

Morphotaxonomic Cladistic Analysis of Rare Cestode Parasites from the Prayagraj Region (U.P.), India



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Abstract: The present study has been conducted to investigate taxonomic aspects of the piscian cestode focusing on its morphological characters. freshwater catfish *Clarias batrachus* (Linnaeus, 1758) were collected from sampling stations and examined for tapeworm parasites. Six tapeworm parasites were found from its Intestine. The morphological study of cestode indicates that parasitic diversity is available in the Ganga river at Prayagraj (U.P.) region. Morphotaxonomic characters were examined as – H, butterfly-shaped ovary, vitelline follicle - cortical.

Keywords: Morphology, Morphotaxonomic, tapeworm, Cestode, Ganga River, Prayagraj (Allahabad).

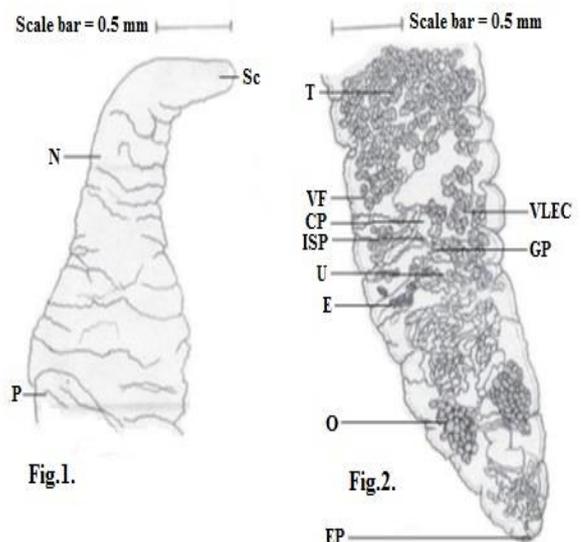
I. INTRODUCTION

Fish provides essential nourishment, especially quality proteins, fats, vitamins and minerals as a macro nutritional contribution to survival and physical health. For those involved in fisheries, aquaculture and fish trade, fish is an important source of income. Government of India conducting many scientific research and projects, to increase fish supply and fulfilled nutritional rich healthy fishes are being promoted globally [1]. Fishes are parasitized by tapeworm parasites, which reduce the nutritional and market value of infected host fish because tapeworm parasites stimulate very harmful substances and consume required nutrition from the host which disturb the physiological condition of the fishes. Due to this, the weight and size of fishes reduce and ultimately lose their market value [2]. The study of tapeworm parasites is, therefore, an urgent necessity today. Very little work has been done on the taxonomy of tapeworm parasites but still, hence more exploration is required. The common helminth parasites are tapeworm (cestode) parasites. The curiosity of the author to know about the tapeworm parasites found in such fishes lead them to undertake the present project. In the present study, the author has restricted himself to the taxonomy of cestode parasites of freshwater catfish from various sampling stations (Table.1).

II. MATERIAL AND METHOD

For the taxonomical study of piscian tapeworms, the catfish *Clarias batrachus* (Linnaeus, 1758) were collected through different sampling station of Allahabad region of Uttar Pradesh. The alimentary canal and various organs of the fish were removed and cut open in normal saline water in the Petri dish. It was lightly shaken and its contents decanted several times. The intestine and its contents containing tapeworm parasites were examined thoroughly under a binocular microscope to ensure that none of the parasites is left behind. In some cases, the scolices of tapeworm parasites found deeply embedded, these were observed necessary to take them out by scraping the mucosa of the intestine with a sharp scalpel or by releasing the scolices with a pair of needles. Later the portion of the mucosa attached to the tapeworms was removed by shaking the body of tapeworm in normal saline water. The worms were stretched in lukewarm water and in case of larger worms, by lifting them with the help of needles against the edges of the Petri dish repeatedly for several times and later on fixed in 5% formalin for morphotaxonomical work. The whole-mount was stained in hematoxylin and eosin and cleared in xylene and mounted in Canada balsam. Only camera lucida drawings were made with a micrograph. All the measurements (L×W) were measured in millimeters.

