anterior to the ovary which opens outside through a fine duct on right side of the body at vagina (fig. 3). Eggs (fig. 2) are oval, with polar filaments and measures 0.06 - 0.07 mm. Vittaline follicles are co-extensive with intestinal caeca.

Haptor (fig. 5) is distinctively set off from the body proper and measures 0.14 - 0.18 x 0.18 - 0.21 mm. Armature of haptor consist of two pairs of anchors, one pair of transverse bars and seven pair of penduncles with hooklets. Each dorsal anchor consists of deeply bifurcated base, a tapering shaft, long recurved pointed tip and measures 0.06 - 0.07 mm. Dorsal bar is slightly bent, tubular structure measures 0.07 - 0.08 mm. Ventral anchors are larger than the dorsal anchors having wide base, tapering shaft, recurved pointed tip and measures 0.08 - 0.09 mm. Ventral bar is bent in the middle region and measures 0.04 - 0.05 mm in length. Seven pairs of marginal hooklets are present with a bulb like base and pointed sickle shaped tips

Discussion :

The genus *Hamatopeduncularia* was erected by Yamaguti (1953) with *H. arri* as type species. Hargis (1955), added another species *H. bagree* to the genus but Tripathi (1959), doubted the inclusion of this species under the genus and transferred it into the genus *Hargitrema*. This was also agreed by Yamaguti (1961) and the present author also holds the same view. Besides this, Tripathi (1959) also proposed to synonymise the genus *Hamatopeduncularia* with *Ancyrocephalus* but this synonymy was not accepted by

Yamaguti (1961), and treat the genus *Hamatopeduncularia* valid on account of the presence of pedunculated haptor. To the best of my knowledge, following more species were added to the genus viz., *H. australis* Young, 1967; *H. bresbanensis* Young 1967; *H. indicus* Siddiqui and Kulkarni, 1983; *H. yogendrai* Pandey and Mehta, 1986; *H. sohani* Tewari and Agarwal, 1986 ; *H. lucknowensis*, Agarwal and Sharma, 1988 and *H. wallagonius* Singh and Agarwal, 1992.

The present form chiefly differs from *H. arri*, *H. australis* and *H. bresbanensis* in shape of haptoral anchors, transverse bars and copulatory complex. However, it differs from *H. indicus* and *H. lucknowensis* in absence of compact tabular head organs, shape of transverse bars, shape of cirrus proper and size of eggs. Moreover, it differs from *H. yogendrai* and *H. sohani* in the distribution of cephalic glands, shape of cirrus. It further differ from *H. wallagonius* by the absence of haptoral glands and shape of vagina and egg.

Therefore, the present form is regarded as a new species and named as *Hamatopeduncularia attui* sp.nov.

Hamatopeduncularia attui sp. nov.

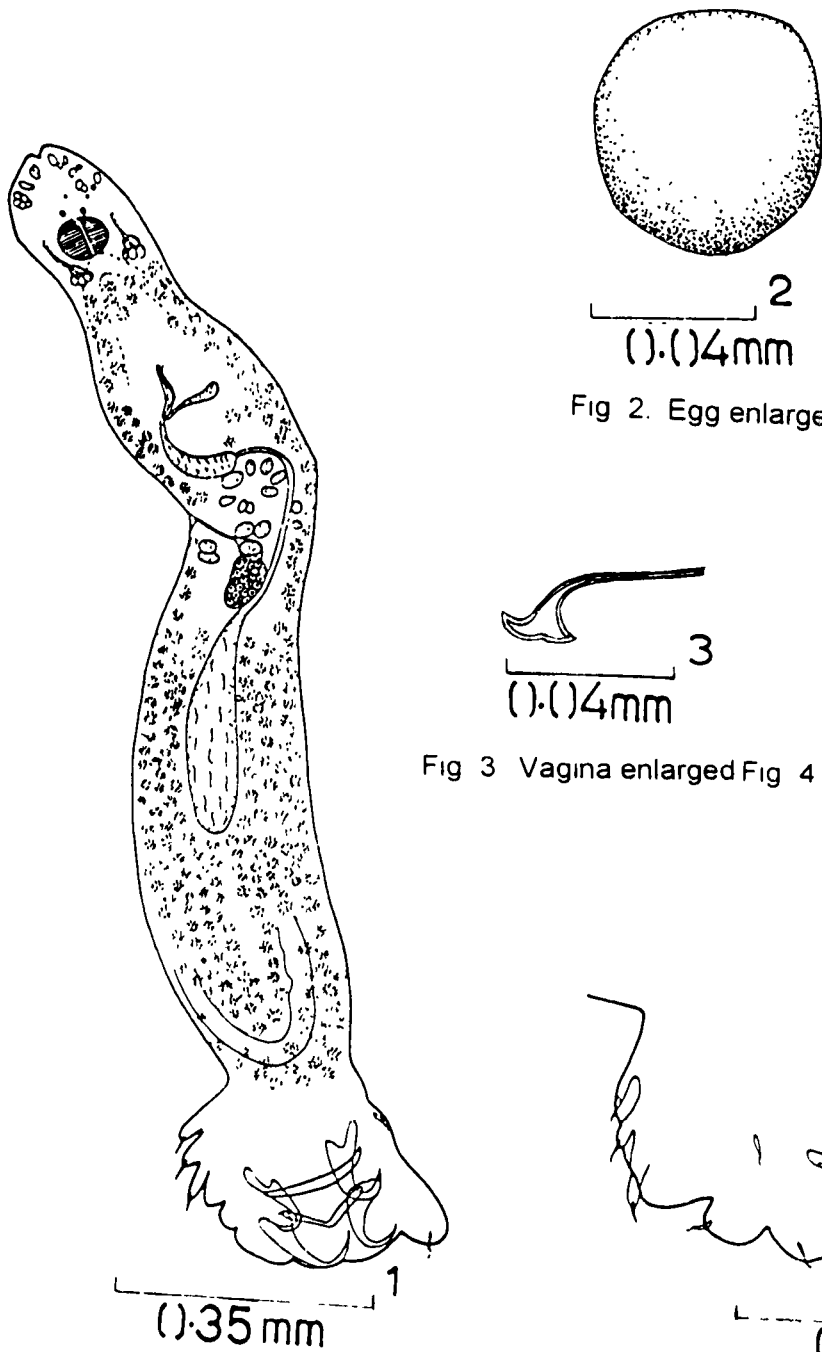


Fig 2. Egg enlarged

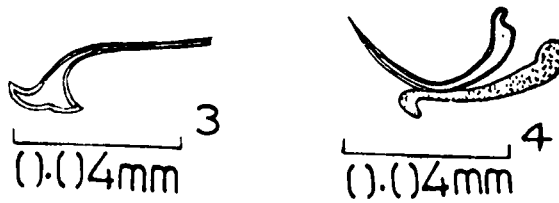


Fig 3 Vagina enlarged Fig 4 Copulatory complex enlarge

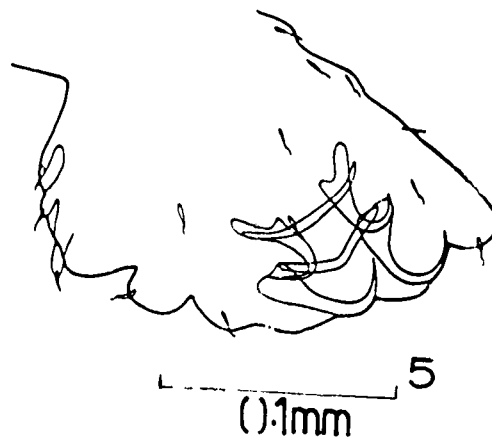


Fig 5 Haptor enlarged

Fig 1 Entire worm (ventral view)

***Silurodiscoides meerutensis* sp.nov.**

Host	: <i>Rita rita</i> (Ham)
No. of host examined	: 15
No. of host found infected	: 2
No. of worms collected	: 9
Site of infection	: Gill filament
Locality	: Meerut

Body (fig. 1) is elongated tapering at both the ends, broad in middle and measures 0.68 - 0.72 x 0.14 - 0.16 mm. Head is broad and bears four pairs of head organs and two pairs of eye spots. Posterior pair is slightly larger than the anterior due to the presence of greater number of metanestic granules. Pharynx is oval, muscular and measures 0.05 - 0.06 mm in diameter. At the postero-lateral sides of pharynx there exist a group of darkly stained cephalic gland. Intestinal caeca are simple and confluent posteriorly behind the testis.

Testis is (fig. 1) single, elongated, oval, post-equatorial, post-ovarian, intercaecal and measures 0.15 - 0.16 x 0.05 x 0.06 mm. An elongated, oval seminal vesicle is present in the pre-equatorial region of the body just behind the copulatory complex, measures 0.07 - 0.08 x 0.02 - 0.03 mm. Copulatory complex consist of cirrus proper and accessory piece of cirrus proper. Cirrus (fig2) is long cuticularized, coiled and measures 0.285 - 0.312 mm. An accessory piece is present around the anterior region of cirrus measures and 0.021 - 0.028 mm.

Ovary (fig. 1) is oval, pre-equatorial or equatorial, pre-testicular, inter caecal and measures 0.058 - 0.062 x 0.05 - 0.06

mm. The vagina (fig. 3) is funnel shaped coiled, tubular, cuticularized structure and measures 0.03 - 0.04 mm. Egg is absent. Vitelline follicles are coextensive with intestinal crura.

Haptor (fig. 4) is well marked off from the body proper and measures 0.45 - 0.51 x 0.6 - 0.7 mm. Armature of haptor (fig. 5) consist of seven pairs of marginal hooklets, two pair of anchors, a single dorsal transverse bar and two pieces of ventral transverse bars. Dorsal anchors are juvenile type, large, having broad base, strong shaft with pointed curved tips and each measures 0.03 - 0.04 mm. These are further strengthened by wings at their shaft. The dorsal anchor are connected together by a single, long transvrse bar measures 0.04 - 0.05 mm. Ventral anchors are small, sickle shaped, base and shaft not well marked, each measures 0.025 - 0.031 mm. These anchors are connected by a set of transverse bars each measures 0.015 - 0.019 mm, above the dorsal bar. Marginal hooklets are small spiny and measures 0.05 - 0.07 mm.

Discussion

The present form belong to the genus *Silurodiscoides* (Achmerow, 1963) Gussev, 1976, on the basis of presence of a pair of seperate ventral transverse bars. Achmerow (1963) erected the genus *Parancylodiscoides*, since it was pre-occupied by Caballero and Bravo-Hollis, (1955). Yamaguti (1961) shifted it into genus *Pseudohaliotrema* Yamaguti, 1937 as a separate sub genus but kept the species valid *P. gigi* Yamaguti, 1937, but Gussev (1976), gave new combination of it and erected a genus *Silurodiscoides*, on the basis of having two pieces of ventral transverse bar, which was used as a generic character.

To the best of my knowledge following species are known under the genus from India and abroad. viz. *S. indicus* (Kulkarni, 1969), Gussev, 1976; *S. octotylus* (Kulkarni, 1969), Gussev, 1976; *S. aori* Rizvi, 1971; *S. sudhakari* Gussev, 1976; *S. devraji* Gussev, 1976; *S. malabaricus* Gussev, 1976; *S. vaginalis* Gussev, 1976; *S. pusillus* Gussev, 1976; *S. parvulus* Gussev, 1976; *Silurodiscoides* sp. Sharma and Sheikh, 1986 and *S. gussevi* Singh, Kumari and Agarwal, 1992. The present form differs from *S. indicus*, *S. octolytus*, *S. aori*, *S. sudhakari* by the presence of cephalic glands, it differ from *S. devraji*, *S. malabaricus*, *S. parvulus*, *S. vaginalis* by the different shape of male copulatory complex and presence of wings on anchors, further it differ from *S. gussevi* by having less number of head organs, shape of male copulatory complex and shape of anchors. Further it differs from *S. indicus* in shape of ventral anchor, vagina, cirrus, accessory piece of cirrus, presence of wings on dorsal anchors and absence of accessory piece on dorsal anchors; from *S. sudhakari* in absence of accessory piece on dorsal anchor, marginal hooklets without opposable piece, shape of ventral anchors and ventral transverse bar, *S. octotylus* in shape of accessory piece of cirrus, ventral anchor, ventral transverse bar, presence of wings on dorsal anchors, absence of accessory piece on dorsal anchors and shape of marginal hooklets, from *S. devraji* in shape of ventral anchor, cirrus, accessory piece of cirrus, absence of accessory piece on dorsal anchors and absence of wings on ventral anchors, ^{from} *S. malabaricus* in shape of ventral anchors, vagina, absence of accessory piece of cirrus, ventral connective bar, presence of wings on dorsal anchors, absence of accessory piece of dorsal anchors, absence of wings on ventral anchors and marginal hooklets without opposable piece,

from *S. vaginalis* in having different shape of ventral anchors, vagina, accessory piece of cirrus, presence of wings on the dorsal anchors, absence of accessory piece on dorsal anchors and marginal booklets without opposable piece, from *S. aori* in shape of ventral anchors, vagina, cirrus, presence of accessory piece of cirrus, presence of wings on dorsal anchors, *S. pusillus* in shape of ventral anchors, vagina, cirrus, accessory piece of cirrus, absence of accessory piece of dorsal anchors, absence of wings on dorsal anchors and marginal hooklets without opposable piece, *S. parvulus* in shape of ventral anchors, vagina, cirrus, accessory piece of cirrus, absence of accessory piece on dorsal anchors, absence of wings on ventral anchors and marginal hooklet without opposable piece and from *Silurodiscoides* sp. by the absence of accessory piece on dorsal anchors, presence of wings, shape of cirrus and accessory piece of cirrus, from *S. gussevi* by the shape of male copulatory organ, ovary, receptaculum seminis and anchors.

Therefore, the present form is described as a new species and named as *Silurodiscoides meerutensis* sp.nov.

***Silurodiscoides meerutensis* sp. nov.**

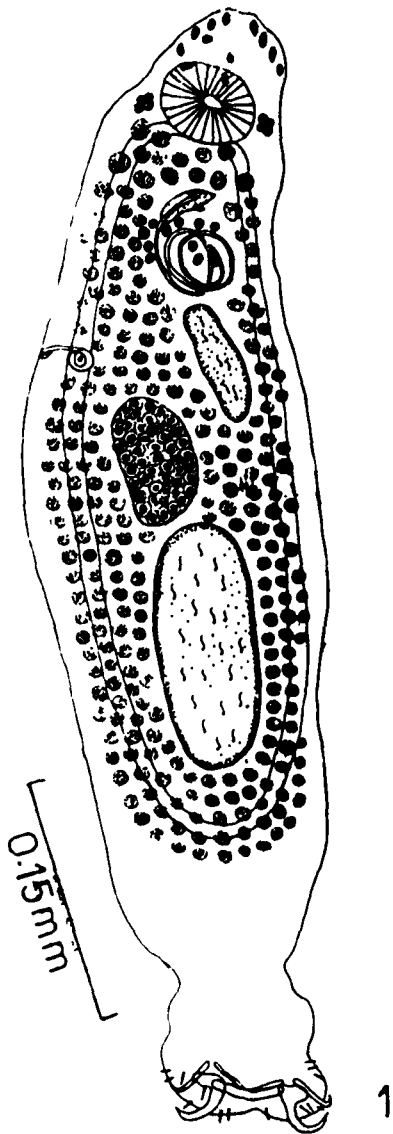


Fig 1 Entire worm (ventral view)

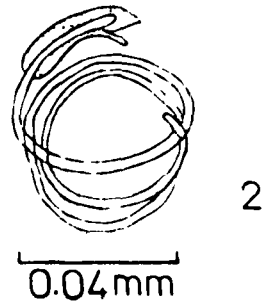


Fig 2 Copulatory complex enlarged

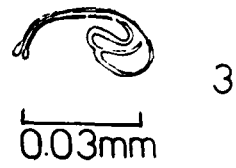


Fig 3 Vagina enlarged

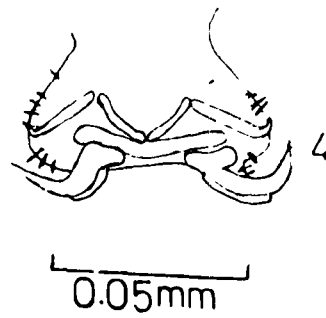


Fig 4 Haptor enlarged



Fig 5 Haptor armature enlarged

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SECTION B
DIGENEA (ADULT)

INTRODUCTION

Digenetic trematodes are animals of very low order of development in some respect and of very high specialization in others. From the standpoint of development and life history, the Digenea not only possess by far the most complex developmental cycle among the platyhelminthes, but also among all the members of the Animal Kingdom. They belong to that group of animals, in which the variation in the morphology presents a baffling situation for investigators. The variation in the body shape due to absence of skeletal structure is influenced by the body contraction, their attainment of body maturity and their chances to continue to grow as long as they can live. Therefore the specific determination in the group has posed a difficult problem. In the existing literature, there are a number of cases, in which the description of the species is based on incomplete worked out morphology, and specific diagnosis is based on characters of doubtful validity. These cases raise the issue of synonymy or of creating new taxonomic categories. These have to be discussed and established. Therefore in the present work an attempt has been made to study the digenetic trematodes of some commonly available fresh water fishes. Apart from restudy of already described forms, certain new species met during the course of study has also been described.

HISTORICAL REVIEW

Southwell (1913) for the first time described a piscine trematode viz., *Isoparorchis trisimillitubis* from *wallago attu* and *Barbus tor* at Calcutta. Subsequently, Verma (1927) described *Opisthorchis pedicellata* from *Bagarius yarrellii* and *Rita rita* and a number of Bucephalid worm from Allahabad. Thapar (1930) added a new genus *Gomtia piscicola* from *Bagarius yarrellii*, at Lucknow. In a subsequent Paper Thaper and Dayal (1935) described *Catylogonoporum orfeum* from *Leuciscus indicus*, at Lucknow.

Subsequently, following workers have added various trematode parasites of Indian fishes, viz., Srivastava (1933, 1934, 1935, 1935, 1935, 1936, 1937, 1937, 1938, 1938, 1938, 1939, 1941 and 1942) ; Pande (1934, 1937 and 1938); Harshey (1933, 1937) ; Bhalerao (1936, 1937, 1941, 1943) ; Verma (1936) ; Dayal (1930, 1935, 1938, 1938, 1939, 1942, 1944, 1948, 1949, 1950 and 1952) ; Singh (1950) ; Chatterjee (1933, 1948, 1953, 1953, 1957) ; Dayal and Gupta (1953) ; Chauhan (1943, 1945, 1947, 1949, 1953, 1953) ; Kaw (1943, 1944, 1945, 1950) ; Singh (1954); Gupta (1950, 1951, 1951, 1951, 1951, 1951, 1953, 1955, 1958, 1958, 1961 and 1962); Achan (1956); Gupta (1956) ; Jaiswal (1957); Gupta (1956, 1957, 1968, 1970 and 1977) ; Agarwal (1958, 1958) ; Gupta and Gupta (1959) ; Saxena (1958, 1960) ; Gupta and Srivastava (1960); Srivastava (1960); Motwani and Srivastava (1961) ; Srivastava (1962, 1962, 1963, 1963, 1968); Gupta (1963); Rai (1962, 1964); Prasad (1965) ; Agarwal (1963, 1964, 1964, 1966); Simha and Prasad (1964) ; Siddiqui (1965); Dwevedi (1965, 1965, 1966, 1966, 1967, 1968, 1968) ; Mukherjee and Chauhan (1967) ; Srivastava and Singh (1967); Srivastava and

Ghosh (1967, 1967, 1968) ; Karyakarte (1968); Rai and Pande (1968); Kakaji (1968, 1969, 1969) ; Tandon (1969) ; Sirkar & Sinha (1969) ; Chauhan and Dwevedi (1969) ; Fotedar (1970) ; Rai (1971, 1971, 1971, 1971, 1972, 1979) ; Gupta and Kumari (1970, 1970, 1970, 1970) ; Dwevedi and Chauhan (1970) ; Hafeezullah (1970, 1971) ; Hafeezullah and Siddiqui (1970); Gupta and Siddiqui (1970) ; Baugh and Chakrabarti (1970) ; Agarwal and Verma (1972) ; Pandey (1970, 1970, 1971, 1973, 1973, 1975) ; Madhvi (1972, 1972, 1974, 1975, 1976, 1978, 1978, 1979, 1979) ; Dandotia (1971, 1972, 1972) ; Verma (1973, 1973) ; Chauhan and Koche (1975) ; Gupta and Jahan (1975, 1976) ; Singh and Sinha (1975, 1976) ; Gupta and Ahmad (1976, 1976, 1978, 1978, 1979, 1979) ; Pande and Shukla (1976) ; Gupta and Gupta (1976) ; Kumari and Srivastava (1976) ; Agarwal and Kumar (1977) ; Karyakarte and yadav (1976 , 1977) ; Gupta and Verma (1976) ; Soota and Ghosh (1977) ; Yadav (1977, 1980) Hafeezullah (1979) ; Ahmad (1978, 1979, 1980, 1981, 1983, 1987) ; Mulay (1977) ; Sahay and Srivastava (1978) ; Lal (1978) ; Dhar (1978) ; Agarwal and Kumar (1979, 1981) ; Dandotia and Bhadauria (1979) ; Gupta (1979) ; Agarwal and Agarwal (1980, 1984, 1987) ; Agarwal and Singh (1980, 1980) ; Kumar and Agarwal (1980) ; Mehra (1980) ; Yadav (1977, 1980) ; Gupta and Puri (1980) ; Srivastava and Kapoor (1980) ; Ubdage and Agarwal (1980) ; Srivastava (1982) ; Agarwal and Dwevedi (1983) ; Agarwal and Agarwal (1984) ; Agarwal and Ahmad (1985) ; Rukimini and Madhavi (1987) ; Swarup and Jain (1987) ; Khan and Karyakarte (1987, 1987) ; Duggal and Bedi (1987) ; Prakash (1988) ; Agarwal and Kumar (1988) ; Agarwal and Agarwal (1989) ; Husain and Sahay (1990) ; Lokhande (1990) ; Gupta and Gupta (1990) ; Agarwal and Sharma (1991) ; Gupta and Jain (1991, 1992 , 1992) ; Tripathi and Johari (1991) ; Agarwal and Jain (1992) ; Hasnain (1992) ;

Maurya and Agarwal (1992) ; Gupta and Gupta (1992) ; Chisti and Bakshi (1992) ; Pandey, George and Peer Mohammad (1992) ; Madhvi, Meenakshi and Krishna Sai Ram (1993) ; Meenakshi, Madhvi and Swarn Kumari (1993) and Srivastava and Mukherjee (1994).

MATERIAL AND METHODS

During the survey of adult trematode parasites of fishes, host fishes from all the three localities were studied. The chief collection sites covered in this thesis were Lucknow, Lakhimpur Kheri, Faizabad and Meerut in Uttar Pradesh, India.

Fishes were purchased from local fish market. Immediately after the collection, the host body was brought to the laboratory and the parasites were collected usually within one hour after the death of the host fish. All the possible sites of infection were searched for the parasites. Eye, nasal and buccal cavities were examined first with a hand lens to collect any parasites if present. Gut of host was cut open in a big petridish and parasites were collected in normal saline and the content were washed several times with fresh tapwater. Larger parasites visible to the naked eye were picked up with the help of fine glass dropper and remaining material was examined under dissecting binocular microscope for collecting the rest of the parasites. To release worms which occurs firmly attached with the gut wall, the wall was seperately examined and scrapped gently. Liver, gall bladder, blood vessel, urinary bladder, and kidney were also examined separately.

Parasites immediately after collection were washed and transferred to a clean petridish of saline and examined in live conditions, with or without using vital stains such as 0.1% neutral red. After that, parasites were narcotized and fixed in well streched condition under pressure of a cover glass in 70% alcohol for 12 hours. Preserved worms were thoroughly washed in running tapwater to remove alcohol and then placed in Acetoalum carmine or Borex carmine for staining. After staining the worms were differentiated. dehydrated in ascending grades

of alcohol, cleared in xylol and mounted in Canada balsam. Measurements of various organs of the worms were taken with the help of calibrated ocular micrometer. All the measurements are given in millimeter. Diagrams were made with the help of Camera lucida.

Table 5 : The appended table shows name and number of fishes examined and name and number of parasites (Adult digeneans) obtained during the course of study (1994 - 1997)

S.No.	Host	Host Examined	Host Infected	Parasite Obtained	Worm Collected	Locality
1	<i>Xenentodon cancila</i> (Ham)	635 (T) LKO-348 FZD-187 LMP-50 MRT-50	150 (T) LKO-105 FZD-30 LMP-15	<i>Bucephalopsis karvie</i> Bhalerao, 1937	500 (T) LKO-270 FZD-120 LMP-100	Lucknow, Faizabad and Lakhimpur kheri, UP
2	"		100(T) LKO-85 LMP-15	<i>Phyllostomum vachius</i> Dayal, 1949	250 (T) LKO-217 LMP-33	Lucknow and Lakhimpur kheri, UP
3	"		3	<i>Nicolla srivastavi</i> sp nov	9	Lucknow, UP
4	"		2	<i>Peracreadium thapari</i> sp nov	3	Lucknow, UP
5	<i>Mastacembelus armatus</i> (Lace)	280(T) LKO-190 FZD-60 LMP-30	3	<i>Allocreadium chauhanisp</i> nov	8	Lucknow, UP
6	<i>Heteropneustes fossilis</i> (Bloch)	150 (T) LKO-140	3	<i>Allocreadium gomtii</i> sp nov	9	Lucknow, UP
7	"	LMP-10	3	<i>Neopodocotyle singhi</i> sp nov	4	Lucknow, UP
8	<i>Clarias batrachus</i> (Linn)	50(T) LKO-35 LMP-15	2	<i>Masenia indica</i> sp nov	3	Lucknow, UP
9	"		1	<i>Opisthorchis guptai</i> sp nov	2	Lakhimpur-kheri, UP
10	<i>Oxygaster bacaila</i> (Ham)	50(T) LKO-40 FZD-10	5 (T) LKO-4 FZD-1	<i>Eucreadium oxygasteri</i> sp nov	11 (T) LKO-9 FZD-2	Lucknow and Faizabad, UP
11	<i>Ompok bimaculatus</i> (Bloch)	25	3	<i>Pleurogenoides hanumanthai</i> sp nov	9	Lucknow U P

**OBSERVATION
AND
DISCUSSION**

***Bucephalopsis karvei* Bhalerao, 1937**

Host	: <i>Xenentodon cancila</i> (Ham)
No. of host examined	: 635(LKO-348, LMP-50, FZD-187, MRT-50)
No. of host found infected	: 150 (LKO-105, LMP-15, FZD-30)
No. of worms collected	: 500(LKO-270, LMP-100, FZD-120)
Site of infection	: Intestine
Locality	: Lucknow, Lakhimpur-kheri, Faizabad

Body is elongated fusiform to sub cylindrical with spinose cuticle and measures 0.70 - 1.10 x 0.28 - 0.48 mm. Rhynchus is sucker like, rounded, muscular, without tentacular appendages and measures 0.09 - 0.16 x 0.11 - 0.25 mm. Mouth is located in post-equatorial part of body at the level of posterior testis. Oesophagus is short and measures 0.04 - 0.08 x 0.02 - 0.04 mm. Intestine is sac like and located anterior to mouth.

Testes are two, one located one behind the other, post ovarian, post-equatorial and rounded in shape. Anterior testis measures 0.08 - 0.16 x 0.08 - 0.14 mm and posterior testis measures 0.07 - 0.21 x 0.09 - 0.14 mm. Cirrus sac is thick, muscular, slightly curved at the beginning and extend up to the level of posterior region of first testis and measures 0.27 - 0.41 x 0.05 - 0.13 mm. It encloses an elongated vesicula seminalis measures 0.15 - 0.28 x 0.03 - 0.07 mm in length and pars prostatica measures 0.05 - 0.15 x 0.01 - 0.03 mm. The pars prostatica opens into ductus ejaculatorius. A genital tongue is present. Cirrus opens at genital pore located at 0.04 - 0.16 mm from the posterior end of the body.

Ovary is rounded in outline, situated in pre-equatorial region of body, pretesticular and measures 0.07 - 0.12 x 0.07 -

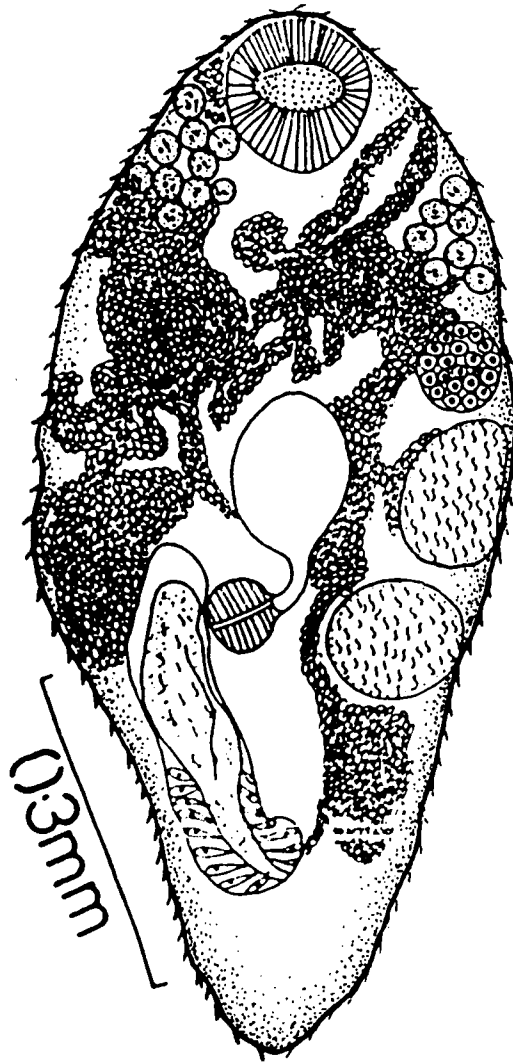
0.09 mm. Receptaculum seminis is not visible. Vitelline follicles are circular in outline and distributed in the form of two groups. Each of this group is situated on the either side of rhynchus in anterior region of the body. The ascending and descending limbs of uterus occupy almost entire space of the body. Eggs are small innumerable, operculated, golden yellow in colour and measure 0.005 - 0.007 x 0.002 - 0.003 mm. Excretory vesicle is tubular with terminal excretory pore located at posterior extrimity of the body.

Discussion

Bhalerao (1937) described *B. karvei* from the intestine of fish *Xenentodon cancila*, at Poona. Subsequently, Gupta (1958) redescribed *B. karvei* from the type host at Lucknow and recorded variation particularly in the disposition and size of gonads and extension of vitellaria. This is another record of the worm from Lucknow, Lakhimpur. kheri and Faizabad. The specimens of *B. karvei* at the disposal of the writer shows variation in the body size, disposition and size of gonads, vitellaria and extension of cirrus sac depending upon the maturity of the worm and contraction of body at the time of fixation. Chauhan and Khoche (1975) described *B. gaurai* from the intestine of *Xenentodon cancella* (Ham.) at Jabalpur. It is characterised by the position of ovary and extension of vitelline follicle as above stated variable features. Therefore, the writer regards *B. gaurai* Chauhan and Koche, 1975 a synonym of *B. karvei*. The record of *B. karvei* from Faizabad and Lakhimpur kheri district, U.P. appears to be new localities for the worm.

Bucephalopsis karvei

Bhalerao, 1937



Entire worm (Ventral view)

***Phyllodistomum vachius* Dayal, 1949**

Host	: <i>Xenentodon cancila</i> (Ham.)
No. of host examined	: 635 (LKO-348, FZD-187, LMP-50, MRT-50)
No. of host found infected	: 100 (LKO-85, LMP-15)
No. of worms collected	: 250 (LKO-217, LMP-33)
Location	: Urinary Bladder
Locality	: Lucknow, Lakhimpur Kheri.

Immature Worms

Body is foliate (Fig. 1) with narrow anterior and broad posterior end and measures 0.99 - 2.83 x 0.20 - 0.27 mm. Oral sucker is terminal, circular in shape and measures 0.14 - 0.17 x 0.14 - 0.16 mm. Ventral sucker is larger than the oral sucker, rounded and measures 0.20 - 0.22 x 0.20 - 0.21 mm. Pharynx absent. Oesophagus is straight and measures 0.17 - 0.20 x 0.02 mm. Intestinal caeca extend up to the hind end of the body.

Gonads are located in the hind region of the body. Testes are oval with entire margins. Anterior testis smaller than the posterior testis, and measures 0.06 - 0.08 x 0.07 - 0.08 mm and posterior testis measures 0.08 - 0.14 x 0.05 - 0.07 mm. Cirrus sac lies free in parenchyma. Pars prostatica and ejaculatory ducts are poorly developed. Ovary is pretesticular, indented and measures 0.07 - 0.09 x 0.06 - 0.08 mm. Vitelline follicles are elongated, oval masses situated just behind the ventral sucker. Uterus absent. Genital pore is situated behind the intestinal bifurcation. Eggs are absent. Excretory bladder is large, tubular and opens by a terminal excretory pore.

Mature Worms

Foliate body (Fig. 2) has a narrow, elongated anterior region and broad, foliate posterior region and measures 0.99 - 2.77 x 0.37 - 1.09 mm. The Oral sucker is terminal, circular and measures 0.14 - 0.29 x 0.14 - 0.32 mm. Ventral sucker is larger than the oral sucker and measures 0.20 - 0.31 x 0.20 - 0.35 mm. Oesophagus straight and measures 0.18 - 0.20 mm. Intestinal caeca extend up to the hind end of the body.

Gonads are located behind the ventral sucker in the hind region of the body. Testes are irregularly lobed. Anterior testis is smaller than posterior testis measures 0.16 - 0.30 x 0.12 - 0.26 mm, while the posterior testis measures 0.18 - 0.33 x 0.14 - 0.30 mm. Cirrus sac absent. Vesicula seminalis oval or bipartite structure and lies free in the parenchyma, anterior to the ventral sucker. The pars-prostatica and ejaculatory ducts are short. Ovary pretesticular, oval or rounded in shape and measures 0.08 - 0.25 x 0.09 - 0.16 mm. Vitelline follicles are elongated, oval, lobed masses, situated behind the ventral sucker. Uterus extend up to the hind end of the body filling most of the space of the body below the genital organs. Genital pore is located just below the intestinal bifurcation. Eggs are oval, numerous and arranged in strings, and measures 0.02 - 0.03 x 0.025 - 0.05 mm. Excretory bladder is tubular and opens by a terminal excretory pore.

Discussion

Dayal (1949) described *Phyllodistomum vachius* found in the urinary bladder of *Eutropiichtys vacha*, at

Lucknow. Subsequently, it was recorded by Pandey (1973) from the urinary bladder of *H. fossilis* at Lucknow. This is another record of the worm from fish *Xenentodon cancila* from type locality and a new locality district Lakhimpur Kheri, U.P. The present form differs from the original account in features like straight oesophagus, more or less equal testes and tubular excretory bladder. The looped oesophagus described by Dayal (1949) appears to be due to contraction in the anterior part of the body. The specimen at disposal of writer shows variation in size of body, ratio of suckers position of gonads, shape of vesicula seminalis and puckering on the body.

To the best of my knowledge so far, the following species of genus *Phyllodistomum* have been described from India viz., *P. lewisi* Srivastava, 1938; *P. vachius* Dayal, 1949; *P. loosi* Kaw, 1950; *P. singhai* Gupta, 1953; *P. vittatusi* Gupta, 1955; *P. pararchis* Jaiswal, 1957; *P. indicum* Jaiswal, 1957; *P. chauhani* Motwani and Srivastava, 1961; *P. tripathi* Motwani and Srivastava, 1961; *P. srivastavai* Rai, 1964; *P. camaroni* Agarwal, 1966; *P. lucknowensis* Pandey, 1970 and *P. longicephalus* Sinha, 1975; and Out of these Rai (1971) has considered the following species valid viz., *P. lewisi* Srivastava, 1938 (P.sp. Bhalerao) *P. tripathi* Motwani and Srivastava, 1961 (= *P. singhai* Gupta 1953), *P. vachius* Dayal, 1949 (= *P. vittatusi* Gupta, 1949) and *P. chauhani* Motwani and Srivastava, 1961; *P. loosi* Kaw, 1950 (= *P. camaroni* Agarwal, 1966) *P. srivastavai* Rai, 1964, *P. lucknowensis* Pandey, 1970. On the perusal of literature it appears that *P. tripathi*, *P. loosi*, *P. pararchis*, *P. indicum*, *P. srivastavai*, *P. lucknowensis* and *P. longicephalus* closely resembles with *P. lewisi*. They are not valid in view of the variable characters like size of the body, ratio of suckers, position of gonads, shape of

seminal vesicle and puckerings on the body on which they are based. They are therefore considered synonyms of *P. lewisi*. The other Indian species is *P. vachius*.

***Phyllodistomum vachius* Dayal, 1949**

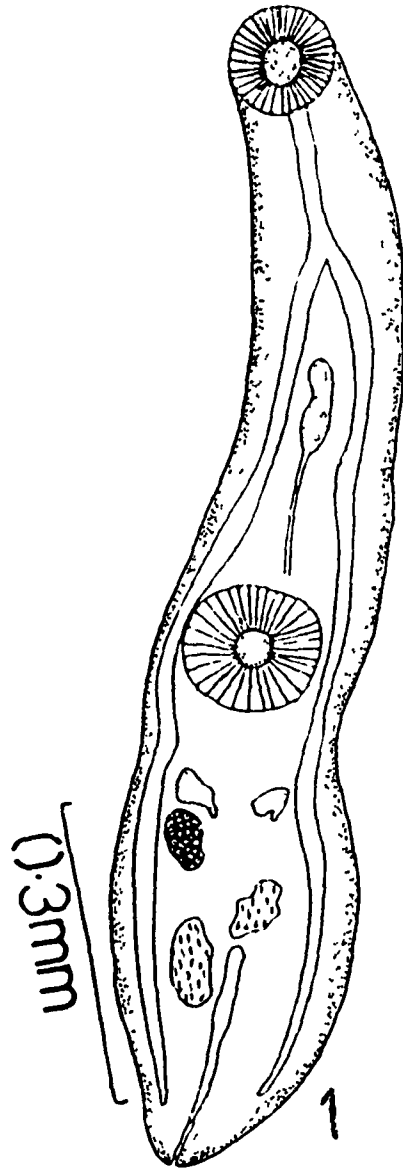


Fig 1 Immature worm (Ventral view)

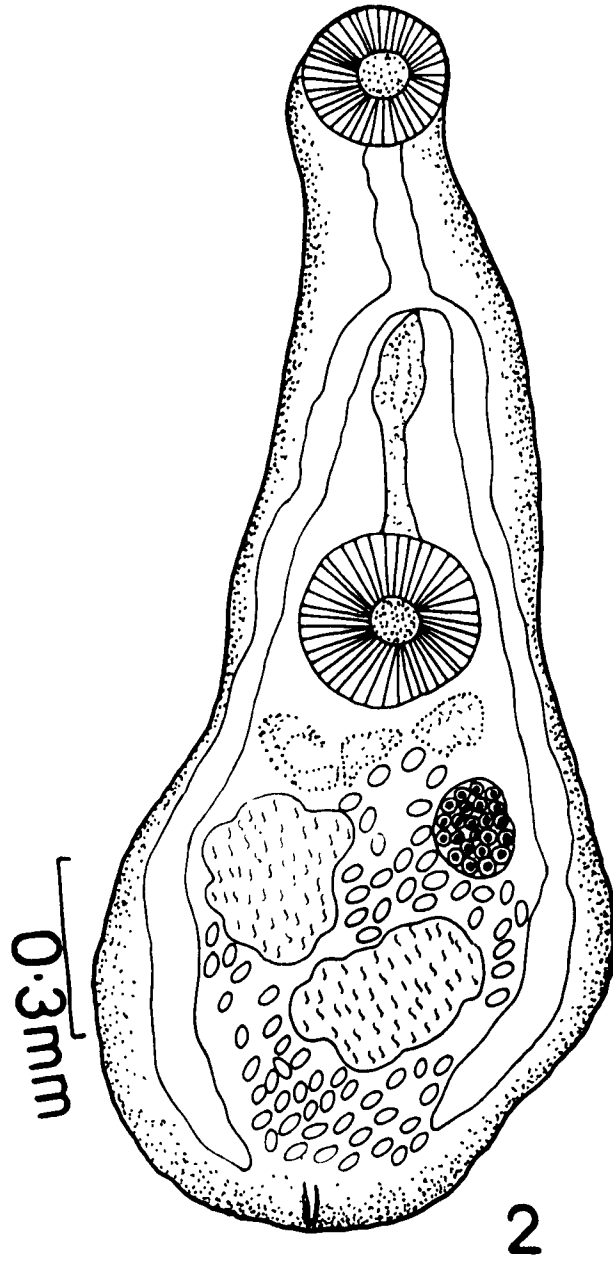


Fig 2 Mature worm (Ventral view)

***Nicolla srivastavi* sp.nov.**

Host	: <i>Xenentodon cancila</i> (Ham.)
No. of host examined	: 635(LKO-348,FZD-187,LMP-50,MRT-50)
No. of host found infected	: 3
No. of worms collected	: 9
Site of infection	: Intestine
Locality	: Lucknow

Body is (Fig.1) smooth, foliate with blunt anterior end and rounded posterior end and measures 0.62 - 1.04 x 0.22 - 0.45 mm. Oral sucker is subterminal, rounded and measures 0.06 - 0.12 x 0.06 - 0.13 mm. Ventral sucker is pre equatorial, more or less rounded, larger than the oral sucker and measures 0.10 - 0.18 x 0.11 - 0.18 mm. Prepharynx is absent Pharynx is well developed, globular, muscular and measures 0.04 - 0.10 x 0.05 - 0.09 mm. Oesophagus moderately developed, slender and measures 0.03 - 0.12 mm. Intestinal caeca simple, reaching up to the hind region of the body, where they are confluent.

Testes are triangular or oval and post-equatorial. Anterior testis triangular and measures 0.05 - 0.12 x 0.05 - 0.17 mm. while the posterior one is bilobed and measures 0.06 - 0.12 x 0.07 - 0.17 mm. Cirrus sac long, enclosing long saccular vesicula seminalis extend up to or above the point of intestinal bifurcation and measures 0.17 - 0.36 x 0.03 - 0.06 mm. Cirrus poorly developed. Genital pore is situated at the level of intestinal bifurcation. A small receptaculam seminis is present in front of ovary. Ovary is oval or transversely elongated, pretesticular and measures 0.03 - 0.08 x 0.06 - 0.14 mm. Uterus limited, equatorial confined from the level of ventral sucker up

to the ovary and opens at genital pore by metraterm. Shell glands numerous and surrounds the ootype. Eggs (fig. 2) oval, yellow in colour, without polar filament and measures 0.06 x 0.03 - 0.04. Vitelline follicles extends from the level of intestinal bifurcation up to the hind end of the body where they becomes confluent.

Discussion

Wisniewski, 1933 established the genus *Nicolla* for the worms collected from various fishes by Iwanitzky (1928) with *N. skrjabini* as type species. Subsequently, following species have been added to the genus viz., *N. skrjabini* Iwanitzky, 1928; *N. macrostomum* Pigulewsky, 1931; *N. testiobliqua*, Wisniewski, 1933; *N. ovata* (Pigulewsky, 1931), Wisniewski, 1933; *N. gallica* Dollfus, 1941; *N. wisniewskii* Slusarski, 1958; *N. timoni* Rebecq et Giudicelli, 1959; *N. allahabadensis* Srivastava, 1968; *N. halichoeri* Overstreet, 1969; *N. indica* Srivastava, 1969. The present form shows close resemblance with *N. allahabadensis*, *N. indica* and *N. skrjabini*. But it differs from *N. allahabadensis* by the absence of prepharynx, shape of ventral sucker and gonads and extension of vitellaria. It differs from *N. indica* by the absence of finger like intestinal bulb, absence of prepharynx and shape of the body. Further more it differs from *N. skrjabini* Iwanitzky, 1928 the species described from foreign land by the shape of gonads, extension of vitellaria and position of receptaculum seminis.

Therefore, the present form is regarded as a new species and named as *Nicolla srivastavi* sp.nov.

Nicolla srivastavi sp. nov.

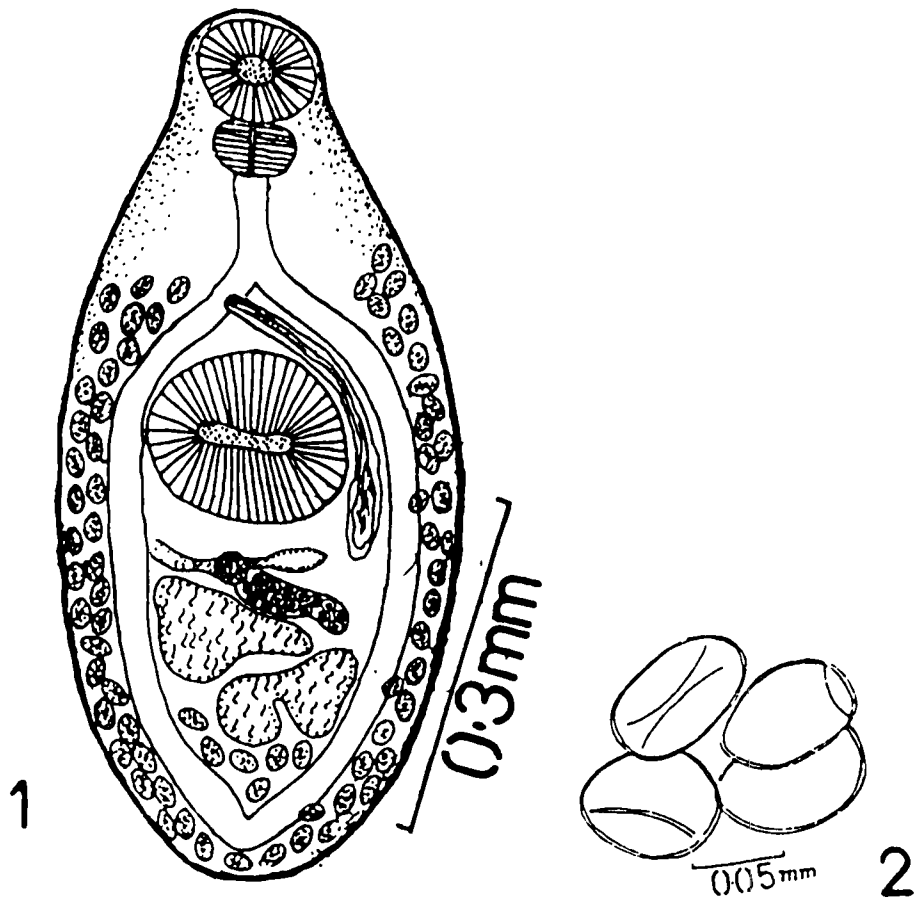


Fig 1 Entire worm (Ventral view)

Fig 2 Eggs enlarged

***Peracreadium thapari* sp.nov.**

Host	: <i>Xenentodon cancila</i> (Ham)
No. of host examined	: 635(LKO-348, FZD-187, LMP-50, MRT-50)
No. of host found infected	: 2
No. of worms collected	: 3
Site of infection	: Intestine
Locality	: Lucknow.

Body is (Fig. 1) long, elliptical, broadest at the level of ventral sucker, tapering at the both ends and measures 1.25 - 2.40 x 0.33 - 0.54 mm. Suckers are well developed. Oral sucker is terminal, rounded or oval in shape and measures 0.09 - 0.11 x 0.12 - 0.13 mm. Ventral sucker is preequatorial larger than the oral sucker, rounded and measures 0.23 - 0.28 x 0.22 - 0.27 mm in diameter. Mouth directly leads into a well developed prepharynx measuring 0.045 - 0.0375 in length. Pharynx is gobular, muscular and measures 0.06 - 0.08. Oesophagus present measures 0.04 - 0.11 x 0.03 - 0.04 mm. Intestinal caeca reaching up to near about the posterior extremity of the body.

Gonads are situated behind the middle of the body. Testes are transversely oval and more or less equal in size. Anterior testis measures 0.08 - 0.09 x 0.15 - 0.16 mm, while the posterior one measures 0.10 - 0.10 x 0.14 - 0.15 mm. Cirrus sac fig. (2) elongated, crescent shaped located on the postero lateral side of the ventral sucker up to the point of intestinal bifurcation and measures 0.15 - 0.40 x 0.07 - 0.09 mm and it encloses a saccular vesicula seminalis followed by pars prostatica and a long ejaculatory duct. Ovary is oval, post-equatorial, horizontally placed just above the anterior testis, smaller than the testes and measures 0.04 - 0.06 x 0.08 - 0.12

mm. Uterus located between ovary and ventral sucker containing small oval uterine follicles and opens at genital pore just below the intestinal bifurcation.

Eggs are oval, yellow in colour, operculated and measures 0.04 - 0.06 x 0.03 - 0.05 mm. Excretory bladder is tubular and opens out side through a terminal excretory pore at the posterior end of the body. Vitelline follicles extend laterally from the level of oesophagus up to the hind body, where they merge together.

Discussion

Nicoll, 1909 erected the genus *Peracreadium* for the worm collected from fish *Rita rita* with *P. genu* as type species. To the best of my knowledge so far following species are reported under the genus *Peracreadium* Nicoll, 1909 viz., *P. genu* (Rudolphi, 1819) Nicoll, 1909; *P. perezii* Mathias, 1926; *P. shawi* (Mentosh, 1939) Winter, 1959 ; *P. mycteropercae* (Sogandares Bernal, 1959) Pritchard, 1966 and *P. guptai* Kakaji, 1969. Only a single species that is *P. guptai* is reported from India. The present form differ from it in the presence of a pre-pharynx, ratio of suckers, shape of testes and extension of uterus.

Therefore, the present form is regarded as a new species and named as *Peracreadium thapari* sp.nov.

Peracreadium thapari sp. nov.

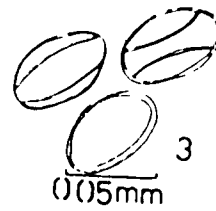
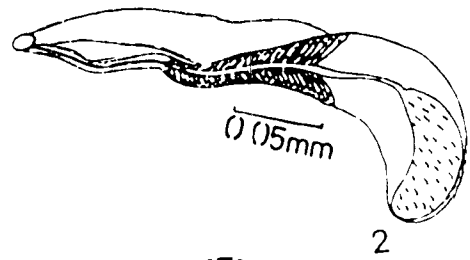
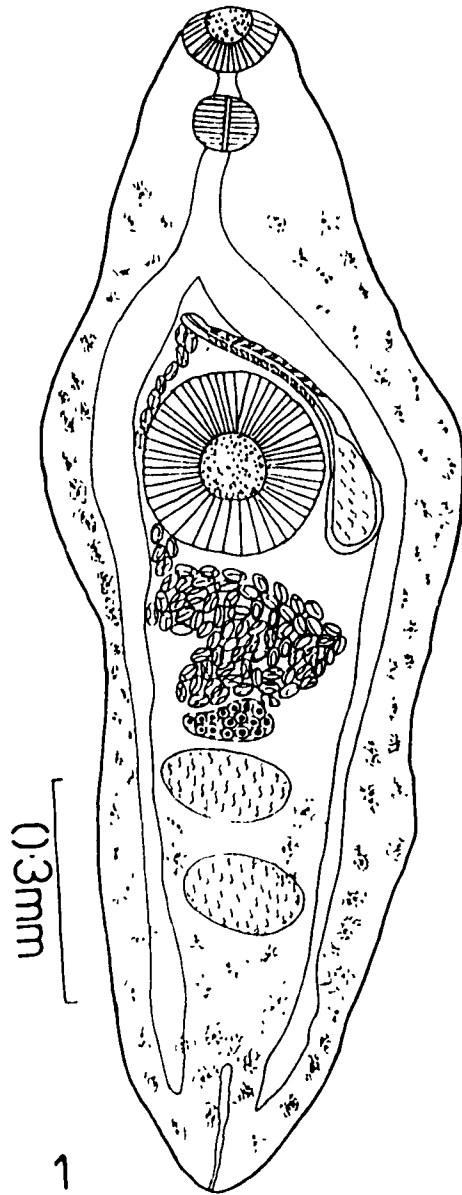


Fig 1 Entire worm (Ventral view)

Fig 2 Cirrus enlarged

Fig 3 Eggs enlarged

***Allocreadium chauhani* sp.nov.**

Host	: <i>Mastacembalus armatus</i> (Lace)
No. of host examined	: 280 (LKO-190, FZD-60, LMP-30)
No. of host found infected	: 3
No. of worm collected	: 8
Site of infection	: Intestine
Locality	: Lucknow

Body is elongated (Fig. 1) tapered at both the ends with aspinose cuticle and measures 3.7 - 5.7 mm in length and 0.7 - 0.8 mm in maximum width. Suckers are well developed. Oval sucker is spherical, subterminal and measures 0.26 - 0.48 - 0.30 - 0.44 mm. Ventral sucker is smaller to the oral sucker, pre equatorial and measures 0.27 - 0.33 - 0.28 - 0.31 mm. ϵ globular and muscular pharynx measures 0.13 - 0.15 x 0.12 - 0.17 mm is present. Oesophagus of varied length is present and measures 0.01 - 0.3 x 0.09 - 0.12 mm. Intestinal caeca reaching up to the posterior extremity of the body.

Testes large, rounded to oval, post-equatorial and nearly equal in size. The anterior testis measures 0.38 - 0.50 x 0.32 - 0.35 mm while the posterior one measures 0.38 - 0.52 x 0.32 - 0.38 mm. An elongated, crescent shaped cirrus sac lies on left lateral side of the ventral sucker, extending from just anterior to the ovary up to the level of intestinal bifurcation and measures 0.49 - 0.80 x 0.14 - 0.19 mm. It encloses a saccular vesicula seminalis followed by pars prostatica surrounded with numerous prostate gland cells and a long ejaculatory duct. Ovary is rounded, just below the cirrus sac, preequatorial in position and measures 0.17 - 0.27 x 0.18 - 0.23 mm. A well developed, pyriform seminal receptacle present on the postero-

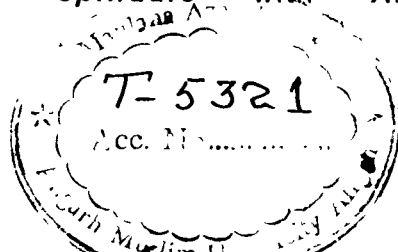
lateral side of ovary and measures 0.31 - 0.43 x 0.09 - 0.17 mm
Eggs are large, yellow in colour and measures 0.04 - 0.06 x
0.04 - 0.05 mm. Uterus is pretesticular, intercaecal and opens at
genital pore located just ahead of ventral sucker. Vitellaria
present on both the lateral side of the body extending from the
posterior margin of ovary up to the hind end of the body and in
the posterior body, below testis vitellaria of both sides unite and
partly cover the intestinal caeca.

Discussion

To the best of my knowledge so far following species
are described from India under the genus *Allocreadium* Looss,
1900. *A. annandalei* Southwell, 1913; *A. handiai* Pande, 1937;
A. nicolli, *A. kosia*, *A. schizothoracis*, *A. mahasheri*, Pandey
1938 ; *A. thapari* Gupta, 1950 ; *A. nemachilus* Kaw, 1950; *A.*
mehrai Gupta, 1956; *A. kamalai* Gupta, 1956; *A. spindale*
Saxena, 1958; *A. ophiocephali* Srivastava, 1960, *A. makundi*,
Gupta, 1961 ; *A. dollfusi* Rai, 1962; *A. singhi* Rai, 1962; *A.*
hirnai Rai, 1962; *A. heteropneustusius* Agarwal, 1964; *A.*
lucknowensis Gupta and Chakrabarti, 1967; *A. fasciatusi* and
A. guptai Kakaji, 1969; *A. catlai* Kakaji, 1969; *A. indicum*
Deshmukh, 1980 and *A. fotedari* Dhar and Kharoo, 1984.

Kakaji (1969) synonymised *A. ophiocephali*
Srivastava, 1960 with *A. handai*, *A. mahaseri* Pandey, 1938
with *A. nicolli* and *A. spindale* Saxsena, 1958 with *N. mehrai*
However, Yamaguti (1971) erected a new genus Viz ,
Pseudoallocreadium for *A. spindale* to which I also agree.

Out of the above listed species, Rai (1970)
synonymised *A. spindale* with *A. mehrai*, *A.*



heteropneustusius with *A. handai*, *A. makundi* with *A. mahaseri* and considered the following eight species valid *A. handai* Pande, 1937; *A. nicolli* Pande, 1938; *A. kosia* Pande, 1938; *A. mahaseri* Pande, 1938; *A. schizothoracis* Pande, 1938; *A. nemacheilus* Kaw, 1950 ; *A. mehrai* Gupta, 1956; and *A. kamalai* Gupta, 1956; Subsequently Gupta and Verma (1976) added three new species viz. *A. mrigalai* Gupta and Verma, 1976; *A. saranai* Gupta and Verma, 1976 and *A. baranai* Gupta and Verma, 1976; further more, Kalyankar and Deshmukh (1980), without giving reasons again retained all the species listed by Kakaji (1969) valid and have followed Kakaji (1969) regarding the synonym of various species suggested by her. However, I differ from Kalyankar and Deshmukh (1980) and agree with Rai (1962) in retaining the following species valid as they are based on several specific features.