III. DESCRIPTION



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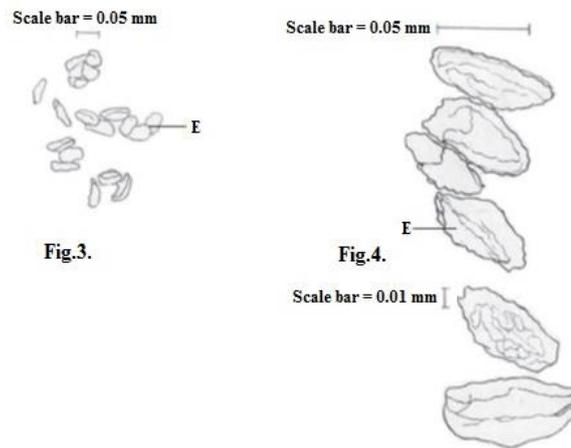


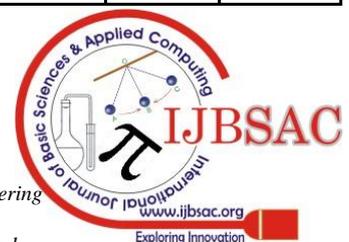
Fig. 1. The anterior part of the worm with smooth scolex and neck [50x] 2. Middle and posterior part of the worm [50x] 3. Eggs [100x] 4. Eggs (bilobed & ovular) [450x]

Table- I: Showing statistical analysis of the population of host fishes at sampling stations

| Sampling station District – Prayagraj (Allahabad) U.P. | | | | | | | | |
|--|------------------|---------------------------|---------------------------|--------------------------------|-----------------------------|-----------------------------|---------------------------|-------------------------|
| Sr. No. | Sampling station | No. of examined hosts (a) | No. of infected hosts (b) | No. of collected parasites (c) | Incidence of infection (X1) | Intensity of infection (X2) | Density of infection (Y1) | Index of Infection (Y2) |
| 1. | Sirsa | 30 | 10 | 13 | 0.33 | 1.3 | 0.433 | 0.144 |
| 2. | Meja | 30 | 8 | 11 | 0.26 | 1.375 | 0.366 | 0.097 |
| 3. | Dandupur | 30 | 7 | 8 | 0.23 | 1.142 | 0.266 | 0.062 |
| 4. | Handia | 30 | 7 | 9 | 0.23 | 1.285 | 0.3 | 0.07 |
| 5. | Dighiya | 30 | 11 | 12 | 0.36 | 1.09 | 0.4 | 0.146 |
| Total | | 150 | 43 | 53 | 1.41 | 6.192 | 1.765 | 0.519 |

Table- II: Showing morphometric measurement L×W (in mm) and cladistic taxonomical characters of Genus *Lytocestus* Cohn13, 1908 tapeworms under generic description.

| Sr. No. | Characters | <i>Lytocestus clariae</i> (Redescribed) | <i>Pseudolytocestus</i> (Pathak et. al., 2015) ³ | <i>Lytocestus osmanabade nsis</i> (Bhure et. al., 2010) ^{4,5} | <i>Lytocestus marathwadensis</i> (Shinde et al, 1988) ⁶ | <i>Lytocestus folliculara e</i> (Bhure et. al., 2010) ⁷ | <i>Lytocestus puranensis</i> (Kasar et. al., 2010) ⁸ | <i>Lytocestus clariae</i> (Shinde, G.B et. al., 1988) ⁹ | <i>Lytocestus longicolli s</i> (Bhure et. al., 2010) ¹⁰ | <i>Lytocestus paryulus</i> (Kasar et. al., 2010) ¹¹ |
|---------|-----------------------------|---|---|--|--|--|---|--|--|--|
| 1 | Length of the body | 12.08 | 13.3 | 11.58 | 12.2 | 12.24 | 12.67 | 12.1 | 11.8 | 12.5 |
| 2 | Maximum breadth of the body | 8.15 | 10.25 | 8.5 | 9.05 | 8.38 | 9.14 | 7.95 | 7.88 | 8.2 |
| 3 | Neck | 0.69×0.18 | 0.80×0.21 | 0.62×0.20 | 0.55×0.21 | 0.45×0.17 | 0.50×0.23 | 0.69×0.19 | 0.60×0.26 | 0.70×0.18 |
| 4 | Ovary: shape | H shaped like a butterfly | Inverted, H shaped | H shaped | Butterfly shaped | H shaped | Inverted U shaped | Butterfly shaped | Inverted A-shaped | X shaped |
| 5 | Genital aperture (pore) | Present | Present | Present | Present | Present | Present | Present | Present | Present |
| 6 | Vitelline follicles | 0.05×0.12 | 0.05×0.11 | 0.6×0.12 | 0.4×0.10 | 0.5×0.13 | 0.6×0.13 | 0.7×0.11 | 0.6×0.9 | 0.05×0.10 |
| 7 | Cirrus Pouch | Well developed, oval to round | Well developed | Round to oval | round | Symmetrical oval | Round to oval | oval to round | Mostly oval | Round to oval |
| 7 | Eggs | 0.05×0.02 | 0.05×0.01 | 0.04×0.02 | 0.05×0.01 | 0.06×0.03 | 0.04×0.04 | 0.05×0.02 | 0.05×0.03 | 0.06×0.03 |
| 8 | Excretory pore | 0.03×0.07 | 0.04×0.09 | 0.03×0.08 | 0.04×0.7 | 0.03×0.07 | 0.05×0.09 | 0.03×0.06 | 0.05×0.08 | 0.04×0.9 |