1. *A. handai* Pande, 1937 (Syn: *A. heteropneustusius* Agarwal, 1964);
2. *A. mahaseri* Pande, 1938 (Syn: *A. makundi*, Gupta, 1961);
3. *A. schizothoracis* Pande, 1938;
4. *A. nicolli* Pande, 1938;
5. *A. kosia* Pande, 1938;
6. *A. nemacheilus* Kaw, 1950;
7. *A. mehrai* Gupta, 1956 (Syn: *A. spindale*, Saxena 1958);
8. *A. kamalai* Gupta, 1956;
9. *A. fasciatusi* Kakaji, 1969;
10. *A. guptai* Kakaji, 1969;
11. *A. catlai* Kakaji, 1969;

The present form differ from *A. mehrai* and *A. spindale* in the extension of vitelline follicles. It differs from *A. handai* in the ratio of suckers and extension of vitellaria, from *A. heteropneustusius* by the shpe and extension of cirrus sac, from *A. mahaseri* by the ratio of suckers (suckers are equal in *A. mahaseri*), from *A. makundi* by the relative size of the testes and shape of cirrus sac, from *A. nemacheilus* in the extension of vitellaria (vitallaria extends from the anterior end of the ventral sucker up to the hind end of the body), from *A. schizothoracis*, *A. mahseri*, *A.kosia* and *A. nicolli* by the position of genital pore (genital pore on the anterior margin of ventral sucker in the present form instead of on the intestinal bifurcation as in the above stated species), from *A. kamalai* by the extension of vitellaria (vitellaria extend from hind end of the oral sucker up to the posterior end of the body in *A. kamalai*), from *A. fasciatusi* and *A. guptai* by the extension of cirrus sac, position of genital pore and relative position of ovary and testes and lastly from *A. catlai* by the extension of vitellaria and shape and position of cirrus sac.

Therefore, the present form is regarded as a new species and named as *Allocreadium chauhani* sp.nov.

Allocreadium chauhani sp. nov.

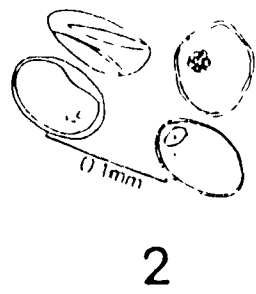
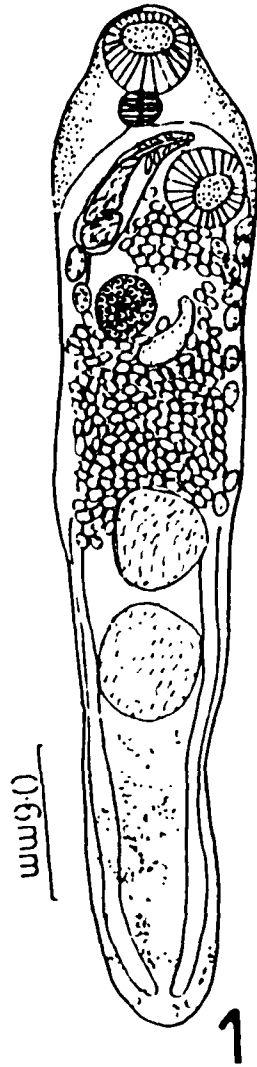


Fig 1 Entire worm (Ventral view)

Fig 2 Eggs enlarged

***Allocreadium gomtii* sp.nov.**

Host	: <i>Heteropneustes fossilis</i> (Bloch)
No. of host examined	: 150 (LKO-140,FZD-10)
No. of host found infected	: 3
No. of worms collected	: 9
Site of infection	: Intestine
Locality	: Lucknow

Body elongated, smooth with rounded anterior end and pointed posterior end and measures 1.73 – 2.50 x 0.40 – 0.55 mm. Oral sucker terminal, rounded and measures 0.20 – 0.25 x 0.22 – 0.30 mm. Ventral sucker is smaller than oral sucker, pre-equatorial, circular and measures 0.20 – 0.22 x 0.18 – 0.25 mm. Well developed, globular and muscular pharynx present and measures 0.08 – 0.15 x 0.10 – 0.15 mm. Oesophagus absent. Intestinal caeca reaches up to the posterior extremity of the body.

Testes rounded or oval, post-equatorial and tendom. Anterior testis measures 0.16 – 0.25 x 0.15 – 0.20 mm, posterior testis smaller and measures 0.15 – 0.22 x 0.13 – 0.20 mm. Well developed elongated cirrus sac is present anterior to the ventral sucker and measures 0.30 – 0.43 x 0.10 – 0.15 mm. It encloses an oval vesicula seminalis pars-prostatica surrounded by a number of prostate gland cells and a long, narrow ejuaculatory duct. Ovary rounded, pre-equatorial, pretesticular and measures 0.10 – 0.15 x 0.10 – 0.15 mm. Receptaculum seminis is pear shaped, lies in between the anterior testis and ovary and measures 0.08 – 0.10 x 0.10 – 0.12 mm. Uterus is located between the anterior testis and ventral sucker. Eggs are few large yellow, operculated and measures 0.11 – 0.20 x 0.08 –

0.11 mm. The genital pore is located at the anterior margin of ventral sucker vitellaria extensive extending from the level of ventral sucker up to the hind body where they merge together covering the intestinal caeca. The excretory bladder is "Y" shaped and excretory pore is terminal.

Discussion

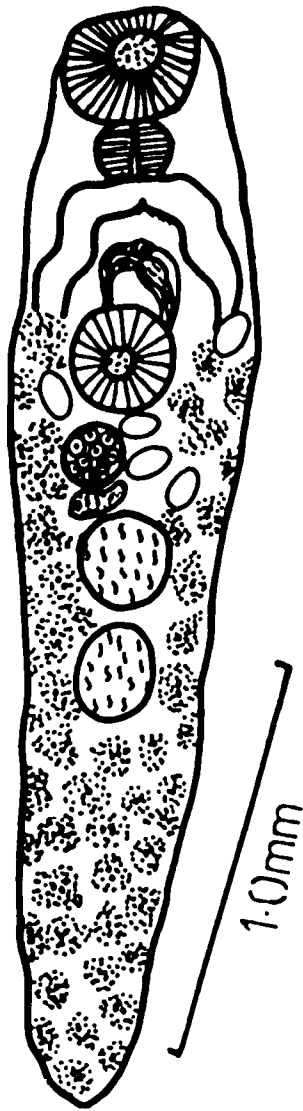
Looss (1900) erected the genus *Allocreadium* for the worms collected from *Cyprinus carpio*, *Carassius carassuis*, *Phoxinus laevis*, *Leuciscus rutilus*, *L. idus*, *A. bramis brama*, *Alburnus alburnus*, *Nemachellus barbatulus*, *Squalius cephalus*, *Blicca bjorkna*, *Tinca vulgaris*, *Esox lucius*, *Barbus gobio*, *Chandrostoma* and *Scardinius* with *A. isoporum* as a type species.

To the best of my knowledge so far following species are described from India under the genus of *Allocreadium* Looss, 1900; viz., *A. annandalei* Southwell, 1913; *A. handiai* Pande, 1937; *A. nicolli*, *A. kosia*, *A. schizothoracis*, and *A. mahasheri* Pande, 1938; *A. thapari* Gupta, 1950; *A. nemachielus* Kaw, 1950; *A. mehrai* Gupta, 1956; *A. kamalai* Gupta, 1956; *A. spindale* Saxena, 1958; *A. ophiocephali* Srivastava, 1960; *A. makundi* Gupta, 1961; *A. dollfusi* Rai, 1962; *A. singhi* Rai, 1962; *A. hirnai* Rai, 1962; *A. heteropneustus* Agarwal, 1964; *A. lucknowensis* Gupta and Chakrabarti, 1967; *A. guptai*, *A. fasciatus* and *A. catlai* Kakaji, 1969; *A. indicum* Deshmukh, 1980 and *A. fotedari* Dhar and Kharoo, 1984.

The present form differ from *A. annandalei*, *A. handiai*, *A. nicolli*, *A. schizothoracis*, *A. mahaseri*, *A. thapari*, *A. nemachellus*, *A. dollfusi*, *A. singhi*, *A. hirnai*, *A. hetropneustosis*, *A. spindale*, *A. mehrai* and *A. kamalai* in the extension of vitelline follicle. The present form further differ from *A. kosia* and *A. mahseri* by the absence of an oseophagus and by the position of genital pore, from *A. mehrai* by the ratio of suckers and by the position of receptaculum seminis, from *A. singhi* by the ratio of sucker and absence of pre-pharynx, from *A. macundi* and *A. heteropneustusius* by the relative size of testes, from *A. fasciatusi* and *A. gupati* by the extension of vitalline follicles, absence of pre pharynx and oseophagus. It further differ from *A. fasciatusi* by the ratio of suckers, position of seminal vesicle and shape and position of cirrus sac, from *A. gupati* and *A. catlai* by the ratio of suckers, extension of cirrus sac and position of genital pore, shape and position of receptaculum seminis. Lastly, the present form differ from *A. lucknowensis*, *A. indicum* and *A. fotedari* in the extension of vitteline follicle, shape and extension of cirrus sac and position of genital pore.

Therefore, the present form is regarded as a new species and named as *Allocreadium gomtli* sp. nov.

Allocreadium gomtii sp. nov.



Entire worm (Ventral view)

Neopodocotyle singhi sp.nov.

Host	: <i>Heteropneustes fossilis</i> (Bloch)
No. of host examined	: 150 (LKO-140,LMP-10)
No. of host found infected	: 3
No. of worms collected	: 4
Site of infection	: Intestine
Locality	: Lucknow

Body is aspinose elongated, with rounded anterior and bluntly pointed posterior end and measures 1.10 - 1.20 x 0.30 - 0.35 mm. Oral sucker terminal, circular and measures 0.17 - 0.19 x 0.18 - 0.20 mm. Ventral sucker is smaller than the oral sucker and situated at 0.32 - 0.35 mm from anterior extremity of the body. It is almost circular and measures 0.10 - 0.16 x 0.17 - 0.20 mm. The prepharynx is absent. Mouth leads into a muscular and oval pharynx measuring 0.05 - 0.06 x 0.09 - 0.10 mm. Oesophagus is absent. Intestinal caeca extend up to the posterior extremity of the body.

Testes are post-equatorial, post ovarian and lobed. Anterior testis is slightly smaller than the posterior testis and measures 0.11 - 0.13 x 0.13 - 0.14 mm, while posterior testis measures 0.12 - 0.18 x 0.15 - 0.20 mm. Cirrus sac is well developed claviform and situated anterolateral to the ventral sucker and measures 0.16 - 0.18 x 0.03 - 0.04 mm. It includes an oval vesicula seminalis, a well developed pars prostatica and an ejaculatory duct surrounded by a large numbers of unicellular glands. Ovary is rounded, located just behind the ventral sucker smaller than testes, equatorial, inter caecal in position and

measures 0.07 - 0.15 x 0.08 - 0.12 mm. Oviduct is short and opens at cotype which also receives vitelline duct, from the well developed vitelline reservoir. A well developed pear shaped receptaculum seminis present measuring 0.09 - 0.12 x 0.05 - 0.08 mm.

Vitelline follicles large arranged extra-caecally in a linear fashion extending between ventral sucker up to hind end of the body. At the hind region, they overlap the caeca and merge together. Excretory bladder is elongated and opens to outside by a terminal excretory pore.

Discussion

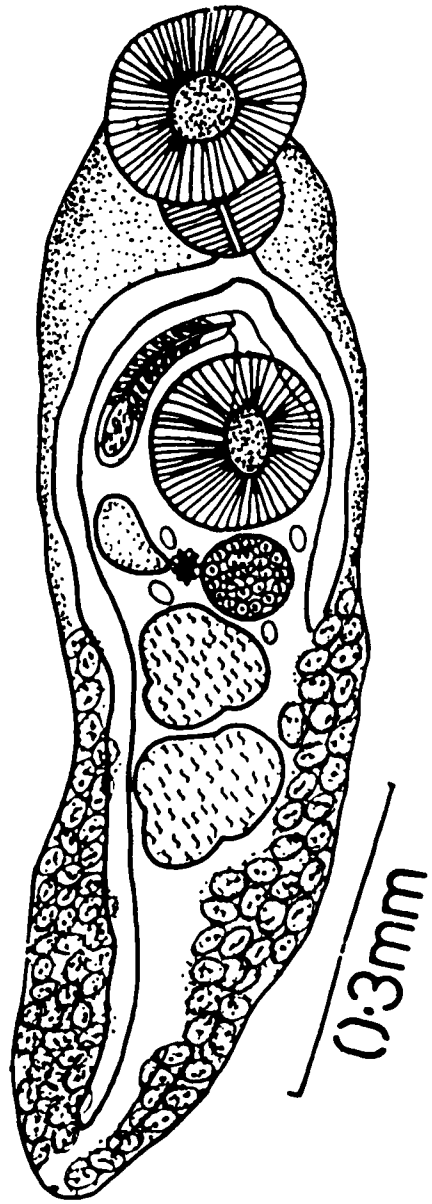
Dayal (1950) created the genus *Neopodocotyle* with *N. indica*, as type species for the worms, collected from the intestine of *Calliculus bimaculatus* at Lucknow. Subsequently, Yamaguti (1958) reduced it to a rank of sub-genus under *Podocotyle* (Duj., 1845), Odhner, 1905. Prichard (1966) transferred *N. indica* to the genus *Allocreadium* Looss, 1900, as *A. indica* (Dayal, 1950). Subsequently, Gupta and Chakrabarti (1966) described *N. lucknowensis*. Rai (1971) added another species *N. mehrai*. Baugh and Chakrabarti (1970) showed the presence of genital sucker in the type specimens of *N. lucknowensis* and created a new genus *Puntiotrema* for *N. lucknowensis* with *P. lucknowensis* (Gupta and Chakrabarti, 1966) as the type species but Pandey, 1973 differs from Prichard (1966) and retains *N. indica* under the genus *Neopodocotyle*. Thus the genus *Neopodocotyle* includes only two species viz. *N. indica* and *N. mehrai*. However number of species are reported under the genus *Neopodocotyle* viz , *N. indica* Dayal, 1950; *N. lucknowensis* Gupta and Chakrabarti,

1966; *N. spinipora* Sircar and Sinha, 1969; *N. mehrai* Rai, 1971; *N. balliaensis* and *N. dayali* Pandey, 1973.

The present form chiefly differs from them in ratio of suckers. It further differs from *N. indica* in the position of the genital pore and extension of vitellaria, from *N. lucknowensis* and *N. spinipora* in ratio of suckers, further differs from *N. spinipora* by the absence of spines in genital pore, from *N. mehrai* by the extension of cirrus sac and ratio of suckers, from *N. balliaensis* by the ratio of sucker (suckers are nearly equal in *N. balliaensis* while oral sucker is larger than ventral sucker in the present form), absence of oesophagus, position of ovary (ovary situated far anterior to the anterior testis and space between them is filled with uterus and vitellaria, while in the present form ovary placed just anterior to the anterior testis), shape and size of testes (testes tandem, circular and more or less equal in *N. balliaensis* while in the present form testes are three lobed and anterior testis is smaller than posterior one), from *N. dayali* by the absence of oesophagus, position of cirrus sac (extracaeal in *N. dayali* while intra-caecal in present form) and extension of uterus (extracaeal in *N. dayali*).

Therefore, the present form is regarded as a new species and named as *Neopodocotyle singhi* sp. nov.

Neopodocotyle singhi sp. nov.



Entire worm (Ventral view)

***Masenia indica* sp.nov.**

Host	: <i>Clarias batrachus</i> (Linn)
No. of host examined	: 50 (LKO-35, LMP-15)
No. of host found infected	: 2
No. of worms collected	: 3
Site of infection	: Intestine
Locality	: Lucknow

Body is small, elongated, fusiform with tapering anterior and posterior extremities and measures 0.80 - 0.86 x 0.25 - 0.28 mm with spinose cuticle. Terminal oral sucker is large and funnel shaped with double circum oral spines. Prepharynx small and measures 0.02 - 0.03 mm. A well developed muscular, globular pharynx present measures 0.02 - 0.05 mm. Oesophagus is very short. Intestinal caeca short, reaching up to the middle of the body. Acetabulum well developed preequatorial and measures 0.09 - 0.11 x 0.07 - 0.09 mm.

Testes oblique, post-equatorial tandem and posterolateral to the ovary. Anterior testis measures 0.07 - 0.09 x 0.08 - 0.10 while posterior one measures 0.09 - 0.10 x 0.08 - 0.10 mm. Cirrus pouch long, over reaching acetabulum, containing bipartite vesicula seminalis, prostatic complex and a very long, narrow ejaculatory duct measures 0.26 - 0.30 x 0.03 - 0.04 mm. Genital pore median, dorsal to the oral sucker. Ovary pre equatorial posterior to acetabulum, rounded in shape and measures 0.09 - 0.1 x 0.07 - 0.08 mm. Seminal vesicle is small, globular and situated just below the ovary and measures 0.05 - 0.06 x 0.04 - 0.06 mm. Vitellaria follicular extending in acetobulo-testicular field. Uterus occupying whole post

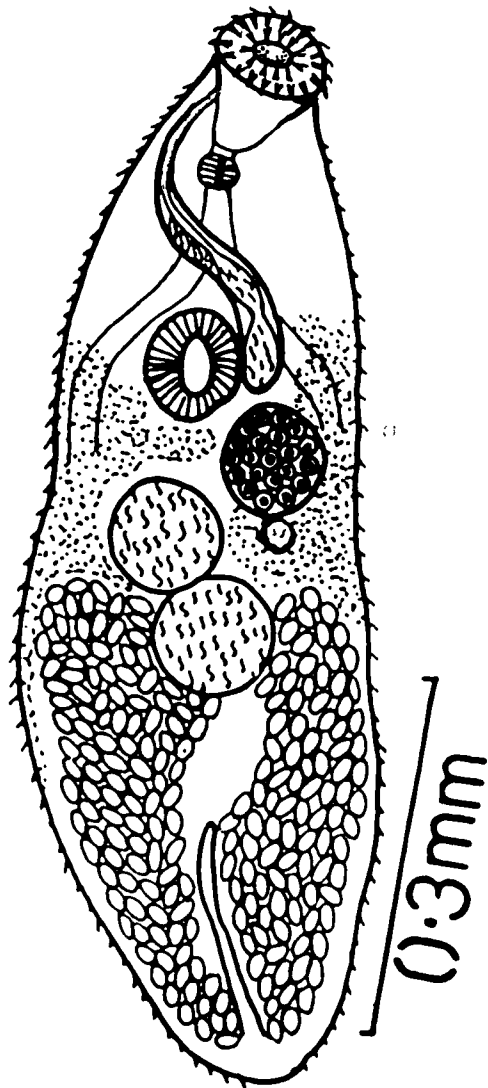
testicular region of the body. Eggs numerous, small and measures 0.02 - 0.03 x 0.01 mm. Excretory bladder tubular and reaching up to the testicular region.

Discussion

Chatterji, 1933 established the genus *Masenia* for the worms collected from fish *Clarias batrachus* (Linn.) with *M. collata* as type species. To the best of my knowledge so far following species are reported under the genus *Masenia* Chatterji, 1933 from India. viz., *M. collata* Chatterji, 1933; *M. fossilisi* Gupta, 1953; *M. dayali* Gupta, 1953, *M. gomtia* Agarwal, 1963; *M. vittatusia* Agarwal, 1963 and *M. ritai* Sircar and Sinha, 1969. The present form differ from *M. collata* by having ovary larger than ventral sucker, position of testes, shape and position of receptaculum seminis and extension of vitellaria, from *M. dayali* by the extension of vitallaria, from *M. fossilisi* by having entire ovary larger than the ventral sucker and in the extension of vitellaria. It further differ from *M. gomtia* in ratio of suckers and extension of vitellaria, from *M. vittatusia* by the position of genital pore and shape of gonads, it also differ from *M. ritai* by the ratio of suckers and position of testes.

Therefore, the present form is regarded as a new species and named as *Masenia indica* sp. nov

***Masenia indica* sp. nov.**



Entire worm (Ventral view)

Opisthorchis guptai sp.nov.

Host	: <i>Clarias batrachus</i> (Linn.)
No. of host examined	: 50 (LKO-35, LMP-15)
No. of host found infected	: 1
No. of worms collected	: 2
Site of infection	: Intestine
Locality	: Lakhimpur-kheri

Body is elongated with anteriorly tapered end and measures 2.90 - 3.70 x 0.90 - 1.08 mm. Suckers are feebly developed. Oral sucker terminal, cup shaped and measures 0.20 - 0.25 x 0.21 - 0.23 mm. Ventral sucker is smaller than the oral sucker, rounded in shape, pre equatorial and measures 0.19 - 0.25 x 0.18 - 0.22 mm. A well developed, oval, muscular pharynx present measures 0.11 - 0.13 x 0.10 - 0.13 mm. Oesophagus short and measures 0.09 - 0.11 x 0.08 - 0.10. mm. Intestinal caeca reaching up to the posterior extremity of the body.

Reproductive organs well developed and present in hinder part of the body. Testes lobed, obliquely placed, more or less equal in size and measures 0.40 - 0.45 x 0.40 - 0.42 mm and 0.40 - 0.45 x 0.32 - 0.35 mm respectively. Cirrus bursa lacking. Ovary post equatorial, oval, elongated, cylindrical just anterior to the anterior testis, and measures 0.16 - 0.18 x 0.40 - 0.45 mm. Uterus pre-ovarian, extend between ovary and ventral sucker in the form of uterine loops. Receptaculum seminis is small conical between ovary and anterior testis. Eggs are numerous, small, oval and measures 0.024 - 0.025 x 0.013 - 0.014 mm. Vitellaria in the form of two group on the lateral side of the body extending from lower boarder of ventral sucker up to

the anterior boarder of the ovary. Excretory bladder curved, S shaped between testes and opens outside through a small, terminal excretory pore.

Discussion

The genus *Opisthorchis* was erected by Blanchard in 1895 for the reception of *O. tenuicollis* (Rud. 1819) Stiles et, Hassal, 1896 for the parasites of Mammals. Thus the species of *Opisthorchis* which are reported from siluroid fishes of India are *O. pedicellata* verma, 1927; *O. gomtii* (Thaper, 1930) Mehra, 1941; *O. pedicellata minuta* Mehra, 1941; *O. vittalani* Gupta, 1953, *O. mehrai* Agarwal, 1959; *O. thaprae* Agarwal, 1959; *O. gorakhpurensis* Rai, 1971; *O. gagatia* (Dayal, 1949) Rai, 1971 ; *O. lucknowia* (Dayal, 1949) Rai, 1971 ; *O. gwaliorensis* Bhadauria and Dandotia, 1977 ; *O. blanchardi*, Bhadauria and Dandotia, 1977 ; *O.thaparia* Agarwal and Singh, 1978 and *O. dayali* Agarwal and Kumar, 1988.

The present form comes closer to *O. pedicellata*, *O. gagatia*, *O. lucknowia*, *O. gwaliorensis* and *O. thapari* in the extension of vitelline follicles. However, it chiefly differs *O.pedicellata* by the ratio of suckers and shape and extension of cirrus sac, from *O. gomtii*, *O. pedicellata minuta*, *O. vittalani*, *O. mehrai*, *O. blanchardi* and *O. gorakhpurensis* by the absence of prepharynx and relative size of gonads, from *O. gangatia*, *O. lucknowia* and *O. thaprae* by the absence of prepharynx from *O. gwaliorensis* by the position of ventral sucker, from *O. thapari* by the extension of vitellaria and shape

of ovary and from *O. dayali* by the relative size of gonads and extension of vitellaria.

Therefore, the present form is regarded as a new species and named as *Opisthorchis guptai* sp. nov.

***Opisthorchis guptai* sp. nov.**

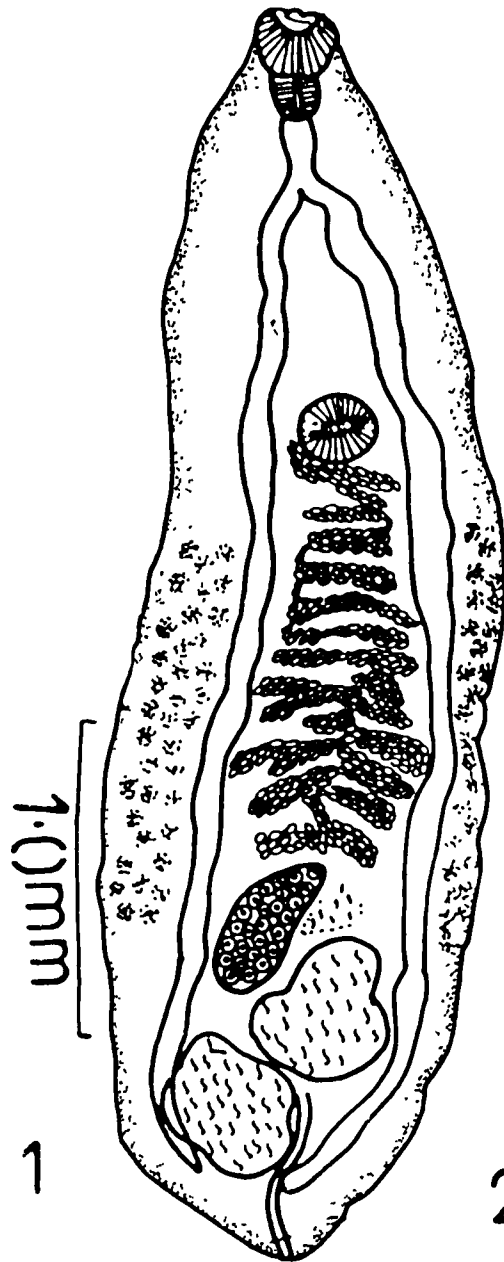


Fig 1 Entire worm (Ventral view)

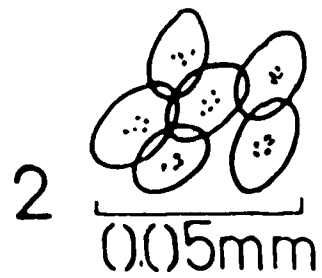


Fig 2 Eggs enlarged

***Eucreadium oxygasteri* sp.nov.**

Host	: <i>Oxygaster bacilla</i> (Ham.)
No. of host examined	: 50 (LKO-40, FZD-10)
No. of host found infected	: 5 (LKO-4, FZD-1)
No. of worms collected	: 11 (LKO-9, FZD-2)
Location	: Intestine
Locality	: Lucknow, Faizabad

Body (Fig. 1) is elongated with rounded ends and measures 1.28 - 3.45 x 0.45 - 1.05 mm. The oral sucker is terminal, rounded and measures 0.25 - 0.38 x 0.25 - 0.38 mm. Ventral sucker is pre-equatorial, rounded, larger than the oral sucker and measures 0.23 - 0.48 x 0.15 - 0.45 mm. A small pre-pharynx is present measures 0.02 - 0.03 mm. Pharynx is small, circular muscular and measures 0.075 - 0.18 x 0.10 - 0.20 mm. Oesophagus small and measures 0.13 - 0.15 x 0.07 - 0.15 mm. Intestine simple and intestinal caeca extend up to the posterior extremity of the body.

Testes are deeply lobed, tandem and unequal in size. Anterior testis measures 0.20 - 0.50 x 0.20 - 0.45 mm. While posterior testis measures 0.20 - 0.49 x 0.13 - 0.40mm. Cirrus sac is preacetabular, claviform and measures 0.30 - 0.50 x 0.10 - 0.25 mm. It encloses an oval vesicula seminalis, a short pars prostatica and an ejaculatory duct. Genital pore submedian and located at the anterior margin of ventral sucker. Ovary is oval or rounded, pre-testicular, pre-equatorial, intercaecal and measures 0.13 - 0.28 x 0.11 - 0.27 mm. A transversely elongated receptaculum seminis is present just anterior to the anterior testis and measures 0.14 - 0.18 x 0.23 - 0.34 mm. Uterus extend from the lower level of ventral sucker up to the

anterior testis and opens at the genital pore by a short metraterm Vitellaria is follicular extending from oral sucker up to the hind region of the body where they are merge together. Excretory bladder is tubular and opens outside through a terminal excretory pore. The eggs are oval, double layered, partly embroynated and measures 0.075 - 0.015 x 0.025 - 0.08 mm.

Discussion

Dayal (1942) established the genus *Eucreadium* for the worms collected from *Eutropichthys vacha* at Lucknow with *E. eutropichthyus* as a type species. To the best of my knowledge so far following species are reported from India under the Genus *Eucreadium* Dayal, 1942; *E. eutropichthyus* Dayal, 1942; Syn. *E. eucreadium* Dayal, 1950; *E. cameronii* Gupta, 1963; *E. jhingrani* Srivastava and Singh, 1967; *E. gangi* Pandey, 1970; *E. varanasi* Agarwal and Verma, 1972; *E. daceal* Bashirullah and Mustaque, 1972; *E. guptai* Verma, 1973; *E. thapari* Agarwal and Kumar, 1979; *E. hemlatae* Gupta and Hare Govind, 1983 and *E. kulpaharensis* Agarwal and Agarwal, 1987.

The present form is differ from from *E. eutropichthyus* and *E. eucreadium* by the ratio of suckers, shape of ovary, position of seminal vesicle and shape of eggs, from *E. gangi* by the presence of pre pharynx and lobed testis, from *E. jhingrani*, *E. daceal* and *E. kulpaharensis* by the presence of lobed testes, from *E. cameronii*, *E. varanasi* and *E. thapari* by the ratio of suckers and extension of vitellaria, from *E. guptai* and *E. hemlatae* by the position of gonads. It further differ from *E. hemlatae* by the extension of vitallaria.

Therefore, the present form is described as a new species and named as *Eucreadium oxygasteri* sp. nov.

Eucreadium oxygasteri sp. nov.

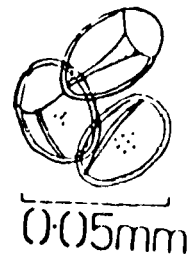
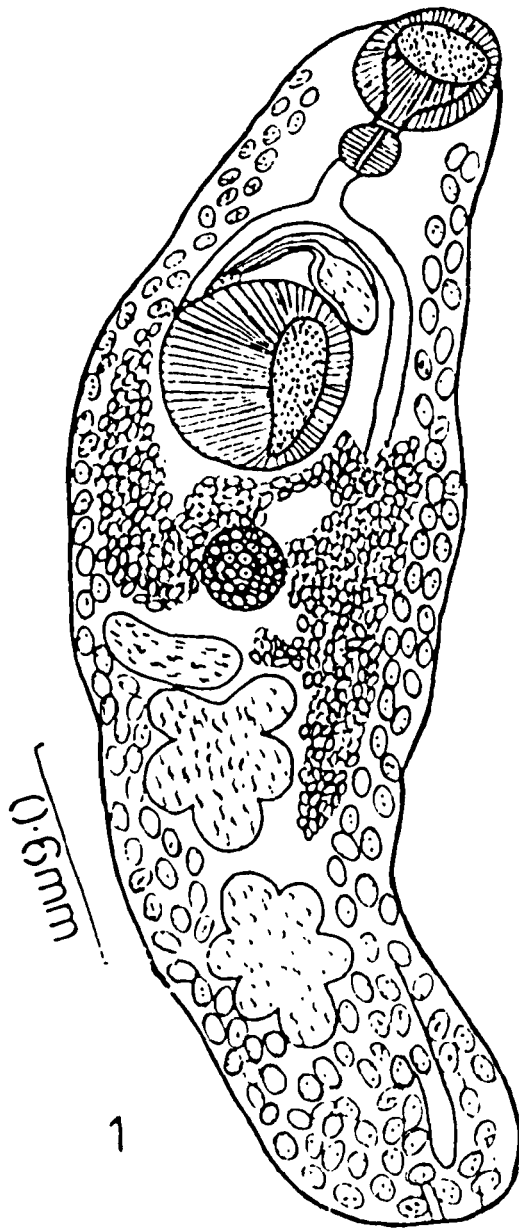


Fig 1 Entire worm (Ventral view)

Fig 2 Eggs enlarged

***Pleurogenoides hanumanthai* sp.nov.**

Host	: <i>Ompak bimaculatus</i> (Bloch)
No. of host examined	: 25
No. of host found infected	: 3
No. of worms collected	: 9
Site of infection	: Intestine
Locality	: Lucknow

Body is oval, spinose (Fig. 1) with rounded anterior and broad bifid posterior end, measures 1.11 - 1.40 mm in length and 0.76 - 0.98 in maximum width. Well developed suckers are present. Oral sucker is terminal, oval and measures 0.15 - 0.18 x 0.17 - 0.28 mm. Vential sucker is situated in the middle of the body, rounded or oval, smaller than the oral sucker and measures 0.14 - 0.22 x 0.13 - 0.19 mm. Prepharynx absent. Mouth leads into a well developed pharynx of 0.25 - 0.30 mm. in size. Oesophagus is long, tubular and measures 0.12 - 0.15 mm in length. Intestinal caeca are simple and reaching up to the anterior margin of the testes.

Testes are extracaeal, rounded, more or less symmetrical and equatorial. Right testis measures 0.20 - 0.27 x 0.17 - 0.25 mm while the left one measures 0.23 - 0.29 x 0.19 - 0.26 mm. Cirrus sac elongated, claviform situated in the preacetabular region of body anterior to the left testes crossing the corresponding caecum. It contains an oval vesicula seminalis, parsprostatica and an ejaculatory duct and measures 0.21 - 0.40 x 0.08 - 0.10 mm.

Ovary is pretesticular, smaller than testes, round to oval and situated just anterior to the left testis and measures 0.17 - 0.20 x 0.11 - 0.18 mm. The receptaculum seminis and Lawrer's canal are present. Oviduct is short and opens at ootype which is surrounded by a large no of mehlis glands. Uterus arises from ootype runs posetriorly and occupies the posterior part of body opens into genital alrium by a short metraterm. Genital pore is situated on the outer right side of the body. Excretory bladder is Y and opens outside by a terminal excretory pore. Vitellaria consist of 15-20 follicles, situated on the postero-lateral sides of the oral sucker. Eggs are oval, and measures 0.026 - 0.032 x 0.014 - 0.016 mm.

Discussion

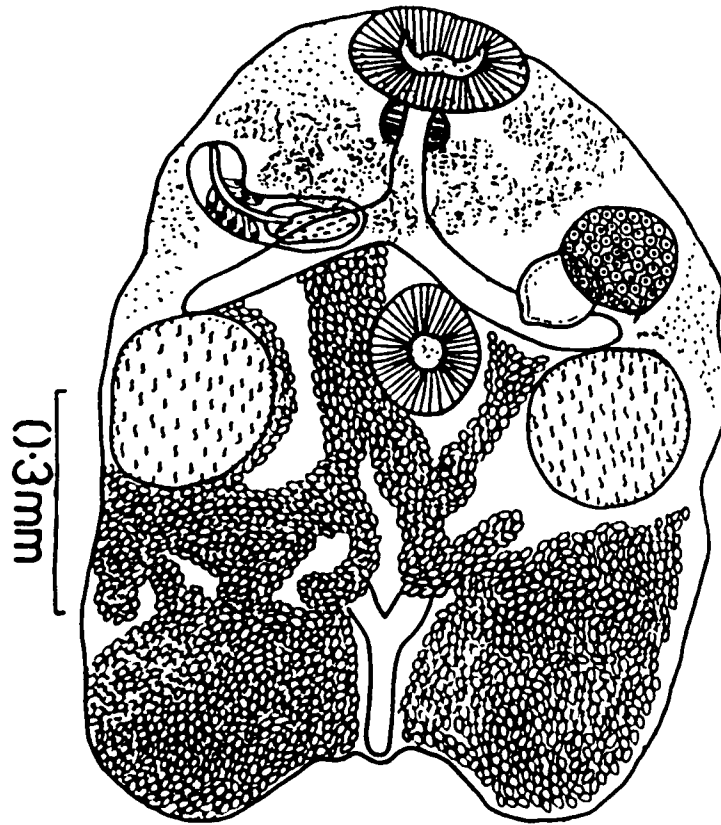
Travassos (1921) proposed the genus *Pleurogenoides* for those species included the genus *Pleurogenes* Looss, 1896 in which the intestinal caeca terminate at the acetabular region which approximate the level of testes.

To the best of my knowledge so far following species are reported under the genus *Pleurogenoides* Travassos, 1921 *P. tener* (Looss, 1896) Travassos, 1921; *P. medians* (Olsson, 1876) Travassos, 1921; *P. arrectus* (Duj., 1845) Dollfus, 1961. Moreover the *Pleurogenoides* reported from fishes are *P. minus* (Pigulewsky, 1931) Kaw, 1943. ; *P. pabdai* Pande, 1937 ; *P. japonicus* Yamaguti, 1936 ; *P. sitapurii* (Srivastava, 1934), Kaw, 1948 ; *P. notopteris* Bashirullah and Hafizuddin, 1976 and *P. attui* (Kakaji, 1968 ; Yamaguti, 1971) Prakash, 1988 from the intestine of *Mastacembelus armatus* (Lace.)

The present form differs from *P. japonicus*, *P. sitapurii*, *P. minus* and *P. notopteris* by having a bifid posterior body and extension of vitellaria. It differs from *P. attui* and *P. pabdai* by the absence of prepharynx and shape of excretory bladder. It is further different from *P. minor* by the position of genital pore and from *P. attui* by the ratio of suckers, shape of intestinal caeca, extension of cirrus sac, position and shape of receptaculum seminis and shape of excretory bladder.

Therefore, the present form is regarded as a new species and named as *Pleurogenoides hanumanthai* sp.nov.

Pleurogenoides hanumanthai sp. nov.



Entire worm (Ventral view)

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SECTION C
DIGENEA (METACERCARIA)

INTRODUCTION

The trematodes are of great significance for the fishing industry. In the larval metacercarial phase, they are widespread and dangerous parasites of many fishes primarily carps and siluroids causing massive epizootics. This results in significant economic loss to the nation's fishing industry each year. The control and development of preventive measures must be based, primarily on firm and accurate knowledge of the structure, life cycle, biology and special composition of these pathogenic trematodes. A good deal of taxonomic work has been done in India on the adult trematodes of fishes by several Indian workers since 1926 which forms a landmark in the history of Helminthological research in India. Further more, foreign workers had been sporadically reported on trematode fauna of India since the middle of the last century but no doubt, scant attentions has been paid by the Indian workers to the study of metacercariae infecting the fresh water fishes.

Southwell for the first time (1913) described a metacercariae from the fish. Other workers are Southwell and Prasad, Sewell, Bhalerao, Kaw, Lal, Singh, Sinha, Srivastava, Agarwal, Khera, Rai, Pande, Chakraborty, Baugh, Nath, Pandey and some others described various metacercariae from different fishes. With a view to study the metacercariae of some commercially important fishes of District Lucknow, Lakhimpur-Kheri, Faizabad and Meerut U.P. the present investigation was undertaken.

HISTORICAL REVIEW

To the best of my information, Southwell (1913), for the first time in India reported a metacercaria as "*Distomum*" sp. from *Nandus marmoratus*, at Calcutta. Later, Southwell and Prasad (1918) described *Clinostomum piscidium* from *Nandus nandus* (Hamilton) and *Trichogaster fasciatus* (Bloch and Schneider), at Khulna (Now in Bangladesh). After about a decade, Faust (1927) described some strigeid larvae from fishes, viz. *Diplostomulum schizothoracis* from *Schizothorax zarudnyi* Nikolsky and *Neodiplostomulum kashmirianum* from *Schizothorax niger* (Heckel), *Schizothorax curvifrons* (Heckel) and *Crossochellus latia* (Hamilton) respectively from Kashmir. Subsequently, following workers have added various metacercariae from our country viz., Bhalerao (1926, 1932, 1942, 1943); Chauhan (1947); Kaw (1950); Srivastava (1950); Lal (1953, 1953); Ganpati and Rao (1954, 1955); Abraham and Anantaraman (1955); Agarwal (1955, 1958, 1958, 1959); Singh (R.N. 1955, 1956, 1957); Premvati (1956); Singh (K.S. 1956, 1957, 1957); Jaiswal (1957); Khera (1958); Ahsan (1959), Farooqui (1957); Anantaraman (1959); Bhowmick (1960); Bhardwaj (1961); Ganpati and Shantha Kumari (1961); Rai (1961, 1961, 1964, 1969, 1970); Ganpati et. al. (1962); Rai and Pande (1964, 1965, 1965, 1969, 1969, 1969); Trivedi (1964); Pande and Rai (1964); Sinha (1964); Pande et. al. (1964); Matta and Pande (1966); Thaper (1967); Mishra and Pande (1966, 1967); Pandey (1966, 1966, 1967, 1968, 1969, 1969, 1969, 1969, 1970, 1971, 1971, 1971, 1971, 1973, and 1973); Mukherji (1967); Chakrabarti (1968, 1968, 1970, 1970, 1970, 1974, 1974); Pande et. al. (1964, 1968); Jain and Srivastava (1969); Baugh and Pandey (1969); Pandey and Baugh (1969, 1970); Chakrabarti and Baugh (1970, 1973, 1974); Nath and Pande

(1970, 1970); Agarwal (R.D. 1971); Matta and Rai (1971); Nath (1971, 1972); Dutta and Srivastava (1972), Pande and Shukla (1972, 1972, 1973); Agarwal (1975); Baugh and Chakrabarti (1977); Pandey and Agarwal (1977, 1978); Madhavi (1978, 1978); Agarwal and Singh (1980); Dwivedi and Dwivedi (1981); Agarwal and Khan (1982, 1982); Tewari (1982); Chopra, Kumar and Singh (1983); Pandey and Tewari (1983, 1983, 1984, 1984, 1986); Pandey and Tyagi (1986); Tewari and Tyagi (1986); Sinha, Sinha and Nikhil (1988); Rao and Madhavi (1989); Sinha (1991); Madhavi and Shamim (1993) and Singh and Sharma (1994).

MATERIAL AND METHODS

A large number of live and dead fishes were regularly obtained from the local fish markets of Lucknow, Faizabad, Lakhimpur-Kheri and Meerut U.P. and examined fresh. Some were also maintained in properly aerated aquaria for a short period usually for a day or two. Live fishes were chloroformed and killed in a glass container. Standard procedure as suggested by Hoffman (1960), were followed for obtaining worms from the host. The entire body surface including the fins, scales, gills, muscles of the body, visceral organs, cranial cavity and eyes were carefully examined under a dissecting binocular microscope in normal saline. Encysted metacercaria, once located were removed either by a pair of a fine forceps or by lightly scratching by a fine scalpel or by teasing the infected tissue and organs and occasionally also by camel hair brush and were transferred to normal saline solution. The metacercaria which were found devoid of cysts were picked up by a specially prepared pipette having a long capillary tip. Such pipette were also used for handling small metacercarial cysts. A camel hair brush was used particularly for handling larger forms.

Metacercaria were taken out of their cysts, in these special ways:-

a. By applying light pressure on the coverslip. For this purpose, square coverslips with grease applied at their corners were particularly used. By this simple application the amount of pressure required to rupture the cysts could be easily regulated under a dissecting binocular microscope. This procedure was useful for those cysts which were too small to be opened even by fine dissecting needles.

b. By the use of fine dissecting needles under dissecting binocular microscope.

c. By the use of artificial digests, prepared as suggested by Komiya and Tajimi (1941) and Hoffman (1960).

For fixing metacercaria 70% alcohol was used. After fixation the material was washed in fresh tapwater and stained in Borex carmine. Stained material after differentiation with acid alcohol were dehydrated by passing through a graded series of alcohols (30%, 50%, 70%, 90% and absolute alcohol), cleared in xylene and mounted in canada balsam. Metacercaria were studied under the light microscope. For morphological studies live specimens were used. Sterilized petridises with cover were used for maintaining the live metacercaria at room temperature or in a incubator regulated at 32° C. They were stained by freshly prepared vital stains viz. neutral red and methyl blue. Neutral red proved to be far and best. The measurements of various organs of the metacercariae were taken with the help of calibrated ocular micrometer. All the measurements were given in millimeter. Sketches were made with the help of Camera lucida.

Table : 6 The appended table shows name and number of fishes examined and name and number of parasites (1) during the course of study (1994 - 1997)

S.No.	HOST	Host Examined	Host Infected	Parasite Obtained	Worm Collected
1	<i>Xenentodon cancila</i> (Ham.)	635 (T) LKO-348 FZD-187 LMP-50 MRT-50	8	<i>Tetracotyle tridi</i> sp. nov.	12
2	"		16	<i>Tetracotyle dochofi</i> sp. nov.	33
3	"		200 (120+45+35)	<i>Neascus srivastavi</i> sp. nov.	2000 (1100+500+400)
4	"		3 (2 + 1)	<i>Clinostomum lucknowensis</i> Pandey, 1969	3 (2 + 1)
5	"		1	<i>Isoparorchis hypselobagri</i> (Billet, 1898) Odner, 1927	1
6	<i>Mastacembelus armatus</i> (Lac.)	280 (T) LKO-190 FZD-60 LMP-30	4	<i>Tetracotyle madavii</i> sp. nov.	10
7	"		10	<i>Clinostomum piscidium</i> Southwell and Prasad, 1918	37
8	<i>Heteropneustes fossilis</i> (Bloch)	150 (T) LKO-140 LMP-10	3	<i>Tetracotyle chacuti</i> sp. nov.	6
9	"		1	<i>Diplostomulum ophthalmi</i> Pandey 1968	3

10	"		15	<i>Diplostomulum indicum</i> sp nov.	27	Lucknow, U.P.
11.	"		8	<i>Neascus thapari</i> sp nov	12	Lucknow, U.P.
12	"		4(3+1)	<i>Clinostomum dasi</i> Bhalerao, 1942	⁽¹⁰ 12 + 2)	Lucknow Lakhimpur kheri, U.P.
13	"		1	<i>Clinostomoides baughi</i> sp nov	2	Lucknow, U.P.
14	<i>Trichogaster fasciatus</i> (Bloch and Schm.)	20	2	<i>Clinostomum trichogasteri</i> Pandey, 1969	2	Lucknow, U.P.
15	<i>Channa straitus</i> (Bloch)	30 LKO-10 FZD-20	2	<i>Opisthorchiid metacercaria</i> sp. nov.	6	Faizabad, U.P.

OBSERVATION AND DISCUSSION

***Tetracotyle tridi* sp.nov.**

Host	:	<i>Xenentodon cancila</i> (Ham.)
No. of host examined	:	635(LKO-348,FZD-187,LMP-50,MRT-50)
No. of host found infected	:	8
No. of worms collected	:	12
Site of infection	:	Body cavity, Mesentry
Locality	:	Lucknow

Cyst (Fig. 1) is thin and quite transparent, without any pigmentation, oval in outline and measures 1.09 - 1.50 x 0.8 - 1.05 mm.

Aspinose body (Fig. 2) is not clearly divided into forebody and hindbody, oval in shape and measures 1.50 - 1.67 x 0.85 - 0.95 mm. Suckers are well developed, muscular and ventral sucker is slightly larger than oral sucker. Oral sucker is rounded to oval, terminal and measures 0.06 - 0.08 x 0.10 - 0.14 mm. Ventral sucker is rounded, equatorial in position and measures 0.15 - 0.17 x 0.18 - 0.20 mm. Two pairs of pseudosuckers are present in the anterior half of the body. Anterior pair of pseudosuckers are smaller as compared to posterior one while the posterior pair is very large. Besides this, a well developed hold fast organ is situated just behind the ventral sucker. Hold fast gland is present and overlap the posterior margin of the hold fast organ. Mouth directly leads into a rounded and muscular pharynx measures 0.03 - 0.05 x 0.06 - 0.08 mm. Pharynx opens into a short oesophaegus. Intestinal caeca are thin walled extend upto hind region of the body. Intestinal caeca and its extension could be seen only in live specimens. In fixed specimens it is not fairly visible.

Gonads are not well developed however, they are represented in the form of four darkly stained irregular bodies in the hind region of the body.

Excretory bladder (Fig. 3) is small 'V' shaped structure and located at the hind end of the body. It opens to exterior through a small excretory pore. Reserve excretory system is extensively developed due to which, details of primary excretory system including flame cell pattern could not be seen. However, there are two main reserve excretory canals arising from the anterior margin of the cornua of the excretory bladder. Each of this canal extend anteriorly along the lateral margins of the body upto the oral sucker. At the level of oral sucker, the canals of the either sides are joined together with the help of an anterior transverse canal. A median longitudinal canal arise from this anterior transverse canal and runs backward almost upto hind end of the body where it is connected by an another transverse canal (Posterior transverse canal) with the main excretory canal of each side. In the hind region of the middle third of the body another transverse canal connects the median longitudinal canal with the main reserve excretory canal. Besides this median longitudinal canal, one submedian and twolateral (inner and outer) longitudinal canals arise on each side from the anterior transverse canal. Sub-median longitudinal canal of each side runs backwards between median longitudinal canal and main reserve excretory canal of its own side and extends roughly upto hind region of middle third of the body where it joins the transverse canal which connects median longitudinal canal with main reserve excretory canal of both sides. Two lateral (inner and outer) longitudinal canals of each side runs on outer side of main reserve excretory canal almost upto the level of cornual ends of excretory bladder where they

join a short transverse canal which is merely a lateral extension of posterior transverse canal. Further cross connections, varying from four to eight in numbers, are present on each side of the body between median longitudinal canal and sub median longitudinal canal, between submedian longitudinal canal and main reserve excretory canal, between main reserve excretory canal and inner lateral longitudinal canal and between two lateral (inner and outer) longitudinal canals. A colourless fluid with round corpuscles of different size are present in these canals and voided out from the excretory pore.

Discussion

To the best of my knowledge so far following species of the larval genus *Tetracotyle* Fillipi, 1869 have been described from India by various workers, viz. *T. ranae* Kaw, 1950; *T. indicus* Singh, 1956; *T. sophoriensis* Singh, 1956; *T. ujjainensis* Trivedi, 1964; *T. muscularis* Chakrabarty, 1970; *T. xenentodoni* Chakrabarty, 1970; *T. glossogobi* Chakrabarty, 1970; *T. aglandulata* Chakarabarty, 1970; *T. szidati* Chakrabarty and Baugh, 1970; *T. lali* Pandey, 1971; *T. lucknowensis* Pandey, 1971; *T. singhi* Pandey, 1973; *T. baughi* Pandey, 1973; *T. tandoni* Pandey, 1973; *T. bufoi* Agarwal, 1975; *T. lymnae* Pandey and Agarwal, 1978; *T. gyanpurensis* Agarwal and Singh, 1980; *T. simhal* Pandey and Tewari, 1983; *T. sanjivi* Pandey and Tewari, 1983; *T. fotedari* Pandey and Tewari, 1983 and *T. satendri* Tewari and Tyagi, 1986.

The present form differs from all the above species by having two pairs of enormously grown pseudosuckers. Further, it differs from *T. ranae* by the presence of a cyst and oesophaegus, from *T. indicus*, *T. sanjivi*, *T. fotedari*, *T. ujjainensis* and *T. xenentodoni* by the ratio of suckers, from *T.*

glassogobi, *T. tandoni*, *T. lymnae* and *T. lali* by having an undivided body, from *T. lucknowensis*, *T. sophoriensis*, *T. baughi*, *T. singhi* and *T. satendri* in number and position of genital rudiments, and from *T. muscularis*, *T. simhai*, *T. szidati*, *T. bufoi*, *T. gyanpurensis* and *T. aglandulata* by the pattern of reserve excretory system.

A number of species under genus *Tetracotyle*, Fillipi, 1869 have been recorded from foreign countries, viz, *Tetracotyle* of *Cotyluris communis* Hughes, 1928; *T. diminuta* Hughes, 1928; *Tetracotyle* of *Apatemon fuligulae* Yamaguti 1933 ; *Tetracotyle* of *Apatemon pellucides* Yamaguti, 1933 ; *T. biwaensis* Yamaguti, 1942 ; *T. tachoensis* Haderlie, 1953 ; *Tetracotyle* of *Apatemon gracilis pellucidus* Hoffman, 1959 ; *Tetracotyle* of *Strigea elegans* Pearson, 1959 ; *Tetracotyle* of *Strigea stregis* Sudarikov, 1960 ; *Tetracotyle* of *Strigea falconis* Sudarikov, 1960 and *Tetracotyle* of *Strigea sphaerula* Sudarikov, 1960. The present form chiefly differs from all the above species by having two pairs of enormously developed pseudosuckers and pattern of reserve excretory system.

Therefore, the present form is regarded as a new species and named as *Tetracotyle tridli* sp. nov.

***Tetracotyle tridi* sp. nov.**

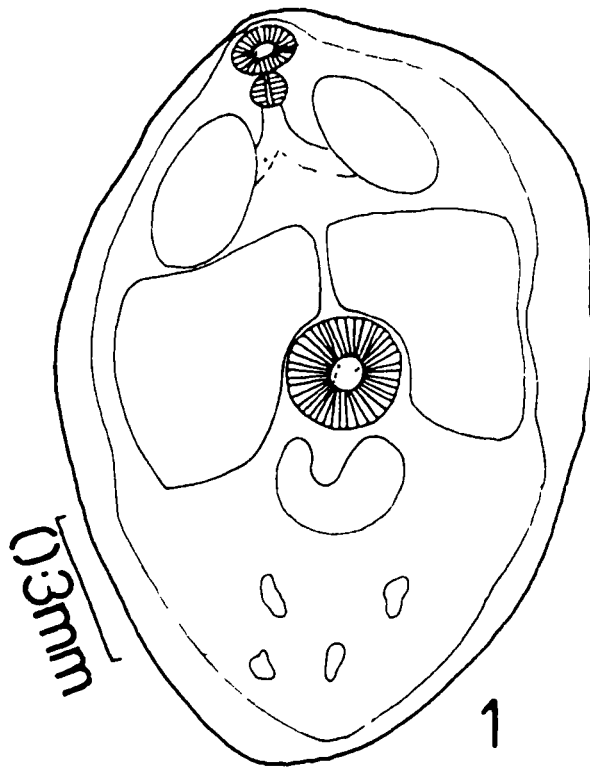


Fig 1 Encysted Metacercaria
(drawn from a live specimen)

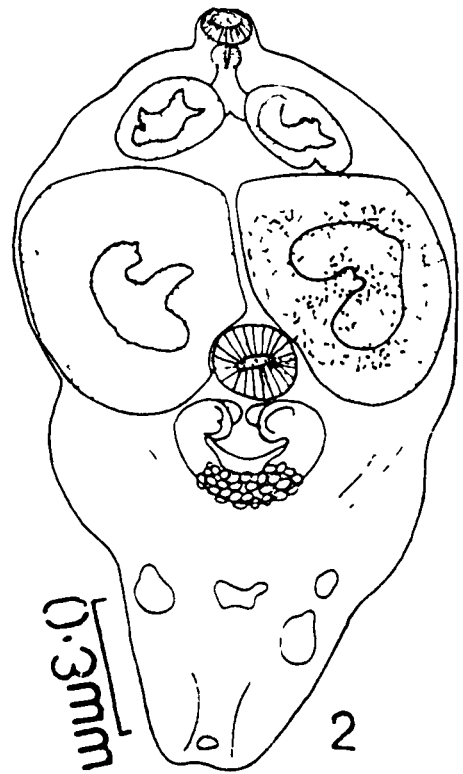


Fig 2 Excysted Metacercaria
(drawn from a live specimen)

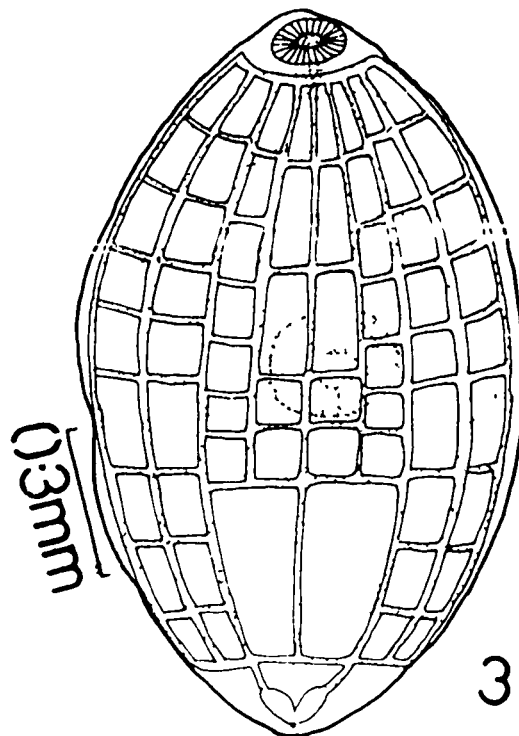


Fig 3 Metacercaria showing excretory system
(drawn from a live specimen)

***Tetracotyle dochoti* sp.nov.**

Host	: <i>Xenentodon canalla</i> (Ham.)
No. of host examined	: 635(LKO-348, FZD-187, LMP-50, MRT-50)
No. of host found infected	: 16
No. of worms collected	: 33
Site of infection	: Body Cavity, Mesentry
Locality	: Lucknow

Cyst (Fig.1) is elongated, double layered, whitish in colour and measures 1.0 - 1.80 x 0.47 - 0.66 mm. A slight pressure on the cyst yielded to juvenile stage which is comparatively sluggish and without any contraction in the body.

Body elongated (Fig.2) pear shaped and measures 0.98 - 1.80 x 0.34 - 0.46 mm. Suckers are well developed. Oral sucker subterminal, rounded to oval in shape and measures 0.09 - 0.15 x 0.10 - 0.16 mm. Ventral sucker post-equatorial, rounded in shape, larger than oral sucker, and measures 0.11 - 0.19 x 0.12 - 0.17 mm. Mouth directly leads into a small, muscular pharynx measures 0.04 - 0.06 x 0.05 - 0.13 mm. Oesophagus long and measures 0.07 - 0.17 x 0.03 - 0.05 mm. A pair of oval pseudosuckers are present on the lateral sides of oesophagus and measures 0.10 - 0.22 x 0.08 - 0.10 mm. Intestinal caeca extending beyond the hold fast organ. A well developed, large lobed hold fast organ is present just below the ventral sucker. A heavily stained 'U' shaped gland mass representing the hold fast gland. is present covering the posterolateral margin of hold fast organ.

Genital rudiment is represented by a single, darkly stained gland mass below the hold fast gland.

Excretory bladder (Fig. 3) is small, bicornuate and opens outside by a terminal excretory pore. The excretory canals of the reserve system, arise one on each side from the cornua of the excretory bladder and runs anteriorly through the lateral margin of the body up to the oral sucker where they are connected by an anterior transverse canal. A median longitudinal canal originate from this anterior transverse canal and extends posteriorly upto the hold fast gland where it joins another transverse canal, the posterior transverse canal. The posterior transverse canal connecting the two main lateral excretory canals. Further, two other longitudinal canals (inner and outer) arise on each side from the anterior transverse canal, in between the main reserve excretory canal and median longitudinal canal. These two longitudinal canals connects on each side the main excretory canal with the median longitudinal canal, the outer longitudinal canals and the inner longitudinal canal. These canals contains a fluid with round carpuscles which freely move and often voided out through the excretory pore during contraction of the body.

Discussion:

Of all the known species, described both from India as well as abroad, the present form most closely resembles with *T. indicus* Singh, 1956; and *T. singhi* Pandey, 1973 in general topography of the organs. But the present form differs from *T. indicus* by the position of the ventral sucker, shape of hold fast organ, hold fast gland and pseudosuckers. It differs from *T. singhi* by the absence of prepharynx and ratio of suckers.

Therefore, the present form is regarded here as a new species and named as *Tetracotyle dochoti* sp. nov.

***Tetracotyle dochoti* sp. nov.**

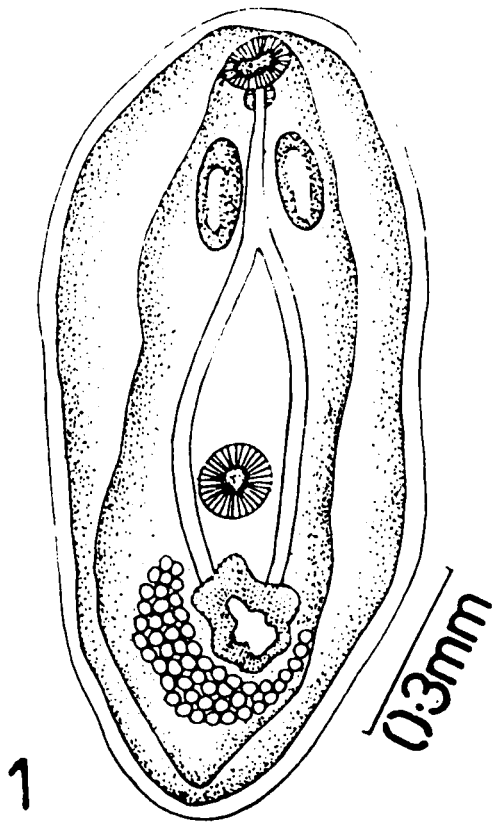


Fig. 1. Encysted Metacercaria
(drawn from a live specimen)

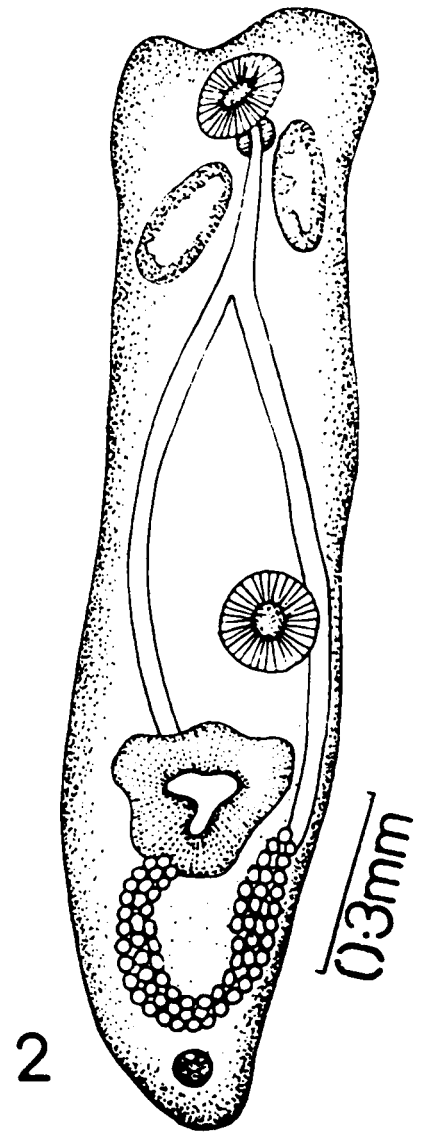


Fig. 2. Excysted Metacercaria
(drawn from a live specimen)

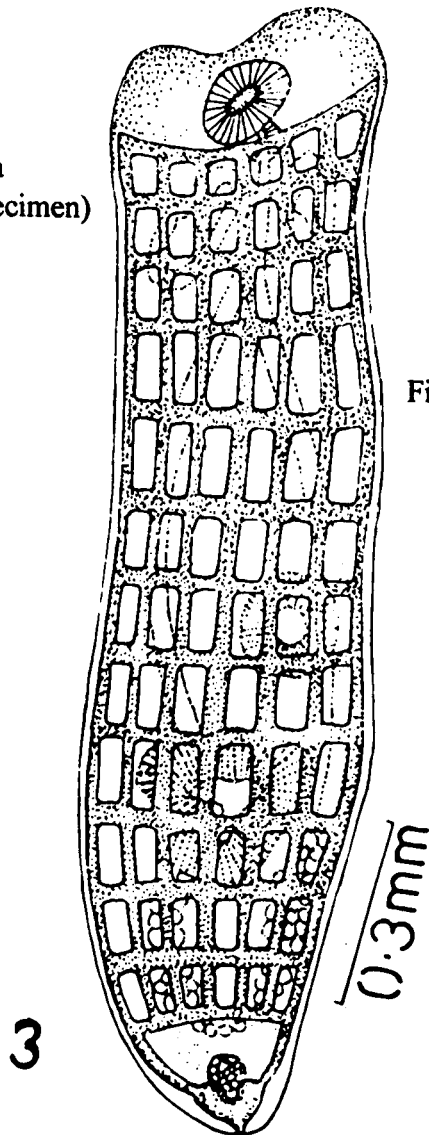


Fig. 3. Metacercaria showing excretory system
(drawn from a live specimen)

Neascus srivastavi sp.nov.

Host	: <i>Xenentodon cancila</i> (Ham.)
No. of host examined	: 635(LKO-348, LMP-50, FZD-187, MRT-50)
No. of host found infected	: 200 (LKO-120, LMP-45, FZD-35)
No. of worms collected	: 2000(LKO-1100, LMP-500, FZD-400)
Site of infection	: Liver tissue
Locality	: Lucknow, Lakhimpur, Faizabad UP.

Cysts (fig.1) are round to oval, transparent, unpigmented and measures 0.58 - 0.69 x 0.41 - 0.43 mm. Cyst wall is thin and larva freely performs movement inside the cyst.

Body (fig.2) is aspinese and divisible into large, leaf like fore body and small, bluntly pointed hind body. Fore-body measures 0.54 - 0.64 x 0.28 - 0.44 mm and the hind body measures 0.20 - 0.25 x 0.18 - 0.27 mm. Oral sucker is terminal oval and measures 0.02 - 0.04 x 0.02 - 0.03 mm. Ventral sucker is equatorial in position, rounded in shape, larger than the oral sucker and measures 0.04 - 0.06 x 0.05 - 0.08 mm. Pseudosuckers are absent. Hold fast organ is well developed and located in post-equatorial part of the body behind the ventral sucker. It is further equipped with a hold fast gland situated in the form of transversely elongated mass just behind the hold fast organ. Pharynx is absent. Mouth leads into an elongated oesophagus of 0.06 - 0.08 mm. Intestinal caeca are not traceable in fixed specimens, however, in live metacercaria they extends upto the hind end of the body.

Genital rudiments are restricted to the hind part of the body, and represented in the form of four darkly stained bodies.

Anterior one represent the ovary and measures 0.04 - 0.05 x 0.05 - 0.06mm while the posterior two masses which are more or less equal in size represent the testes and measures 0.03 - 0.05 x 0.06 - 0.09mm. Copulatory bursa is represented by another rounded mass located below the posterior testis.

Excretory system (fig.3) consists of an excretory bladder, main collecting canals and transverse canals etc. Excretory bladder is V - shaped, located at the hind end of the body and opens outside by terminal excretory pore. From the cornua of excretory bladder, two main collecting canals of primary system originates and runs anteriorly through the lateral fields of the body upto the oral sucker where they are connected with anterior transverse canal. Single median and two lateral longitudinal canal arises from the anterior transverse canal. Median longitudinal canal runs posteriorly along the middle line of the body upto the level of excretory bladder but just anterior to it, it is connected with the main reserve excretory canal of each side by another transverse canal, the posterior transverse canal. Two lateral longitudinal canals run backwards and behind the posterior edge of hold fast organ, they are connected with two transverse canals. Apart from these prominent canals, a large number of fine canals connects the main reserve excretory canal with the median and lateral longitudinal canals. All the canal system of the reserve excretory system contain a transparent fluid with round to oval concretion of various sizes.

Discussion

Since Hughes (1927) established the larval genus *Neascus* for strigeid metacercariae, a number of species have been described from our country. These are *N. vetastai* Kaw,

1950; *N. chelai* Khera, 1958; *N. hepatica* and *N. mesentric* Rai and Pande, 1964; *Neascus* sp. I. and *Neascus* sp. II Thaper 1967; *N. hepatica* Chakrabarti, 1970; *N. elongatus* (Singh, 1967), Pandey, 1971; *N. channi* and *N. xenentodoni* Pandey, 1971; *N. hoffmani* and *N. komiyai* Pandey, 1973; *N. gussevi* Chakrabarti, 1974; *N. nanaksagarensis* Baugh and Chakrabarti, 1977; *N. chauhani*, *N. hanumanthai* and *N. moghei* Agarwal and Khan, 1982; *N. ramalingami* Pandey and Tewari, 1986; *N. vedi* Pandey and Tewari, 1986; *N. shahjahanpurensis* Pandey and Tewari, 1986 and *N. dalibaghensis* Pandey and Tewari, 1986.

The present larvae resembles with all the above mentioned species except *N. elongatus* in having a divided body. It differs from *N. vetastai*, *N. hepatica* form, *N. mesentric* form, *Neascus* species I and *Neascus* species II in number, location and arrangement of genital rudiments; from *N. chelai* in having well developed sucker and being a distom, from *N. xenentodoni* in ratio of suckers and disposition of gonads; from *N. hepatica* and *N. nanaksagarensis* in the number and shape of genital rudiments and patterns of reserve excretory system. It can be differentiated from *N. channi* by the absence of pharynx, from *N. komiyai* in the location of ventral sucker and in the disposition of ovary. The present form differ from *N. hoffmani* by the location of ventral sucker shape of genital rudiment and pattern of reserve excretory system. It chiefly differ from *N. chauhani*, *N. hanumanthai* and *N. moghei* in the pattern of reserve excretory system. It differs from *N. ramalingami* by the shape of body, absence of pharynx and position of ventral sucker. It differs from *N. vedi* by the shape of hold fast organ, genital rudiments and position of ovary. It is further differ from *N. shahjahanpurensis* by the shape of body, position of ventral sucker and absence of pharynx. It differs

from *N. dalibagensis* in shape and arrangement of genital rudiments and in the pattern of reserve excretory system.

Among species described from foreign land the present larva chiefly differs from *Neascus of Uvulifer ambloplitis*, Hughes, 1927; *Neascus of Ornithodiplostomum ptychocheilus*, Hughes and Piszczek, 1928; *Neascus of Posthodiplostomum minimum* Hughes, 1928; *Neascus longicollis* and *Neascus pyriformis* Chandler, 1951; in the pattern of reserve excretory system. Further, it can be distinguished from *Neascus of Crassiphiala bulboglossa* Hughes, 1928 and *Neascus of Neodiplostomum perlatum* Ciurea, 1930 in the number and arrangement of genital rudiments and in shape and size of hold fast gland, from *Neascus of Posthodiplostomum cuticola* Ciurea, 1930; and *Neascus grandis* Muller and Vancleave, 1932 in shape, size and number of genital rudiments, from *N. rhinichthysi* Hunter and Wanda, 1933 in the presence of hold fast gland, from *Neascus ellipticus* Chandler, 1951 *Neascus longicollis* Chandler, 1951; in the ratio of fore and hind body, in the absence of pharynx, and lastly from *Neascus nolfi* Hoffman, 1955 by the absence of pharynx and presence of hold fast gland.

Therefore, the present form is regarded as a new species and named as *Neascus srivastavi* sp. nov.

Neascus srivastavi sp. nov.

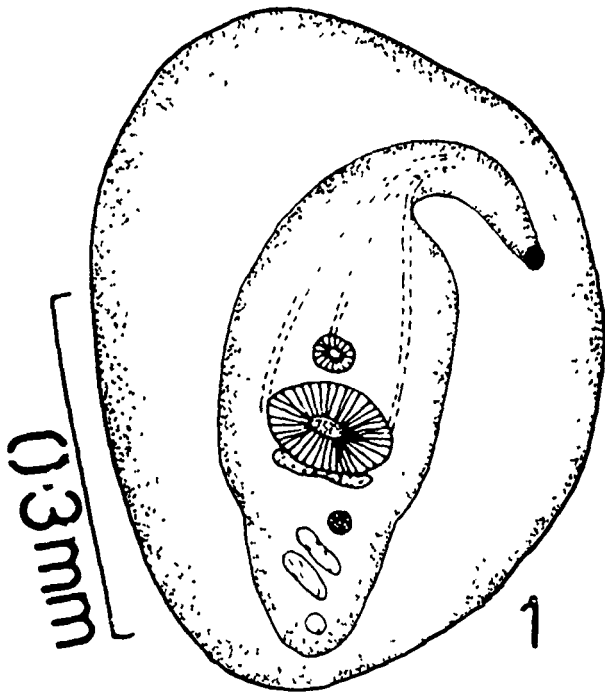


Fig 1 Encysted Metacercaria
(drawn from a live specimen)

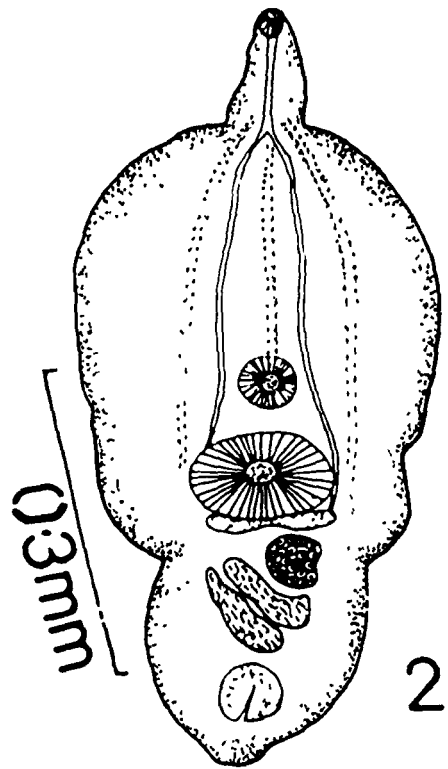


Fig 2 Excysted Metacercaria
(drawn from a live specimen)

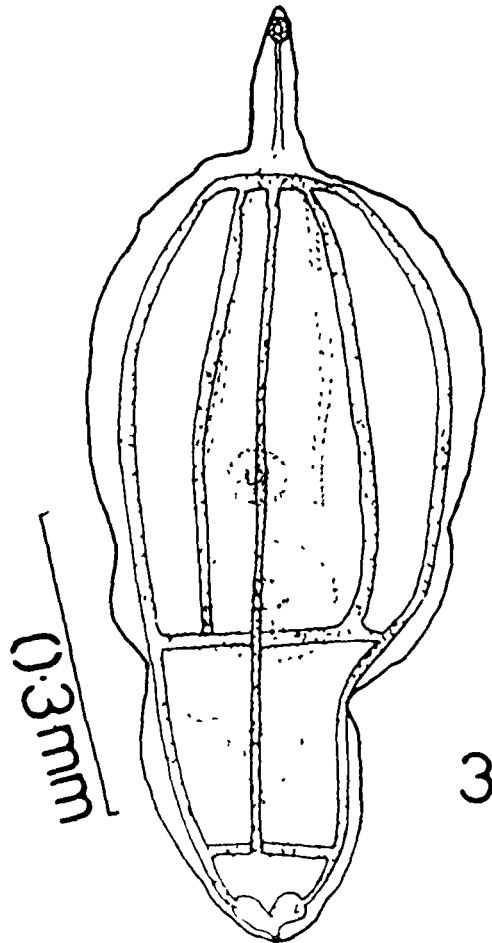


Fig 3 Metacercaria showing excretory system
(drawn from a live specimen)

***Clinostomum lucknowensis* Pandey, 1969**

Host	:	<i>Xenentodon cancila</i> (Ham.)
No. of host examined	:	635(LKO-348,FZD-187,LMP-50,MRT-50)
No. of host found infected	:	3 (LKO-2,LMP-1)
No. of worms collected	:	3 (LKO-2,LMP-1)
Site of infection	:	Body cavity
Locality	:	Lucknow, Lakhimpur-Kheri

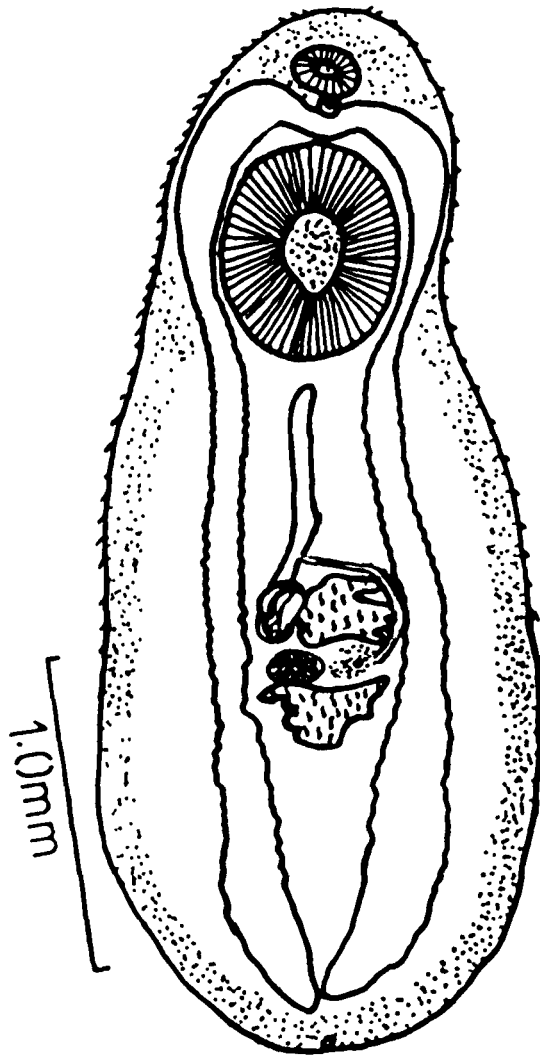
Metacercariae were found in the body cavity of the piscine hosts, attached to the visceral organs. Pandey, (1969) described the metacercaria from the *Xenentodon cancila* (Ham.) at Lucknow. As the material at the disposal of writer is simulated with the original account, it is briefly recorded.

Body spinose and measures 2.42 - 3.63 mm x 0.90 - 1.19 mm. Oral sucker measures 0.14 - 0.25 x 0.15 - 0.16 mm. Ventral sucker measures 0.48 - 0.56 x 0.45 - 0.54 mm. Oesophagus measures 0.05 - 0.06 x 0.03 - 0.05 mm. Pseudopharynx present. Intestinal caeca extend posteriorly upto the hind end of the body. Anterior testis measures 0.19 - 0.21 x 0.28 - 0.29 mm while the posterior one measures 0.18 - 0.19 x 0.28 - 0.39 mm. Cirrus sac measures 0.15 - 0.30 x 0.08 - 0.15 mm. Ovary measures 0.09 - 0.12 x 0.09 - 0.13 mm. Excretory bladder is very small 'V' shaped.

Table : 7 Appended table shows differences in various body measurement of *Clinostomum lucknowensis* Pandey, 1969 and as shown by the present specimen (all measurements are in millimeter)

Body Organs	<i>Clinostomum lucknowensis</i> Pandey, 1969	Present specimens
Size	2.20-3.68 X 0.65-1.00 mm	2.42-3.63 x 0.90-1.19 mm
Oral Sucker	0.15-0.16	0.14-0.25 x 0.15-0.16
Ventral Sucker	0.34-0.46	0.48-0.56 x 0.45-0.54
Anterior Testis	0.25-0.29 x 0.23-0.31	0.19-0.21 x 0.28-0.29
Posterior Testis	0.20-0.25 x 0.26-0.37	0.18-0.19 x 0.28-0.39
Cirrus Sac	0.23-0.29 x 0.10-0.15	0.15-0.30 x 0.08-0.15
Ovary	0.06-0.08 x 0.06-0.12	0.09-0.12 x 0.09-0.13

***Clinostomum lucknowensis* Pandey, 1969**



Metacercaria
(drawn from a live specimen)

***Isoparorchis hypselobagri* (Billet, 1898)Odhner,1927**

Host	:	<i>Xenentodon cancila</i> (Ham.)
No. of host examined	:	635(LKO-348,FZD-187,LMP-50,MRT-50)
No. of host found infected	:	1
No. of worm collected	:	1
Site of infection	:	Body cavity
Locality	:	Lucknow

Out of about six hundred thirty five specimens of *Xenentodon cancila* (Ham.), only one specimen of host was found infected with metacercaria of a fluke which, on study revealed to be metacercariae of *Isoparorchis hypselobagri* (Billet, 1898) Odhner, 1927.

The occurrence of metacercariae of *Isoparochis hypselobagri* has been recorded in India from fishes like *Barbus tor*, *Channa straitus*, *Notopterus notopterus*, *Channa marulius*, *Channa gachua*, *Mastacembalus armatus*, *Ambasis nana*, *Wallago attu*, *Glossogobius giuris*, *Clarias batrachus*, *Xenentodon cancila*, *Eutropilichthys vacha*, *Mystus vittatus*, *Mystus seenghala* and *Ompak bimaculatus* etc by different workers viz. Southwell and Prasad (1918), Bhalerao (1926, 1932), Chauhan (1947), Jaiswal (1957), Bharadwaj (1961) and Rai and Pande (1965). As the detailed morphology of the metacercaria was forwarded by Pandey (1969) it is therefore briefly recorded.

Body (Fig. 1) measures 3.77 x 1.42 mm. Suckers are well developed, muscular and circular in outline. Oral sucker measures 0.25 x 0.35 mm. Ventral sucker measures 0.84 x 0.90

mm. Prepharynx is absent. Pharynx oval, muscular measures 0.17 x 0.24 mm. Oesophagus measures 0.07 - 0.08 mm. Intestinal caeca sinuous, runs up to the posterior end of the body. Testes measures 0.05 - 0.09 and 0.06 - 0.10 mm. respectively. Ovary (Fig. 1) measures 0.03 - 0.20 mm. The excretory bladder (Fig. 3) is club shaped.

Table : 8 The appended table shows variations in various body measurements of *Isoparorchis hypselobagri* (Billet, 1898) Odhner, 1927 ; Pandey, 1969 and as shown by the present specimens (all measurements are in millimeter).

Body Organs	<i>Isoparorchis hypselobagri</i> Pandey, 1969	Present specimens
Host	<i>Mystus vittatus</i>	<i>Xenentodon cancella</i> (Ham.)
Locality	Lucknow	Lucknow
Size	1.63 - 3.80 x 0.37 - 1.42	3.77 x 1.42
Oral Sucker	0.09 - 0.36 x 0.12 - 0.31	0.25 x 0.35
Ventral Sucker	0.15 - 0.60 x 0.16 - 0.63	0.84 x 0.90
Pharynx	0.04 - 0.15 x 0.05 - 0.28	0.17 x 0.24
Oesophagus	0.03 - 0.15	0.07 - 0.08
Right Testis	0.01 - 0.07 x 0.01 - 0.10	0.05 - 0.09
Left Testis	0.01 - 0.10 x 0.01 - 0.07	0.06 - 0.10
Ovary	-----	0.03 - 0.20

Isoparorchis hypselobagri (**Billet, 1898**) **Odhner, 1927**

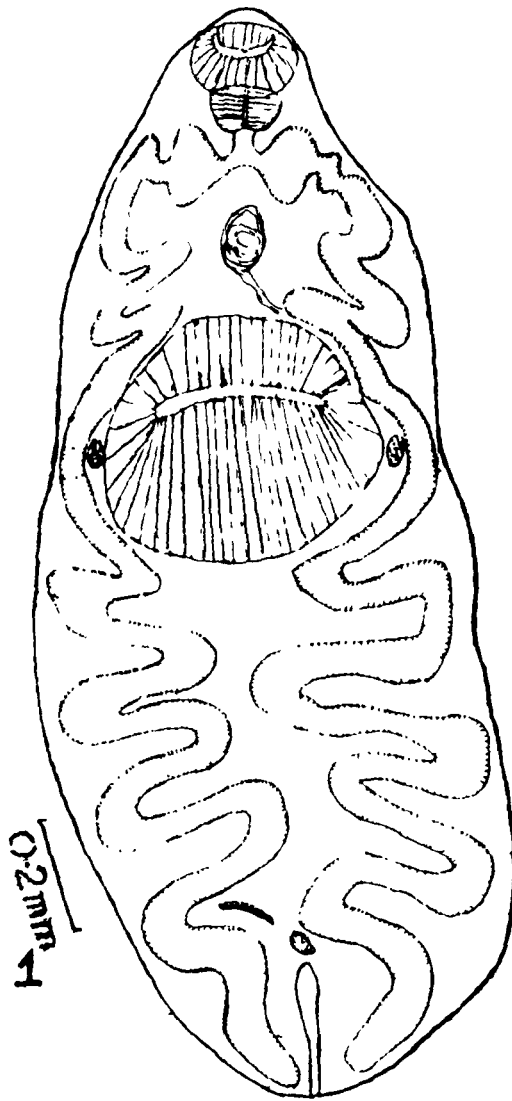


Fig 1 Metacercaria
(drawn from a live specimen)

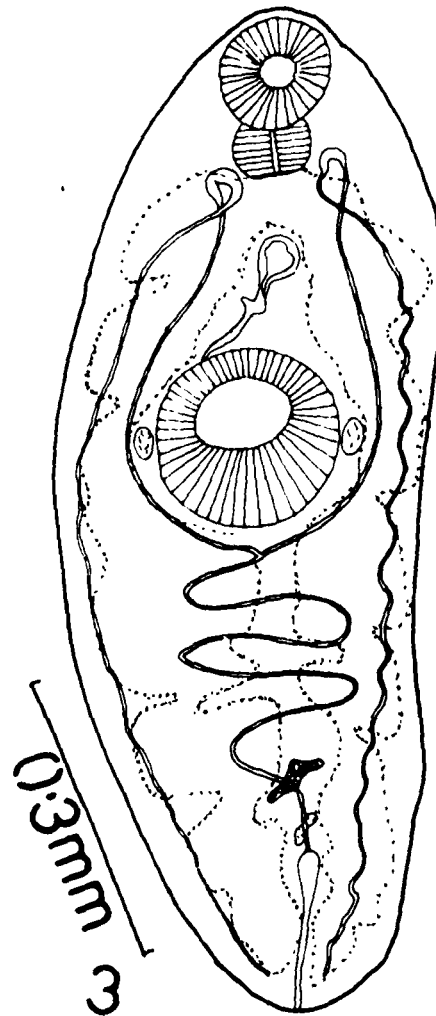


Fig 3 Metacercaria showing excretory system
(drawn from a live specimen)

***Tetracotyle madavii* sp.nov.**

Host	: <i>Mastacembelus armatus</i> (Lace.)
No. of host examined	: 280 (LKO-190,FZD-60,LMP-30)
No. of host found infected	: 4
No. of parasites collected	: 10
Site of infection	: Muscles, Body cavity, attached with visceral organs
Locality	: Lucknow

Cyst (Fig. 1) is thin, delicate and quite transparent, with out any pigment, oval in shape and measures 0.52 - 0.81 x 0.33 - 0.64 mm.

Body (Fig. 2) is aspinose, broadly oval and measures 0.50 - 0.81 x 0.32 - 0.48 mm. Suckers are well developed. Oral sucker is rounded, subterminal and measures 0.05 - 0.11 x 0.07 - 0.12 mm. Ventral sucker is pre-equatorial, circular in outline, larger than the oral sucker and measure 0.7 - 0.12 x 0.10 - 0.15 mm. Pseudo suckers are large and prominent covering most of the anterolateral margin of the body. Hold fast organ is large, located just behind the ventral sucker and irregularly shaped. The hold fast gland is absent. Mouth leads through a small, oval, muscular pharynx into a short oesophagus. Pharynx measures 0.03 - 0.06 x 0.04 - 0.05 mm while oesophagus measures 0.03 - 0.06 x 0.02 - 0.06 mm. Intestinal caeca extend up to the anterior margin of the hold fast organ. Gonads are not yet fairly developed and represented by two oval masses situated in the hind end of the body.

Excretory bladder (Fig. 3) is small V-shaped located at hind end of the body. It opens outside by a terminal excretory

pore. Due to extensive development of reserve excretory system, the flame cell pattern could not be traced out. Details of excretory system are as follows : Two main reserve excretory canals arise one on each side from the cornua of the excretory bladder. Each main reserve excretory canal runs along the lateral margin of the body and by the side of outer border of intestinal caecum of its own side up to the region of the oral sucker where the canals of each sides are joined by a transverse canal (anterior transverse canal). One median longitudinal canal arise from this anterior transverse canal and runs backward almost up to hind end of the body where it is connected by another transverse canal (Posterior transverse canal) with the main reserve excretory canal of each side. In the hind region of the middle third of the body another transverse canal connects the median longitudinal canal with the main reserve excretory canal. Besides this, median longitudinal canal, one sub median and two lateral (inner and outer) longitudinal canal arise on each side from the anterior transverse canal. Submedian longitudinal canal of each side runs backward between median longitudinal canal and main reserve excretory canal of its own side, and extend roughly up to hind region of middle third of the body where it joins the transverse canal which connect median longitudinal canal with main reserve excretory canal of both side. Two lateral (Inner & Outer) longitudinal canals of each side run on outer side of main reserve excretory canal almost up to level of cornual end of excretory bladder, where they join a short transverse canal which is a lateral extension of posterior transverse canal. Further cross connections varying from four to eight in number, are present on each side of body between all the excretory canals. A colourless fluid with rounded corpuscles is present in these canals. These corpuscles move about in fluid

as latter flows in these canals and often being voided out of the excretory pore.

Discussion

Following species are described from India under the larval genus *Tetracotyle* Fillipi, 1869 viz., *T. ranae* Kaw, 1950; *T. indicus* Singh, 1956; *T. sophoriensis* Singh, 1956; *T. ujjainensis* Trivedi, 1964; *T. xenentodoni* Chakrabarti, 1970; *T. glossogobi* Chakrabarti, 1970; *T. aglandulata* Chakrabarti, 1970; *T. muscularis* Chakrabarti, 1970 ; *T. szidati* Chakrabarti and Baugh 1970; *T. lucknowensis* Pandey 1971; *T. lali* Pandey, 1971; *T. singhi* Pandey, 1973; *T. tandoni* Pandey, 1973; *T. baughi* Pandey, 1973; *T. bufoi* Agarwal, 1975; *T. lymnae* Pandey and Agarwal, 1978; *T. gyanpurensis* Agarwal and Singh 1980; *T. simhai* Pandey and Tewari, 1983; *T. sanjivi* Pandey and Tewari, 1983; *T. fotedari* Pandey and Tewari, 1983 and *T. satendri* Tewari and Tyagi, 1986.

The present form differ from, *T. ranae* by the presence of a cyst, from *T. indicus*, *T. sophoriensis*, *T. muscularis*, *T. xenentodoni*, *T. singhi*, *T. tandoni*, *T. baughi* and *T. satendri* by the number and arrangement of genital rudiments, from *T. ujjainensis*, *T. simhai*, *T. fotedari*, *T. sanjivi* and *T. lucknowensis* by the ratio of suckers, from *T. glossogobi* and *T. lymnae* by having an undivided and aspinose body further, it differ from *T. aglandulata*, *T. bufoi*, *T. gyanpurensis*, *T. lali* and *T. szidati* by the pattern of reserve excretory system. Among all the species described from foriegn land, the present form closely resembles with *Tetracotyle* of *Apatemon fuligulae* Yamaguti, 1933 and *Tetracotyle* of *Apatemon pellucides* Yamaguti, 1933 in general topography of

the organs. It can be distinguished from *Tetracotyle* of *A. fuligulae* by having an undivided body and absence of hold fast gland. It further differ from *Tetracotyle* of *A. pellucides* by ratio of the suckers and number of genital rudiments.

Therefore, the present form is regarded here as a new species and named as *Tetracotyle madavii* sp nov.

***Tetracotyle madavii* sp. nov.**

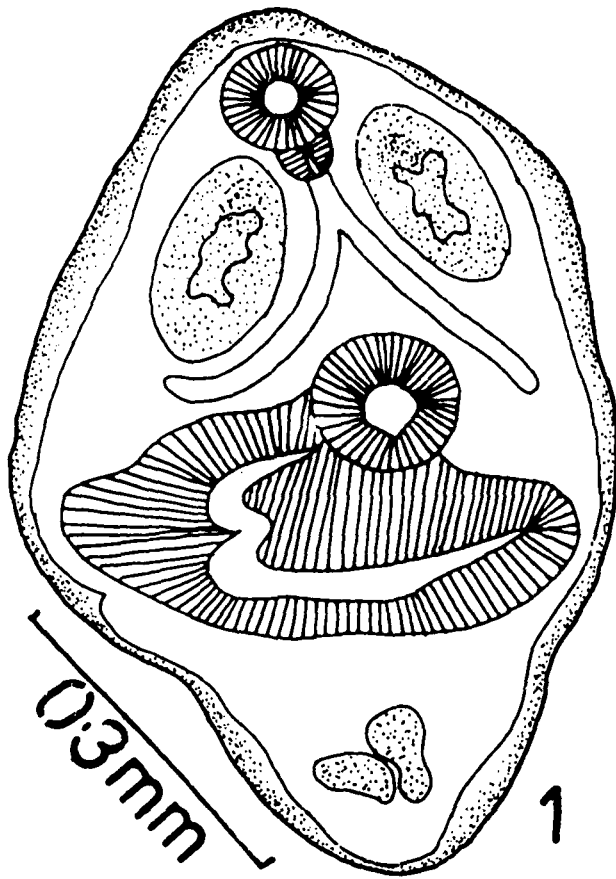


Fig. 1. Encysted Metacercaria
(drawn from a live specimen)

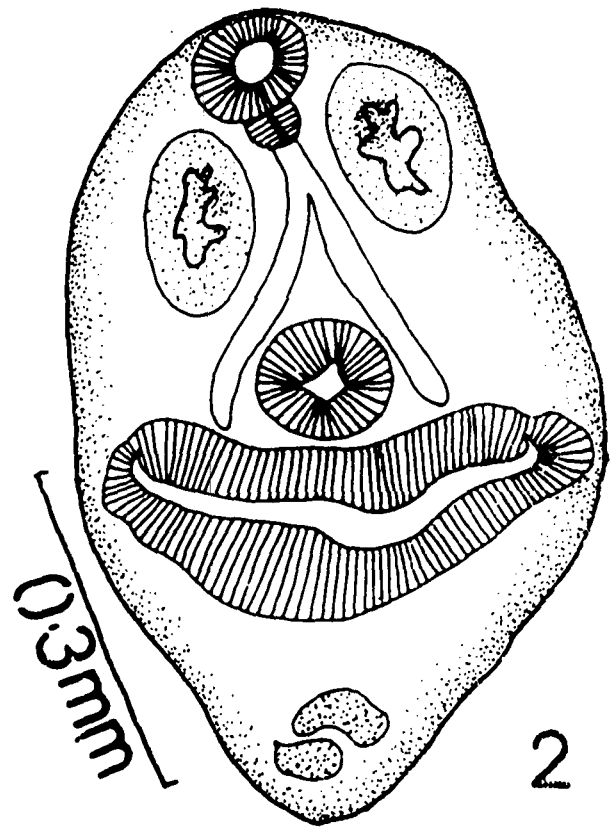


Fig. 2. Excysted Metacercaria
(drawn from a live specimen)

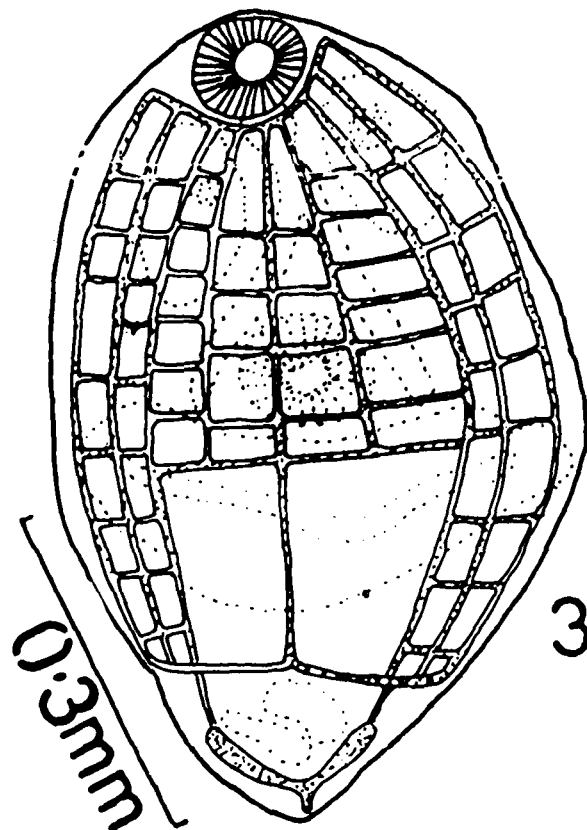


Fig. 3. Metacercaria showing excretory system
(drawn from a live specimen)

***Clinostomum piscidium* Southwell and Prasad, 1918**

Host	: <i>Mastacembelus armatus</i> (Lace.)
No. of host examined	: 280 (LKO-190, FZD-60, LMP-30)
No. of host found infected	: 10
No. of worms collected	: 37
Site of infection	: Body cavity
Locality	: Lucknow

During the course of study of larval digeneans found in fishes the author came across 10 specimens of a fresh water fish *M. armatus* (Lace.) were found infected with 37 specimens of a larva belonging to the larval genus *Clinostomum* Leidy, 1856. On further study it proved to be *C. piscidium* Southwell and Prasad, 1918. Southwell and Prasad, 1918 described this parasite from *Trichogaster fasciatus* and *Nandus nandus* (Ham.) at Khulana (Now in Bangla desh). Subsequently workers like Bhalerao, 1942, reported it from *Nandus nandus* (Ham.) at Poona. Singh (1955) described *C. microstomum* from *Nandus nandus* (Ham.), *Xenentodon cancila* (Ham.) and *Channa punctatus* (Bloch.) at Jabalpur. Later Singh 1959, himself synonymized it with *C. piscidium* Southwell and Prasad, 1918. Since Pandey and Baugh, 1969 redescribed in detail the *C. piscidium* from *T. fasciatus* and *Nandus nandus* (Bloch.) at Lucknow, it is briefly recorded. Furthermore, *Mastacembelus armatus* (Lace.) is added as a new host for the worm.

Body spinose and measures 2.6 - 7.8 x 0.75 - 2.00mm. Entire body is covered with minute spines. Oral sucker measures 0.15 - 1.0 x 0.17 x 1.6 mm. Ventral sucker measures 0.28 - 0.50 x 0.39 - 0.56 mm. Pseudopharynx oval and

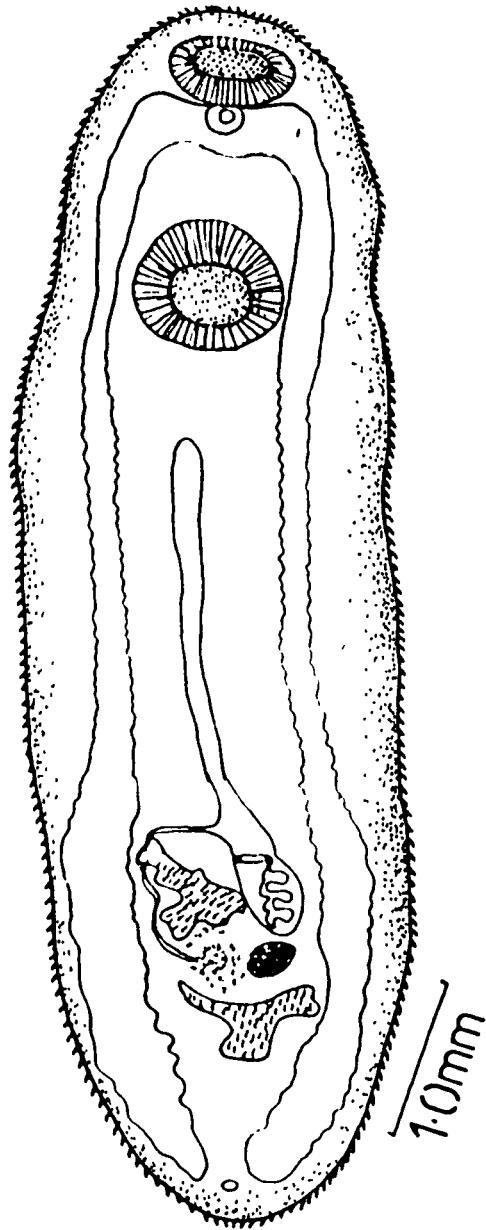
surrounded by unicellular gland cells. Oesophagus measures 0.20 - 0.80 mm. Intestinal caeca crenated, runs posteriorly, along the lateral sides of the body upto the hind end and terminate blindly. Intestinal caeca appears to be narrow anteriorly and broad posteriorly. Besides this the caeca has partly crenated and partly sacculated appearance.

Anterior testis measures 0.15 - 0.35 x 0.18 - 0.45 mm, while the posterior one measures 0.15 - 0.30 x 0.17 - 0.55 mm. Cirrus sac measures 0.20 - 0.45 x 0.07 - 0.21 mm. Ovary measures 0.09 - 1.0 x 0.04 - 0.08 mm. Excretory bladder is 'V' shaped.

Table 9 : Appended table shows differences in various body measurement of *Clinostomum piscidium*. Southwell and Prasad 1918; Bhalerao 1942; Pandey and Baugh, 1969 and as shown by the present specimens. (all measurements in millimeters)

Body Organs	<i>C. piscidium</i> Southwell and Prasad, 1918	<i>C. piscidium</i> Bhalerao, 1942	<i>C. piscidium</i> Pandey and baugh, 1969	<i>C. piscidium</i> Present specimens
Body	2.8-5.2 x 1.1-1.8	3.8 x 1.96	2.26-4.57 x 0.64-1.68	2.60-7.80 x 0.75-2.0
Oral Sucker	--	0.28 x 0.18	0.12-0.22 x 0.15-0.22	0.15-1.0 x 0.17-1.6
Ventral Sucker	--	0.6 0.48	0.31-0.60 x 0.49-0.69	0.28-0.50 x 0.39-0.56
Oesophagus	--	--	0.30-0.70	0.20-0.80
Anterior Testis	--	--	0.10-0.22 x 0.15-0.31	0.15-0.35 x 0.18-0.45
Posterior Testis	--	--	0.10-0.22 x 0.18-0.43	0.15-0.30 x 0.17-0.55
Cirrus Sac	--	0.35	0.15-0.22 x 0.07-0.15	0.20-0.45 x 0.07-0.21
Ovary	--	--	0.04-0.06 x 0.04-0.09	0.09-0.10 x 0.04-0.08

***Clinostomum piscidium* Southwell and Prasad, 1918**



Metacercaria
(drawn from a live specimen)

***Tetracotyle chacuti* sp.nov.**

Host	:	<i>Heteropneustes fossilis</i> (Bloch.)
No. of host examined	:	150 (LKO-140,LMP-10)
No. of host found infected	:	3
No. of worms collected	:	6
Site of infection	:	Muscles
Locality	:	Lucknow

Cyst is (Fig. 1) oval, elongated, thick, unpigmented and embeded in the subcutaneous muscles of the host body. Beside metacercaria, cyst contains a whitish fluid which makes the cyst opaque. After releasing from the cyst, metacercaria shows active movement of contraction and expansion. Cysts measures 0.85 - 0.91 x 0.55 - 0.62mm.

Body is (Fig. 2) aspinose, foliaceous, not divided into fore and hind body and measures 0.88 - 0.98 x 0.40 - 0.44mm. Suckers are well developed. Oral sucker is terminal, circular and measures 0.06 - 0.08 x 0.07 - 0.08 mm. Ventral sucker is circular, pre-equatorial, smaller than oral sucker and measures 0.05 - 0.07 x 0.05 - 0.08 mm. Pseudo suckers are well developed, located in the anterolateral region of the body, on both sides of oral sucker and measures 0.08 - 0.18 x 0.08 - 0.10 mm. Holdfast organ is oval in shape, about three to four times larger than the oral sucker, strongly muscular and located just behind the ventral sucker. Hold fast gland is fairly developed and located just behind the hold fast organ. Mouth directly leads in to a muscular, oval pharynx measures 0.02 - 0.03 x 0.02 -

0.04 mm. Oesophagus short. Intestinal caeca reaching up to the middle of hold fast organ.

Gonads are fairly developed and confined in the hind region of the body. Anterior testis is roughly triangular in shape, laterally placed and measures 0.08 - 0.10 x 0.06 - 0.08 mm. Posterior testis is large and "H" shaped, one limb is larger than the other. Limbs measures 0.18 - 0.20 x 0.05 - 0.07mm and 0.12 - 0.15 x 0.04 - 0.06mm respectively. Cirrus sac is represented by darkly stained gland mass extending from the level of anterior testis up to the lower margin of the posterior testis. Ovary is small, rounded and situated between the anterior testis and cirrus sac and measures 0.03 - 0.04 x 0.02 - 0.03 mm. Vitellaria is yet not developed.

Excretory bladder is (Fig. 3) small, bicornuate and situated at the hinder end of the body and opens out side through a terminal excretory pore. Two main reserve excretory canals arise, one on each side from the cornua of excretory bladder and runs anteriorly along the lateral body margin up to the level of the oral sucker, where they are joined by an anterior transverse canal. One median and four longitudinal canal (two on each side) runs posteriorly from the anterior transverse canal. The median longitudinal canals runs posteriorly and joins the main canals by a posterior transverse canal just below the hold fast gland after it runs posteriorly and joins the excretory bladder. The lateral longitudinal canals are united with median canal by six to eight short transverse canals. A large number of small, round excretory corpuscles move freely inside the excretory canals and often voided out from the excretory pore.

Discussion

Of all the known species of *Tetracotyle* Fillipi, 1869 describe from India present larva shows resemblance with *T. ranae* Kaw, 1950; *T. sophoriensis* Singh, 1956; *T. indicus* Singh, 1956; *T. ujjainensis* Trivedi, 1964; *T. muscularis* Chakrabarti, 1970; *T. xenentodoni* Chakrabarti, 1970; *T. glossogobi* Chakrabarti, 1970; *T. szidati* Chakrabarti and Baugh 1970; *T. lucknowensis* Pandey, 1971; *T. lali* Pandey, 1971; *T. singhi* Pandey, 1973, *T. tandoni* Pandey, 1973; *T. baughi* Pandey, 1973; *T. bufoi* Agarwal, 1975; *T. lymnae* Pandey and Agarwal, 1978; *T. simhai* Pandey and Tewari 1983, and *T. fotedari* Pandey and Tewari 1983 in general topography of the organs.

However, the present form differs from *T. ranae* by having a cyst; from *T. sophoriensis* and *T. szidati* by the ratio of suckers and well developed genital rudiments, from *T. indicus* by the position of ventral sucker; from *T. ujjainensis* and *T. glossogobi* by the ratio of suckers and number of genital rudiments; from *T. lucknowensis* by the shape and position of pseudo-suckers, shape of hold fast organ, by the presence of well developed hold fast gland and by the number of genital rudiments, from *T. muscularis* and *T. lymnae* by having an aspinose body, from *T. xenentodoni* by the number of genital rudiments and pattern of excretory system, from *T. singhi* by the shape of hold fast organ, hold fast gland, shape of pseudo-sucker, ratio of suckers, number of genital rudiment and by the pattern of reserve excretory system; from *T. tandoni* by the shape of pseudosuckers, ratio of suckers, by having an

undivided body and shape of hold fast organ and genital rudiments; from *T. lali* by the shape of hold fast organ, from *T. bufol* by having well developed suckers and from *T. simhai* and *T. fotedari* by having an undivided body, by the shape of hold fast organ and position of hold fast gland and shape of genital rudiments and lastly from *T. baughi* by the shape, size and position of genital rudiments, shape of excretory bladder, position of hold fast gland and pattern of excretory system.

The present larva also resembles with the following described forms from foreign lands viz. *Tetracotyle* of *Cotyluris communis* Hughes, 1928; *T. diminuta* Hughes, 1928; *Tetracotyle* of *Apatemon fuligulae* Yamaguti, 1933; *Tetracotyle* of *A. pellucides* Yamaguti, 1933; *T. biwaensis* Yamaguti, 1942; *T. tachoensis* Haderlie, 1953 and *Tetracotyle* of *A. gracilis pellucidus* Hoffman, 1959; It differs from *Tetracotyle* of *A. fuligulae*, *Tetracotyle* of *A. Pellucides* and *T. tachoensis* in the shape of hold fast gland and in the number and arrangement of genital rudiments. It can be further distinguished from *Tetracotyle* of *Cotyluris communis*, *T. biwaensis* and *T. diminuta* by having well developed genital rudiments and by the pattern of reserve excretory system, it is further differ from *T. diminuta* and *Tetracotyle* of *Cotyluris communis* by the presence of hold fast gland.

Therefore, the present form is regarded here as a new species and named as *Tetracotyle chacuti* sp. nov.

***Tetracotyle chacuti* sp. nov.**

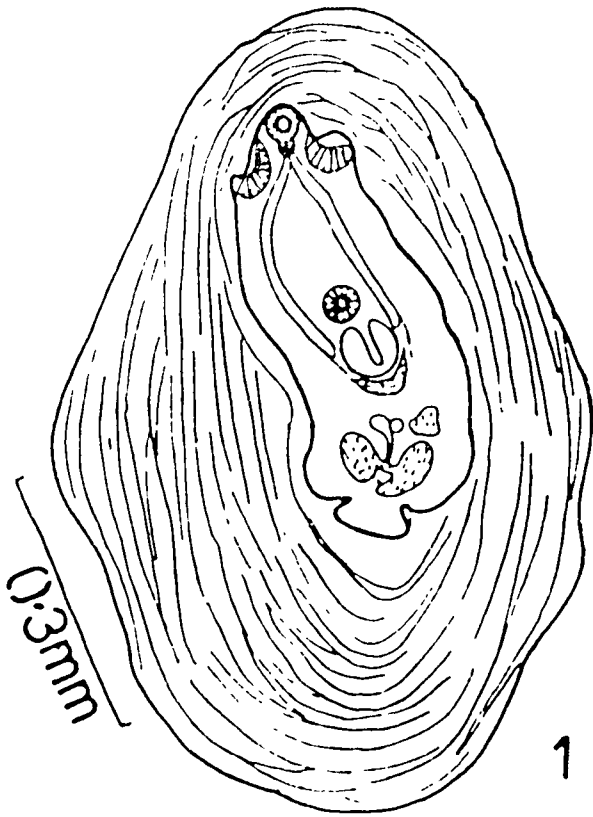


Fig 1 Encysted Metacercaria
(drawn from a live specimen)

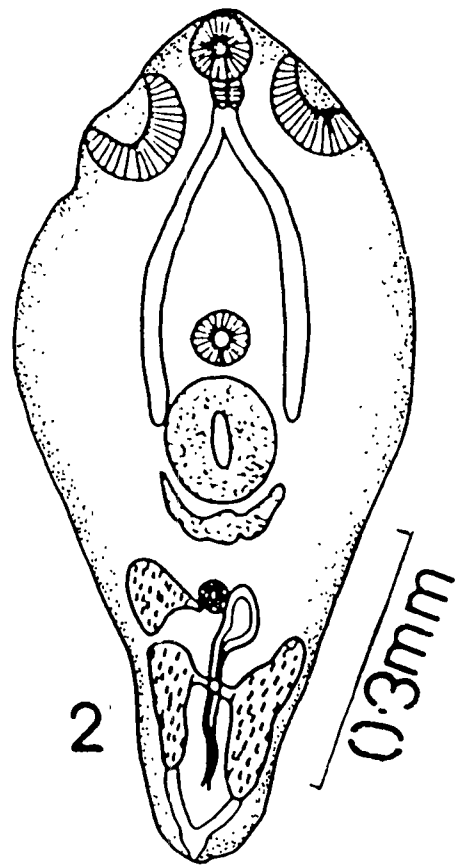


Fig.2. Excysted Metacercaria
(drawn from a live specimen)

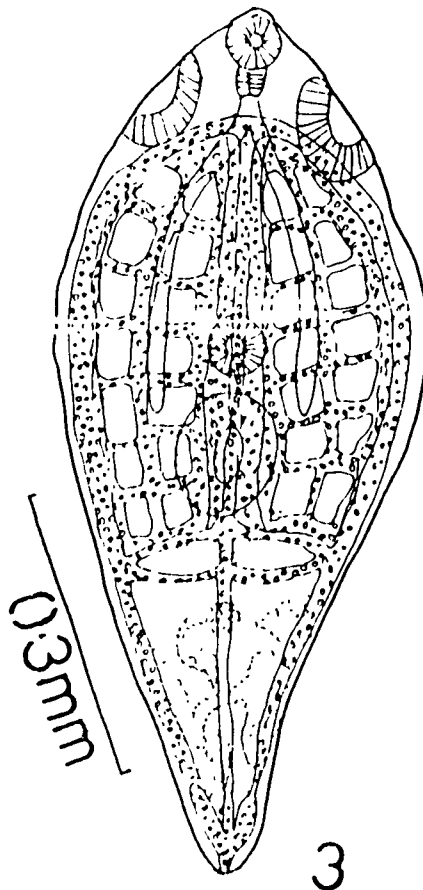


Fig 3 Metacercaria showing excretory system
(drawn from a live specimen)

***Diplostomulum ophthalmi* Pandey, 1968**

Host	: <i>Heteropneustes fossilis</i> (Bloch)
No. of host examined	: 150 (LKO-140,LMP-10)
No. of host found infected	: 1
No. of worms collected	: 3
Site of infection	: Body cavity
Locality	: Lucknow

Out of one hundred and fifty specimens of *Heterpneustes fossilis* (Bloch.) only a single specimen was found infected with a strigeid metacercaria belonging to the larval group *Diplostomulum* Brandes, 1892. On taxonomic study, this metacercaria was found to be closely resembles to the *Diplostomulum ophthalmi* Pandey, 1968. Since, the present metacercaria shows some variable features, it is briefly recorded here as such.

Body (Fig.1) elongated with smooth cuticle and rounded anterior and bluntly pointed posterior end and measures 0.49 - 0.54 x 0.18 - 0.20 mm. Suckers are fairly developed. Oral sucker subterminal, rounded and measures 0.13 - 0.04 x 0.03. The lateral pseudosuckers are poorly developed situated at both the lateral side of the oral sucker and measures 0.04 - 0.05 x 0.01 - 0.02 mm. Ventral sucker is nearly equal to the oral sucker, circular in outline and situated in middle third of the body measures 0.03 - 0.04 x 0.04 mm. A rounded, muscular hold fast organ is, situated behind ventral sucker and measures 0.05 - 0.06 x 0.04 - 0.06 mm. Hold fast gland is absent. Alimentary canal consist of a short prepharynx measures 0.01 - 0.02 mm. Pharynx well developed, oval in outline and measures

0.02 - 0.023. A short oesophagus is present measures 0.02 - 0.03 mm. Intestinal caeca are simple and extend up to the region of hold fast organ in the hind body. Genital rudiments (Fig.1) are poorly developed and represented by two darkly stained gland masses behind the hold fast organ. Anterior one larger than the posterior one and each measures 0.01 - 0.02 x 0.04 - 0.05 and 0.02 x 0.03 mm respectively.

Excretory bladder (Fig2) is small 'V' shaped, located at the hind end of the body and opens outside through a terminal excretory pore. Two main collecting canals of reserve system arise on each side, from the anterior margin of cornua of excretory bladder. They run up to the region of pharynx or little behind and joined together by an anterior transverse canal. They are also joined by two or more other transverse canals situated in different regions of the body. A median longitudinal canal arises from anterior transverse canal and runs to the hind end of the body. It is also joined to the main collecting canals by a transverse canal. Posterior most transverse canal also gives rise to an anterior and a posterior collecting canal, which runs in the lateral margin of the body. Moreover, each excretory canal gives rise to numerous short branches which divide and redivide forming a network of canals.

Discussion

Pandey, 1968 described *Diplostomulum ophthalmi* recovered from the fish *Puntius sophore* (Ham), *Trichogaster fasciatus* (Bloch and Schn), *Puntius ticto* (Ham.), *Oxygaster bacaila* (Ham.) and *Heteropneustes fossilis* (Bloch.) at Lucknow.

Pandey and Tewari, 1986 critically reviewed the various Indian species comes under the genus *Diplostomulum* Brandes, 1892 and regarded *Diplostomulum sp.* Rai and Pande, 1964 ; *D. cerebralis* Chakrabarti, 1968 ; *D. ellipticus* Chakrabarti and Baugh, 1973 ; *D. tulsipurensis* Chakrabarti and Baugh, 1973 and *D. lucknowensis* Chakrabarti and Baugh, 1973 ; as a synonym of *Diplostomulum ophthalmi* to which I also agreed.

Table : 10 The appended table shows characters and measurements (mm) of *Diplostomulum* Brandes, 1892, metacercaria described from India and as shown by the present specimens

Body Organs	<i>D ophthalmi</i> Pandey, 1968	<i>D cerebralis</i> Chakrabarty, 1968	<i>D ellipticus</i> Chakrabarty, 1973	<i>D lucknowensis</i> Chakrabarty, 1973	<i>D tulsipurensis</i> Chakrabarty 1973	<i>D ophthalmi</i> Pandey & Tewari, 1984	<i>D ophthalmi</i> , Present form
Body size	0 65-1 12 x 0 25-0 30	0 86-1 23 x 0 28-0 33	0 65-0 95 x 0 18-0 26	0 42 - 0 72 x 0 20 - 0 32	0 74 - 0 30 x 0 24 - 0 40	0 52 - 0 66 x 0 16 - 0 15	0 49 - 0 54 x 0 18 - 0 20
Shape of oral sucker	Circular	Cup like	Cup like	Cup like	Cup like	Cup like	Circular
Oral sucker	0 04-0 06	0 05-0 07 x 0 03-0 04	0 05-0 07 x 0 02-0 04	0 04 - 0 05 x 0 02 - 0 03	0 04 - 0 07 x 0 02 - 0 04	0 022 - 0 025 x 0 025 - 0 030	0 03 - 0 04 x 0 03
Ventral sucker	0 07-0 08	0 042-0 056	0 03-0 05	0 03 - 0 05	0 03 - 0 06	0 025 - 0 030	0 03 - 0 04 x 0 04
Pseudosucker	Absent	Absent	Present	Present	Present	Present	Present
Hold fast Organ	?	0 12-0 17 x 0 05-0 08	0 09-0 16 x 0 06-0 09	0 06 - 0 06 x 0 04 - 0 06	0 08 - 0 12 x 0 04 - 0 07	0 065 - 0 075 x 0 040 - 0 045	0 05 - 0 06 x 0 04 - 0 06
Pharynx	0 01-0 03	0 02-0 03	0 02-0 05	0 01 - 0 03	0 01 - 0 03	0 013 - 0 028	0 02 - 0 023
Genital rudiment	One mass	One mass	Two mass	One mass	One mass	One mass	Two mass
Shape of excretory corpuscle	Oval	Elliptical	Elliptical	Round	Rod like	Elliptical	Elliptical
Origin of main reserve excretory canal from excretory bladder	Lateral side of cornua	Lateral side of cornua	Anterior end of cornua	Anterior end of cornua	Lateral side of cornua	Lateral side of cornua	Anterior end of cornua

Diplostomulum ophthalmi Pandey, 1968

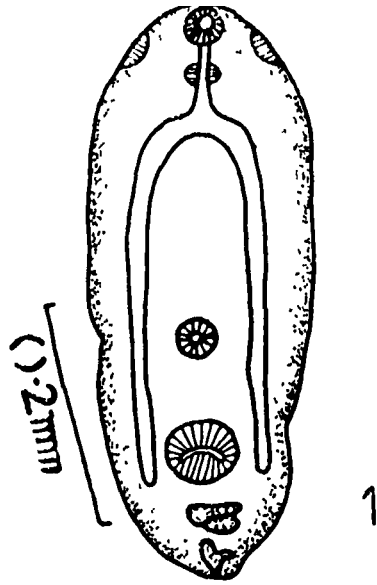


Fig 1 Metacercaria
(drawn from a live specimen)

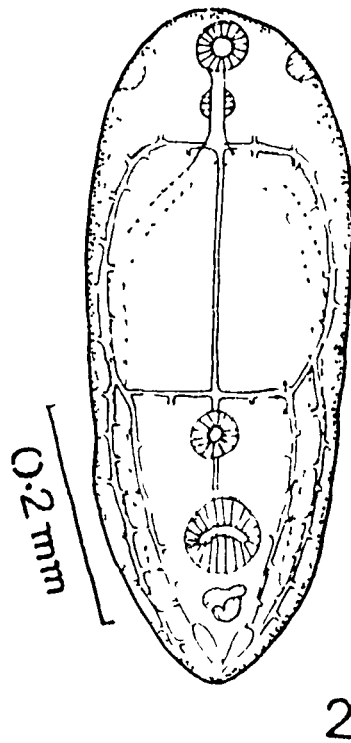


Fig 2 Metacercaria showing excretory system
(drawn from a live specimen)

***Diplostomulum indicum* sp.nov.**

Host	:	<i>Heteropneustes fossils</i> (Bloch)
No. of host examined	:	150 (LKO-140,LMP-10)
No. of host found infected	:	15
No. of parasites collected	:	27
Site of infection	:	Muscles
Locality	:	Lucknow

Cysts (Fig. 1) are found embedded in the ventro-lateral muscles of the host and appears as small whitish or yellowish protruberances on the skin and easily seen by the naked eye. Cyst is very delicate, small, single layered and without any pigment, oval in shape and measures 0.75 - 0.88 x 0.49 - 0.59 mm.

Body (Fig. 2) is pear shaped with spinose cuticle and divisible into a fore body and a hind body. Fore body measures 0.50 - 0.55 x 0.40 - 0.55 mm while the hind body measures 0.25 - 0.30 x 0.38 - 0.47 mm. Spines present over the body are uniformly distributed in anterior 1/3 of the body up to the anterior margin of the ventral sucker. Suckers are well developed, unequal in size and circular or oval in outline. Oral sucker is subterminal, oval in shape and measures 0.04 - 0.08 - 0.05 - 0.10 mm. Pseudo suckers are well developed and situated on either side of the oral sucker and measures 0.10 - 0.14 x 0.05 - 0.06 mm. Ventral sucker is pre equatorial in the fore body, rounded in shape and measures 0.03 - 0.08 - 0.05 - 0.06 mm. The hold fast organ is well developed, very large, about 5-6 times larger than the ventral sucker situated just

behind the ventral sucker, rounded to oval in shape and measures 0.19 - 0.24 x 0.18 - 0.20 mm. A well developed hold fast gland is present immediately behind the hold fast organ. Pre pharynx is absent. Pharynx is well developed, smaller than the oral sucker and measures 0.02 - 0.04 x 0.05 - 0.08. A very short oesophagus is present. Intestinal caeca simple and reaching up to the posterior extremity of the fore body.

Gonads are well developed and located in the hind body. Testes are parallel. Right testis is small, oval to rounded in shape while the left one is long club shaped slightly crossing the midline of fore body and hind body. Right testis measures 0.05 - 0.06 x 0.03 - 0.04 mm while the left one measures 0.12 - 0.15 x 0.04 - 0.06 mm. Cirrus sac is transversely comma shaped, situated in the inter testicular field and measures 0.10 - 0.12 x 0.03 - 0.04 mm. The contents of cirrus sac are not yet developed. Ovary is rounded in shape, situated just anterior to the cirrus sac in inter-testicular field and measures 0.04 - 0.05 - 0.04 - 0.05 mm.

Excretory bladder (Fig. 3) is an elongated structure extending from the midline of fore body and hind body and opens externally by a terminal excretory pore. Main collecting canals, one on each side of the body, runs on each lateral side upto oral sucker and joins each other by a transverse collecting canal. Numerous branches are given out both on outer side and inner side of main collecting canal and further ramify to end in a vesicle containing excretory corpuscles.

Discussion

To the best of my knowledge, at present four larval groups of strigeids are known viz. *Neascus*, *Tetracotyle*, *Diplostomulum* and *Prohemistomulum*, Hoffman (1961) in his classical work "Synopsis of strigeid of fishes and their life cycle" has well defined these larval groups, chiefly on the basis of reserve excretory system. Subsequently Dubois (1951) erected another group of larval strigeid *Neodiplostomulum*, this is devoid of lateral pseudosuckers. Pearson (1960) and Pandey (1970) did not accept this larval group and they were of opinion that reserve excretory system should be given prime importance in classification of larval strigeid to which I also agree. As far as writer is aware the larval genus *Diplostomulum* Brandes, 1892 includes following Indian species. viz., *D. bufonis* Kaw, 1950; *D. pigmentata* Singh, 1956; *D. ketupensis* Ganpati and Rao, 1962; *D. singhii* Pande, Bhatia and Rai, 1964; *D. nurius* Thaper, 1967; *D. cerebralis* Chakrabarti, 1968, *D. minutum* Pandey, 1970; *D. ophthalmi* Pandey, 1968; *D. ellipticus* Chakrabarti and Baugh, 1973; *D. tulsipurensis* Chakrabarti and Baugh, 1973; *D. lucknowensis* Chakrabarti and Baugh, 1973; *D. dutti* Agarwal and Khan, 1982 ; *D. titrai* Chopra et. al., 1983 and *D. singhii* Sinha, 1991.

The present form differs from *D. bufonis* and *D. pigmentata* in distribution of spines on the body and number of genital rudiments, from *D. cerebralis*, *D. ophthalmi*, *D. minutum*, *D. ellipticus* and *D. lucknowensis* in having a divided body. Further it differ from *D. cerebralis* in the presence of pseudosuckers and number of genital rudiments. It differ from *D. ophthalmi* by the presence of pseudosuckers, hold fast gland and number of genital rudiments. It differ from

D. ellipticus and *D. lucknowensis* in the presence of spines on body and in number of genital rudiments. It also differs from *D. tulsipurensis* by the absence of pre-pharynx, in number of genital rudiments and in ratio of suckers. It differs from *D. singhii* and *D. nurius* by having a spinose body, by the number of genital rudiments and ratio of suckers. It differs from *D. ketupensis* in the ratio of sucker, from *D. minutum* in having a divided body, from *D. dutti* in number of genital rudiments, distribution of spines and ratio of suckers, from *D. tetrai* in having a divided body, presence of pseudo-suckers and from *D. singhii* in number of genital rudiments.

Following species are described from foreign countries viz : *D. treguna* Nazmi, 1932; *D. scheuringe* (Hughes, 1929) Van Cleave and Mueller, 1934; *D. ambystomae* Rankin and Hughes, 1937; *D. destructor* Szidati and Nani, 1951; *D. truttae* Lal, 1953; *D. ktaluri* Haderlie, 1953; *D. triloba* Huggins, 1954; *D. pelmatoides* Rees, 1955; *D. mordax* Szidati and Nani, 1959 and *D. leonensis* Williams, 1967. The present form, differs from *D. treguna*, *D. scheuringe*, *D. ambystomae*, *D. destructor* and *D. mordax* in number of genital rudiments. Moreover, it differs from *T. truttae*, *D. ktaluri*, *D. triloba*, *D. pelmatoides* and *D. leonensis* by the presence of hold fast gland, absence of prepharynx and ratio of suckers.

Therefore, the present form is regarded as a new species and named as *Diplostomulum indicum* sp. nov.

***Diplostomulum indicum* sp. nov.**

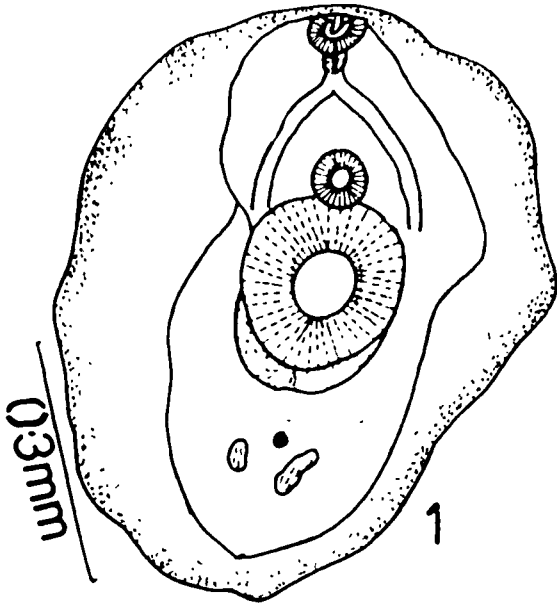


Fig 1 Encysted Metacercaria
(drawn from a live specimen)

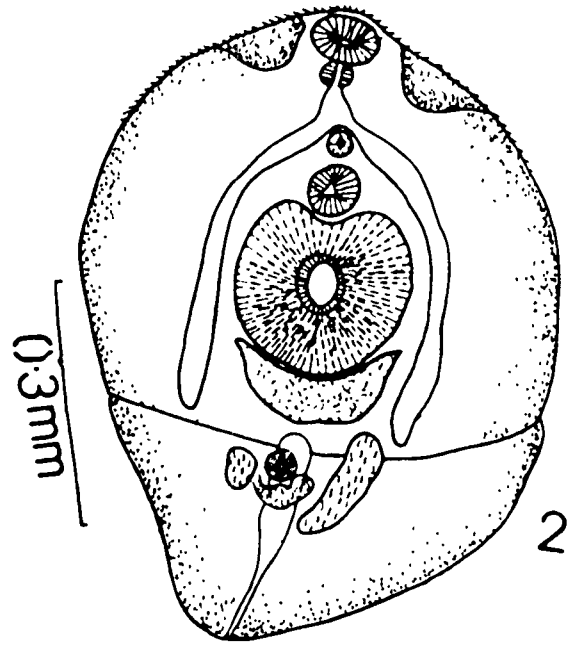


Fig 2 Excysted Metacercaria
(drawn from a live specimen)

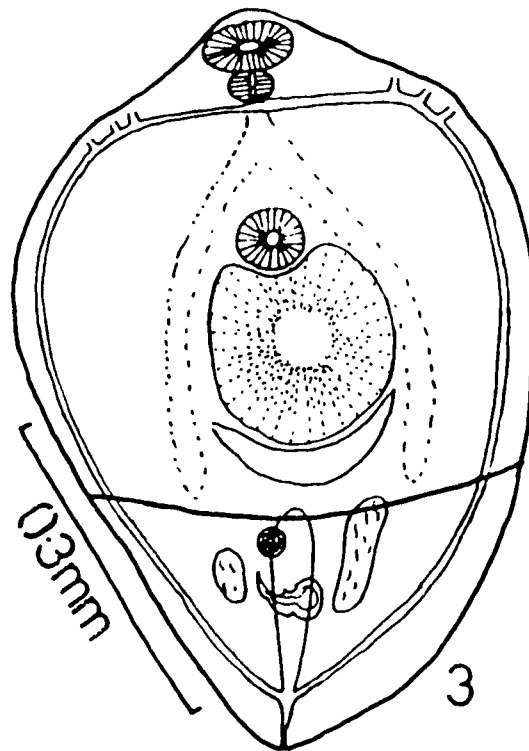


Fig 3 Metacercaria showing excretory system
(drawn from a live specimen)

***Neascus thapari* sp.nov.**

Host	: Heteropneustes fossilis (Bloch)
No. of host examined	: 150 (LKO-140, LMP-10)
No. of host found infected	: 8
No. of worms collected	: 12
Site of infection	: Muscles
Locality	: Lucknow

Metacercariae were found deeply buried in the muscles of the host fish, they were not associated with any cyst.

Body (Fig.1) is foliaceous, aspinose and sharply divided into fore and hind body. Fore body is large with blunt anterior and broad, circular posterior end and measures 0.59 - 0.67 x 0.49 - 0.60 mm. Hind body is small and conical measures 0.19 - 0.23 x 0.34 - 0.35 mm. Oral sucker is terminal, circular in outline and measures 0.07 - 0.08 x 0.05 - 0.10. Ventral sucker is circular, median, located in pre-equatorial region of the forebody, smaller than the oral sucker and measures 0.04 - 0.07 x 0.06 - 0.07. Pseudosuckers absent. Hold fast organ is well developed, oval in shape, strongly muscular, located in the posterior region of the fore body. It measures 0.19 - 0.24 x 0.20 - 0.22. Hold fast gland is composed of a mass of deeply stained cells, located close behind the hold fast organ. Mouth directly leads into a muscular, oval pharynx of 0.02 - 0.04 x 0.04 - 0.05 mm. Oesophagus absent. Intestinal caeca extend up to the posterior extremity of the body.

Gonads are not well developed and represented by three small, darkly stained cell masses. Anterior two are more or

less equal and posterior one is transversely elongated oval in shape. Posterior cell mass is situated at the junction of fore body and hind body. A streak of dark stained cell mass represents the cirrus sac. Bursa copulatrix is not visible.

Excretory bladder (fig. 2) is small bicornuate and opens outside, through a terminal excretory pore, at hind body. Two main collecting canals of reserve excretory system originate, one from each side, from the cornua of excretory bladder and runs through the lateral fields of the body up to the level of pharynx where they unite with each other by a short anterior transverse canal and bifurcates just above the level of ventral sucker. Two median longitudinal canal, join each other by a posterior transverse canal at the junction of fore body and hind body. These major canals are joined together by short transverse canals but their arrangement could not be made out. Small, black, excretory carpuscles flow freely in these canals and are voided out through excretory pore, sometimes during contraction of the body.

Discussion:

Among all the described species under the larval genus *Neascus* Hughes, 1928; the present larva differ from *N. elongatus* Singh, 1967 by having a divided body. It differs from *N. vetastai* Kaw, 1950; *N. hepatica* and *N. mesentric* form Rai and Pandey, 1964; *Neascus species* I, *Neascus species* II, Thaper 1967; in number, location and arrangement of genital rudiments, from *N. hepatica* Chakrabarti, 1970; *N. xenentodoni* Pandey, 1971; and *N. nanaksagarensis* Baugh and Chakrabarti, 1977; in number and shape of genital rudiments and pattern of excretory system. It can also be

differentiated from *N. channi* Pandey, 1971 *N. komiyai* Pandey, 1973 and *N. hoffmani* Pandey, 1973; in shape and position of hold fast organ and ventral sucker and It chiefly differs from *N. chauhani*, *N. hanumanthai* and *N. moghei* Agarwal and Khan, 1982 in the pattern of the reserve excretory system.

Further it differs from *N. ramalingami* Pandey and Tewari, 1986 by having different shape of the body, broad intestinal caeca, absence of prepharynx and shape of hold fast organ, hold fast gland and genital rudiment. It is further differ from *N. vedi* Pandey and Tiwari, 1986 by having different shape of body, broad intestinal caeca, position of ventral sucker, presence of pharynx, shape of hold fast organ, hold fast gland, genital rudiments and pattern of reserve excretory system, from *N. dalibaghensis* Pandey and Tewari, 1986 by the absence of cyst and from *N. shajahanpurensis* Pandey and Tewari, 1986 by the absence of oesophagus and number of genital rudiments

The larva shows resembles with *Neascus* of *Uvulifer ambloplitis* Hughes, 1927, *Neascus* of *Crassiphiala bulboglossa* and *Neascus* of *Posthodiplostomum minimum* Hughes 1928, *Ornithodiplostomum ptychochellus* Hughes and Piszczek, 1928; *Neascus* of *Neodiplostomum perlatum* and *Neascus* of *Posthodiplostomum cuticola* Ciurea, 1930; *Neascus grandis* Muller and Vancleave, 1932; *Neascus rhiniethysi* Hunter and Wanda, 1933, *Neascus pyriformis* *Neascus ellipticus* Chandler, 1951 and *Neascus nolfi* Hoffman, 1955; It differs from *Neascus* of *Ornithodiplostomum ptychocheilus*, *Neascus* of *Uvulifer ambloplitis* and *Neascus pyriformis* in the pattern of reserve excretory system, from *Neascus* of *Crassiphiala bulboglossa* and *Neascus longicollis* in the ratio of fore and hind body, from *Neascus* of

Neodiplostomum perlatum, *Neascus grandis*, *Neascus nolfi* and *Neascus rhinichthysi* in size, shape and arrangement of genital rudiments and from *Neascus* of *Posthodiplostomum cuticola* in the absence of prepharynx, position of ventral sucker and shape, size and arrangement of genital rudiments.

Therefore, the present form is regarded as a new species and named as *Neascus thapari* sp. nov.

Neascus thapari sp. nov.

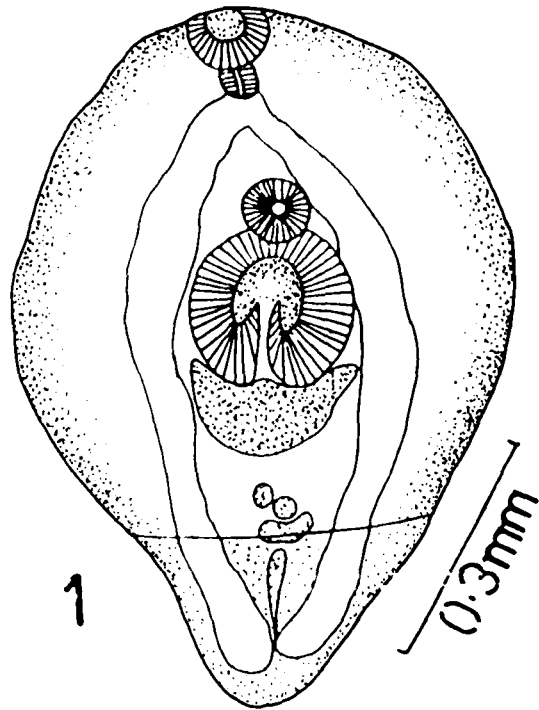


Fig. 1. Metacercaria
(drawn from a live specimen)

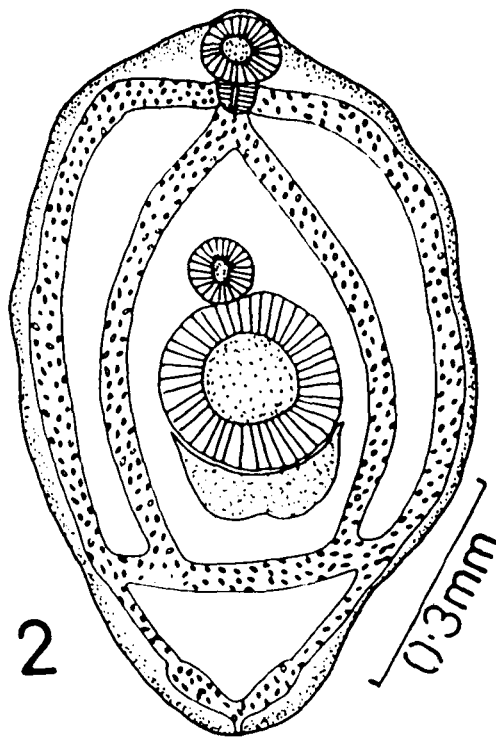


Fig. 2. Metacercaria showing excretory system
(drawn from a live specimen)

***Clinostomum dasi* Bhalerao, 1942**

Host	:	<i>Heteropneustus fossilis</i> (Bloch.)
No. of host examined	:	150 (LKO-140, LMP-10)
No. of host found infected	:	4 (LKO-3, LMP-1)
No. of worms collected	:	12 (LKO-10, LMP-2)
Site of infection	:	Beneath the skin, burried in the muscles of the ventrolateral body wall of host.
Locality	:	Lucknow, Lakhimpur-kheri

Metacercaria was found encysted beneath the skin, in the muscles of ventro-lateral body walls of the host fish. As Pandey (1966) has already given a detailed account of the metacercaria, it is briefly recorded.

Cyst measures 1.60 - 2.00 mm. Body appears measures 2.60 - 4.48 mm x 1.15 - 1.35 mm. Oral sucker measures 0.15 - 0.23 x 0.25 - 0.35 mm. Ventral sucker measures 0.45 - 0.58 x 0.48 - 0.50 mm. Oesophages measures 0.08 - 0.10 mm. A pseudo pharynx is also present. Intestinal caeca extend up to the hind region of the body. Anterior testis measures 0.10 - 0.25 x 0.20 - 0.30 mm. Posterior testis measures 0.13 - 0.20 x 0.28 - 0.48 mm. Cirrus sac measures 0.18 - 0.28 x 0.08 - 0.13 mm. Ovary measures 0.08 - 0.13 x 0.08 - 0.13 mm. Excretory bladder is small and 'V' shaped.

Table : 11 The appended table shows differences in various body measurements of *Clinostomum dasi* (Bhalerao, 1942) Pandey, 1966 and as shown by the present specimens (all measurements in millimetres)

	C. dasi Bhalerao, 1942	C. dasi Pandey, 1966	Present specimens
Locality	Hyderabad (♀ ^p)	Lucknow (♀ ^p)	Lucknow, Lakhimpurkheri U.P
Cyst size	--	1.47 - 2.10	1.60 - 2.0
Body size	3.45 x 1.33	3.46 - 4.90 x 1.44 - 1.50	2.60 - 4.48 x 1.15 - 1.35
Oral sucker	0.23 x 0.10	0.07 - 0.25 x 0.27 - 0.39	0.15 - 0.23 x 0.25 - 0.35
Ventral sucker	0.52	0.67 - 0.78 x 0.69 - 0.76	0.45 - 0.58 x 0.48 - 0.50
Anterior Testis	0.20 x 0.25	0.30 - 0.42 x 0.48 - 0.60	0.10 - 0.25 x 0.20 - 0.30
Posterior Testis	0.22 x 0.36	0.16 - 0.33 x 0.45 - 0.67	0.13 - 0.20 x 0.28 - 0.48
Cirrus sac	--	0.30 - 0.33 x 0.22 - 0.25	0.18 - 0.28 x 0.08 - 0.13
Ovary	0.065x0.077	0.15 - 0.18 x 0.10 - 0.12	0.08 - 0.13 x 0.08 - 0.13

***Clinostomum dasi* Bhalerao, 1942**

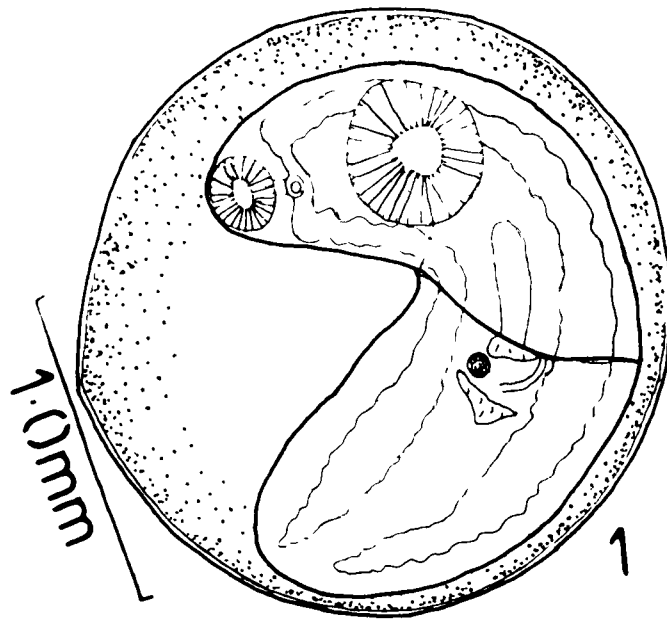


Fig 1 Encysted Metacercaria
(drawn from a live specimen)

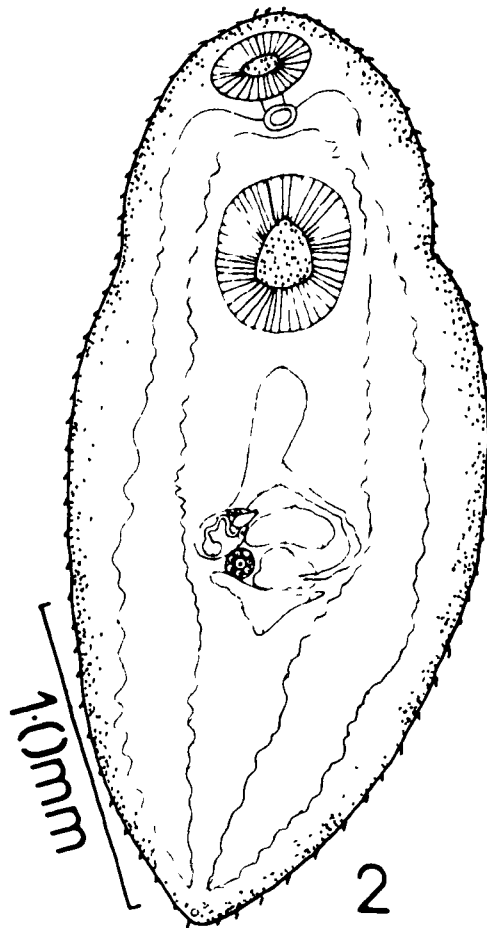


Fig 2 Excysted metacercaria
(drawn from a live specimen)

***Clinostomoides baughi* sp.nov.**

Host	: <i>Heteropneustes fossilis</i> (Bloch.)
No. of host examined	: 150 (LKO-140, LMP-10)
No. of host found infected	: 1
No. of worms collected	: 2
Site of infection	: On skin near operculum
Locality	: Lucknow

Body (Fig.) elongated, whitish in colour, leech like with pointed ends and measures 5.05 - 5.85 x 1.45 - 1.50 mm. Oral sucker is oval or rounded in shape, subterminal and measures 0.16 - 0.18 x 0.25 - 0.28mm. Ventral sucker larger than the oral sucker, preequatorial and measures 0.50 - 0.53 x 0.45 - 0.50 mm. Pharynx is absent. A short oesophagus is present and measures 0.20 - 0.25 mm. Intestinal caeca are simple in preacetabular region but in post-acetabular region they poses small diverticulae on the inner and outer side and look serpentine in structure extended upto the posterior extremity of the body. They are filled with brownish food material which is more conspicuous in live specimens.

Gonads are well developed and located in the posterior part of the body. Testes are transversly elongated. Anterior testis measures 0.09 - 0.10 x 0.35 - 0.40mm and posterior testis is 'V' shaped and measures 0.10 x 0.40 - 0.42 mm. Cirrus sac is intertesticular, elongated and measures 0.18 - 0.20 x 0.08 - 0.09 mm. It contains a poorly developed vesicula seminalis, pars prosatica and opens into the genital atrium. Ovary small, oval to rounded, just opposite to cirrus sac, intertesticular and measures 0.12 - 0.13 x 0.09 - 0.10 mm. Oviduct is short and opens at ootype surrounded by numerous

gland cells. Uteroduct makes coil in intertesticular region and runs anteriorly to open in posterior third of uterine sac, which is a long, slender tube, opens by a short metraterm in to the genital atrium. Genital pore located at the anterior border of the posterior testis. Vitelline follicle are not visible. Excretory bladder small 'V' shaped at the hinder end of the body and open outside through a terminal excretory pore.

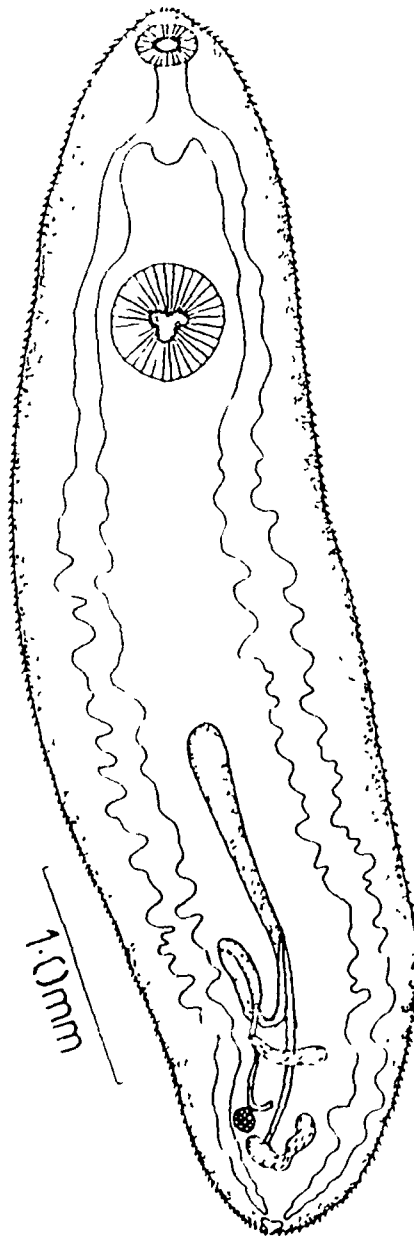
Discussion

To the best of my knowledge the genus *Clinostomoides* Dollfus, 1950 consists of following species viz., *C. ophiocephali* (Tabangui and Musilungan, 1944) Agarwal, 1958; *C. dollfusi* Agarwal, 1958; *C. raii* rai, 1970 ; *C. chauhani* Pandey, 1971; *C. meerutensis* Pandey and Tyagi 1986 and *C. pandeyii* Singh and Sharma, 1994.

The present form chiefly differs from *C. ophiocephali* by spinose cuticle, position of gonads and simple uterus, from *C. dollfusi* by larger body size and spinose cuticle. It differs from *C. raii* by its small body size and from *C. meerutensis* by the shape of gonads. It also differ from *C. chauhani* by the shape of ovary and absence of coil in utero duct and in the position of opening of uteroduct (In *C. chauhani* uteroduct opens at the anterior end of the uterine sac but in the present form it opens in the posterior third of the uterine sac) and lastly it differ from *C. pandeyii* by the shape and disposition of gonads

Therefore, the present form is regarded as a new species and named as *Clinostomoides baughi* sp. nov.

Clinostomoides baughi sp. nov.



Metacercaria
(drawn from a live specimen)

***Clinostomum trichogasteri* Pandey, 1969**

Host	:	<i>Trichogaster fasciatus</i> (Bloch. & Schn.)
No. Of host examined	:	20
No. Of host found Infected	:	2
No. Of worms collected	:	2
Site of infection	:	Body cavity
Locality	:	Lucknow

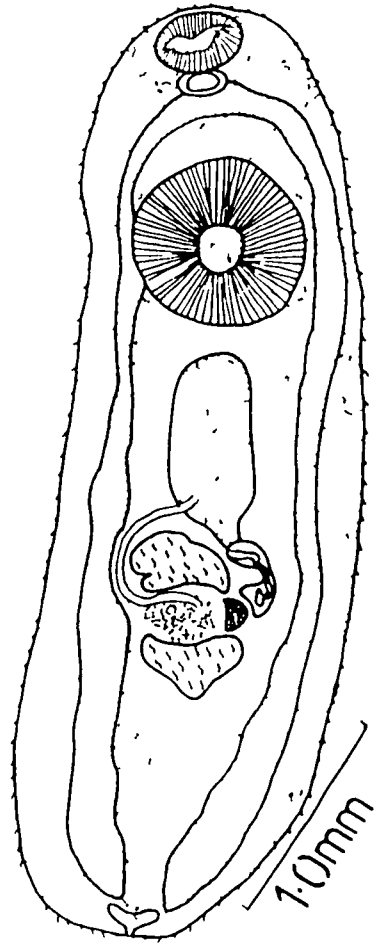
As Pandey (1969) described *Clinostomum trichogasteri* in detail the present form is briefly recorded.

Body measures 3.45-3.95 x 1.10 - 1.20 mm . Oral sucker measures 0.20 - 0.35 x 0.24 - 0.26 mm. Ventral sucker measures 0.60 - 0.75 x 0.38 - 0.75. Pseudopharynx measures 0.04 - 0.05 x 0.15 mm. Oesophagus absent. Intestinal caeca smooth bordered with out any diverticula. Anterior testis measures 0.20 - 0.30 X 0.38 - 0.48 mm while the posterior one measures 0.20 - 0.30 X 0.35 - 0.45 mm. Cirrus sac measures 0.28 - 0.33 X 0.10 - 0.18 mm. It contains tubular seminal vesicle, Pars prostatica and leads in to the fine ejaculatory duct Ovary measures 0.13 - 0.17 X 0.10 - 0.12 mm. excretory bladder is small V - shaped.

Table : 12 The appended table shows variation in body measurements of *C. trichogasteri* Pandey, 1969 and as shown by the present specimens. (all measurements in millimeters)

Body Organs	<i>C. trichogasteri</i> Pandey, 1969	Present specimens
Size	2.03-2.70 x 0.58-0.82 mm	3.45-3.95 x 1.10-1.20 mm
Oral Sucker	0.12-0.15 x 0.13-0.18 mm	0.20-0.35 x 0.24-0.26 mm
Ventral Sucker	0.37-0.45 x 0.37-0.40 mm	0.60-0.75 x 0.38-0.75 mm
Anterior testis	0.09-0.21 x 0.10-0.15 mm	0.20-0.30 x 0.38-0.48 mm
Posterior testis	0.10-0.13 x 0.07-0.18 mm	0.20-0.30 x 0.35-0.45 mm
Cirrus Sac	0.12-0.15 x 0.60-0.75	0.28-0.33 x 0.10x0.18 mm
Ovary	0.50-0.07	0.13-0.17 x 0.10-0.12 mm

***Clinostomum trichogasteri* Pandey, 1969**



Metacercaria
(drawn from a live specimen)

***Opisthorchiid Metacercaria* sp.nov.**

Host	:	<i>Channa straitus</i> (Bloch.)
No. of host examined	:	30 (LKO-10,FZD-20)
No. of host found infected	:	2
No. of worms collected	:	6
Site of infection	:	Body cavity, Mesentry
Locality	:	Faizabad

Cysts(Fig. 1) large, rounded, double layered and found attached to the mesenteries and other visceral organs of the body and devoid of any pigmentation. It measures 0.58 - 0.64 x 0.52 - 0.60 mm. Body aspinose(Fig. 2) clavate with a broad posterior end and pointed anterior end measures 0.66 - 0.68 x 0.27 - 0.33. Oral sucker is subterminal, rounded and measures 0.13 - 0.14 x 0.12 - 0.14. Ventral sucker is equatorial, rounded, smaller than oral sucker and measures 0.09 - 0.10 x 0.08 - 0.10. Mouth directly leads in to a short prepharynx measures 0.03 - 0.04. A cup shaped, muscular pharynx is present and measures 0.05 - 0.07 x 0.04 - 0.06. Oesophagus is of moderate length and measures 0.04 - 0.06 mm. Intestinal caeca reaching up to the posterior extremity of the body.

Genital analgen (fig. 2) are hardly distinguishable in live specimens, however small masses of cells visible in mounted specimens gives an indication of developing genital organs. These are represented by 3 masses below the ventral sucker. Two equal masses of nuclei, which are tandem and post equatorial represents the testes and measures 0.025 - 0.030 x 0.030 - 0.035. Ovarian analgen is located close to the posterior border of ventral sucker and measures 0.04 - 0.06 x 0.01 - 0.02,

another mass of nuclei is visible at the lateral side of ventral sucker and represent the developing cirrus sac.

Excretory bladder (fig. 3) large, triangular in shape placed with its broad end directed anteriorly and apex posteriorly and opens outside by a terminal excretory pore. It is filled with rounded excretory globules which gives a dark appearance to the bladder. Two main excretory canals arise, one on each side, from the antero-lateral cornua of the excretory bladder. They run forward and each divides midway between the caeca and ventral sucker into an anterior and posterior collecting canal. Anterior collecting canals of each side receives three fine branches like wise posterior collecting canals of each side receives three fine capillary branches each ending in a flame cells.

Discussion

The topography of genital organs of the present metacercaria gives a clue to its identity as being larval form of a *Opisthorchid* metacercaria. It can be compared with the metacercaria of *O. caninus* described by Pande and Shukla, 1974 and *O. elongatus* Agarwal, 1975. But it is chiefly differentiated from both of them in absence of prepharynx, extension of intestinal caeca and position of genital rudiments.

***Opisthorchiid Metacercaria* sp.nov.**

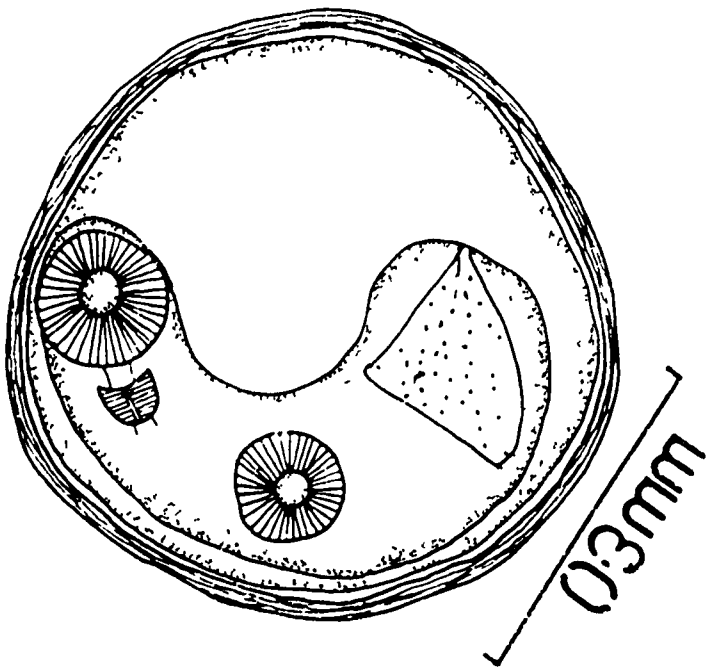


Fig 1 Unencysted Metacercaria
(drawn from a live specimen)

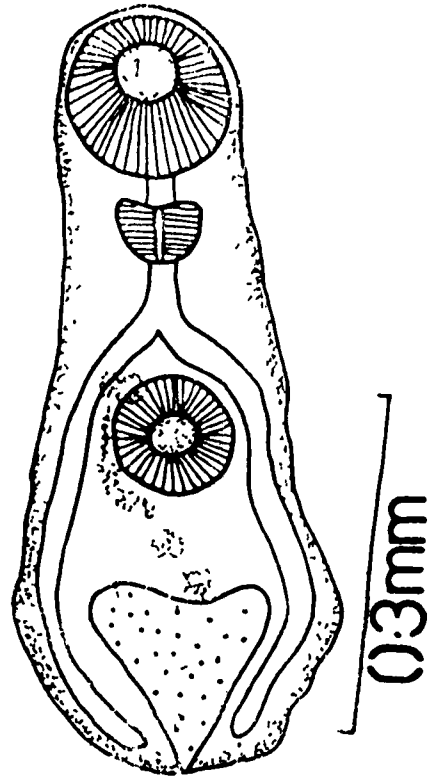


Fig 2 Encysted Metacercaria
(drawn from a live specimen)

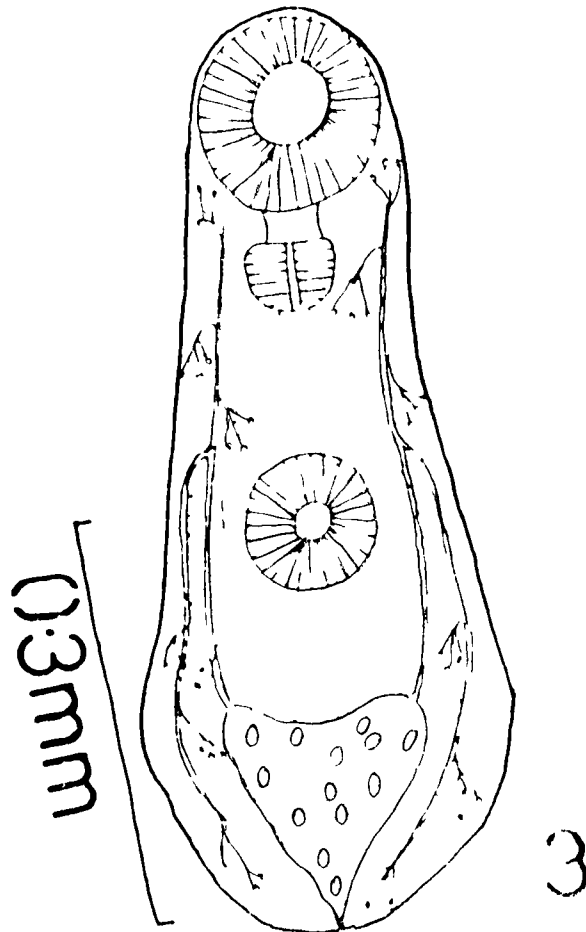


Fig 3 Metacercaria showing excretory system
(drawn from a live specimen)

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SECTION D (SUMMARY)

The thesis entitled "Contribution to our knowledge of some parasites (Monogeneans and Digeneans) of fishes" deals with morphological studies on some important trematode parasites of fresh water fishes and includes an account of 15 species of metacercaria, 8 species of monogenea and 11 species of adult digeneans found infecting some of the fresh water fishes of districts Lucknow, Faizabad, Meerut and Lakhimpur-kheri, U.P. (Abbrev. used - Lucknow-LKO, Faizabad - FZD, Meerut - MRT and Lakhimpur-Kheri - LMP)

In all about 1460 specimens of piscine hosts were examined during the course of study (1994 - 1997). The fishes for the present investigation, were collected from the local fish markets of Lucknow, Faizabad, Meerut and Lakhimpur-Kheri, U.P. Some of them were also collected from local river or pond with the help of fisherman. Standard methods of killing, fixing, clearing and mounting of trematodes were used. All the figures are original drawn by the writer. Many new hosts and localities have been made in the present work. An exhaustive list of references has been included, camera lucida diagrams and tables have been appended to illustrate the observations. The work is divided into 3 parts viz., Section A, Section B, Section C

SECTION A

This section deals with the description of eight monogenean parasites of fresh water fishes of District Lucknow, Meerut and Faizabad, U.P.

1. *Urocleidus xenentodoni* Jain, 1959 has been recovered from fish *Xenentodon cancila* (Ham.) at Lucknow and Faizabad. Jain,

1959 described this worm from the *Xenentodon cancila* (Ham.) at Lucknow. The worm is briefly recorded. A new locality i.e. Faizabad, U.P. is added for the parasite.

2. *Urocleidus polysporalis* Jain, 1961 has been recovered and described from fish *Mastacembelus armatus* (Lac.) at Lucknow and Faizabad. Jain, 1961 described this worm from *Silondia silondia* at Lucknow. Since some minor variation has been observed in morphology, it is briefly re-described. A new locality, Faizabad, U.P. is added for the parasite.
3. *Bifurcohaptor pedunculata* sp. nov. has been recovered and described from fish *Mystus vittatus* (Bloch.) at Lucknow. The new species is characterised by position of testis, shape of male copulatory complex and a long peduncle.
4. *Ancyrocephalus tripathii* sp. nov. has been recovered and described from fish *Oxygaster bacaila* (Ham.) at Lucknow. The new species is characterised by distribution of cephalic glands, shape of cirrus and its accessory piece.
5. *Thaparocleidus sohani* Pandey and Mehta, 1986 has been recovered and described from fish *Wallago attu* (Bl. and Schn.) at Meerut. Pandey and Mehta (1986) described this worm from same host and from same locality. The specimen is briefly recorded.
6. *Dactylogyroides wallagonius* sp. nov. has been recovered and described from fish *Wallago attu* (Bl. and Schn.) at Meerut. It is characterised by number of head organs, presence of cephalic glands, reproductive glands and an additional transverse bar.

7. *Hamatopeduncularia attui* sp. nov. has been recovered and described from *Wallago attu* (Bloch and Schn) at Lucknow. It is characterised by the shape of haptor anchor, transverse bar and copulatory complex, absence of haptor glands and distribution of cephalic glands.
8. *Silurodiscooides meerutensis* sp. nov. has been recovered and described from fish *Rita rita* (Ham) at Lucknow. It is characterised by the presence of a pair of separate ventral transverse bars, shape of anchors, vagina, cirrus and accessory piece of cirrus.

SECTION B

Section B comprises the description of 11 species of adult digeneans belonging to different genera.

1. *Bucephalopsis karvei* Bhalerao, 1937 has been recovered and described from fish *Xenentodon cancila* (Ham.) at Lucknow, Faizabad and Lakhimpur Kheri U.P. Bhalerao, 1942 described *B. karvei* from Nagpur. The specimens of *B. karvei* at the disposal of the writer shows variation in the body size, disposition and size of gonads, vitellaria and extension of cirrus sac. The present form is therefore briefly re-described. Record of worm from Faizabad and Lakhimpur kheri appears to be new localities for the worm.
2. *Phyllodistomum vachius* Dayal, 1942 has been collected and described from fish *Xenentodon cancila* (Ham.) at Lucknow and Lakhimpur Kheri U.P. Dayal, 1949 described *Phyllodistomum*

vachus from urinary bladder of *Eutropiichthys vacha*. Pandey (1973) recorded it from fish *Heteropneustes fossilis* from type locality. The worm from a new locality i.e Lakhimpur kheri U.P. is recorded.

3. *Nicolla srivastavi* sp. nov. has been collected and described from fish *Xenentodon cancila* (Ham.) at Lucknow. It is characterised by having intestinal cruras united posteriorly, absence of prepharynx, presence of large acetabulum and seminal vesicle entirely enclosed in cirrus pouch.
4. *Peracreadium thapari* sp. nov. has been collected and described from fish *Xenentodon cancila* (Ham.) at Lucknow. It is characterised by having large acetabulum, entire and oval testes, long cirrus pouch, extension of vitellaria and shape of eggs.
5. *Allocreadium chauhani* sp. nov. has been collected and described from the fish *Mastacembelus armatus* (Lace) at Lucknow. It is characterised by the extension of cirrus sac and vitellaria and position of genital pore.
6. *Allocreadium gomtii* sp. nov. has been collected and described from the fish *Heteropneustes fossilis* (Bloch.) at Lucknow. It is characterised by the absence of oesophagus, position of genital pore, ratio of suckers, shape and position of receptaculum seminis and extension of vitelline follicles.
7. *Neopodocotyle singhi* sp. nov. has been collected and described from the fish *Heteropneustes fossilis* (Bloch.) at Lucknow U.P. It is characterised by the absence of prepharynx and oesophagus, ratio of suckers, presence of lobed testes, position of genital pore and extension of cirrus sac.

- 8 *Masenia indica* sp nov has been collected and described from the fish *Clarias batrachus* (Linn) at Lucknow It is characterised by the position of genital pore and extension of vitelline follicles
- 9 *Opisthorchis guptai* sp nov has been collected and described from the fish *Clarias batrachus* (Linn) at Lakhimpur-Kheri It is characterised by the spinose body, small acetabulum, shape of testes and excretory bladder absence of cirrus pouch and extension of vitelline follicles
- 10 *Eucreadium oxygasteri* sp nov has been collected and described from the fish *Oxygaster bacaila* at Lucknow and Faizabad U P It is characterised by the presence of deeply lobed testes, position of cirrus pouch, genital pore ovary and extension of vitelline follicles
- 11 *Pleurogenoides hanumanthai* sp nov has been collected and described from the fish *Ompak bimaculatus* (Bloch) at Lucknow It is characterised by the spinose body with bifid posterior end, absence of prepharynx, position of genital pore and extension of vitelline follicles

SECTION C

This section deals with the account of 15 species of metacercariae belonging to different genera

- 1 *Tetracotyle tridi* sp nov has been collected and described from fish *Xenentodon cancila* (Ham) at district Lucknow It is

characterised by having two pairs of enormously developed pseudosuckers and four masses of genital rudiments.

2. *Tetracotyle dochoti* sp.nov. has been collected and described from fish *Xenentodon cancila* (Ham.) at district Lucknow. It is characterised by the position of ventral sucker, shape of hold fast organ, hold fast gland, pseudosuckers, absence of prepharynx and by long oesophagus.
3. *Neascus srivastavi* sp. nov. has been collected and described from fish *Xenentodon cancila* (Ham.) at Lucknow, Lakhimpur Kheri and Faizabad, U.P. The new species is characterised by having a divided body, absence of pharynx and position of genital rudiments.
4. *Clinostomum lucknowensis* Pandey, 1968 has been recovered from the fish *Xenentodon cancila* (Ham.) at Lucknow, and Lakhimpur Kheri U.P. and briefly re-described.
5. *Isoparorchis hysilobagri* (Billet, 1898), Odhner, 1927 has been recovered from *Xenentodon cancila* (Ham.) at Lucknow. The occurrence of metacercaria of *Isoparorchis hypselobagri* (Billet, 1898) Odhner, 1927 has been recorded in India from a number of fishes by different workers viz. Southwell and Prasad (1918), Bhalerao (1926, 1932), Chauhan (1947), Jaiswal (1957), Bharadwaj (1961) and Rai and Pandey (1965). The gross morphology of the metacercaria was described by Pandey (1969) in detail. Therefore, it is briefly recorded.
6. *Tetracotyle madhavii* sp. nov. has been collected and described from fish *Mastacembelus armatus* (Lace.) at district Lucknow. It is characterised by having an undivided body by

the stupendous size of pseudosuckers and number of genital rudiments.

- 7 *Clinostomum piscidium* Southwell and Prasad, 1918 has been recovered from fish *Mastacembelus armatus* (Lac.) at Lucknow Southwell and Prasad, 1918 described this worm from *Trichogaster fasciatus* and *Nandus nandus* (Ham.) at Khulna (Now in Bangla desh). Pandey and Baugh (1969) redescribed *C. piscidum* from *T. fasciatus* and *Nandus nandus* (Bloch.) at Lucknow. The specimens at the disposal of writer shows slight variation. Therefore, it is brierly re-described as such.
- 8 *Tetracotyle chacuti* sp. nov. has been collected and described from fish *Heteropneustes fossilis* (Bloch) at Lucknow. It is characterised by having a cyst, divided body, well developed genital rudiments and shape of the testes.
- 9 *Diplostomulum ophthalmi* Pandey, 1968 has been collected from fish *Heteropneustes fossilis* (Bloch.) at Lucknow. Pandey, 1968 described *Diplostomulum ophthalmi* recovered from the fish *Puntius sophore* (Ham.), *Trichogaster fasciatus* (Bloch And schn.), *Puntius ticto* (Ham.), *Oxygaster bacaila* (Ham.) and *Hetropneustes fossilis* (Bloch.) at Lucknow. The specimen at the disposal of writer differs from those described earlier in certain minor features besides the measurements
10. *Diplostomulum indicum* sp. nov. has been collected and described from fish *Heteropneustes fossilis* (Bloch) at Lucknow. It is characterised by having a divided body and genital rudiments in the form of four masses.

11. *Neascus thapari* sp. nov. has been collected and described from fish *Heteropneustes fossilis* (Ham.) at Lucknow. It is characterised by the absence of a cyst, having a divided body, absence of oesophagus and number of genital rudiments.
12. *Clinostomum dasi* Bhalerao, 1942 has been recovered from fish *Heteropneustes fossilis* (Bloch.) at Lucknow and Lakhimpur-Kheri U.P.. Bhalerao (1942) briefly described this metacercaria from fish *Heteropneustes fossilis* (Bloch.). Subsequently, Pandey (1966) have thoroughly studied the morphology of the worm from the type host at Lucknow. The present specimens at the disposal of writer differs from the those described earlier in some minor morphological features like broad and crenated margin of intestinal caeca through out its length, entire testes and by the opening of uteroduct and position of ventral sucker. Some variation in the measurements of various body organs were also observed. Therefore, it is briefly recorded.
13. *Clinostomoides baughi* sp. nov. has been recovered from fish *Heteropneustes fossilis* (Bloch.) at Lucknow. It is characterised by spinose body, position of gonads and simple uterus.
14. *Clinostomum trichogasteri* Pandey, 1968 has been recovered from fish *Trichogaster fasciatus* (Bloch. & Schn.) at Lucknow. The specimens at the disposal of writer differs from those described earlier by Pandey (1968) in certain morphological features as absence of Oesophagus, shape of oral sucker and