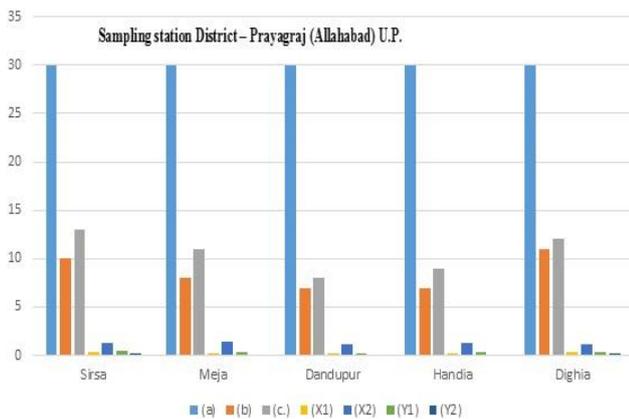


Fig. 2. Graphical presentation of sampling stations

New introducing rare tapeworm parasites of freshwater catfish (*Clarias batrachus* Linnaeus, 1758). Figs. (1-4) Shape, Size, Position, Measurement observed under a compound microscope with camera lucida figures. All measurements are in millimeters.

Tapeworms measure 8-12×0.42-0.94 (10×0.68).

Scolex is medium-sized, flat, smooth, blunt without any major groove, hooves and pointed spines. banded at the top measures 0.64-0.74×0.12-0.24 (0.69×0.18). Neck present with under segmented proglottids measures 0.68-0.75×0.59-0.45 (0.71×0.52). Proglottids present.

Numerous testes are present in the medullary region, numerable. oval to round shaped Measures 0.08-0.16×0.07-0.11 (0.12×0.09). Vas deferens are visible. Vitelline Follicle present in the cortical region. VF never touches the ovarian lobes. Uterus extends the posterior region to the ovary. Uterus long, non-glandular, coiled medullary, situated posterior and anterior to the ovarian isthmus.

Cirrus pouch well-developed oval to round with internal seminal vesicle. Median measures 0.36-0.30×0.18-0.14 (0.33×0.16). Genital aperture present.

Ovary H shaped like a butterfly, both arms even, lateral lobes of ovary situated in cortical and medullary regions measures 0.30-0.32×0.44-0.42 (0.31×0.43) behind the cirrus pouch. Genital pore present at the posterior region of the worm. Isthmus present and curved in the medullary region anterior uterus measures 0.04-0.06×0.22-0.24 (0.05×0.23).

Excretory pore measures 0.02-0.04×0.08-0.06 (0.03×0.07). Eggs are some oval and bilobed, broader than length, coffee bean-like shape and operculate structure measures 0.04-0.06×0.02-0.03 (0.05×0.02).

IV. RESULT AND DISCUSSION

The present parasite form comes closer to genera *Lytocestus*, *Pseudolytocestus*.

This form differs from *Pseudolytocestus* in having well developed banded scolex, external seminal vesicle absent, internal seminal vesicle present, ovary H shaped like butterfly and uterus extend up to post ovarian region [3].

- 1) The present form differs from *Lytocestus osmanabadensis* (Bhure et. al., 2010) in having a well-developed Scolex with neck, ovary H shaped, and bilobed eggs [4,5].
- 2) The present form differs from *Lytocestus marathwadensis* (Shinde et al, 1988) in having medium

size worm with well-developed scolex, H shaped ovary, uterus extend up to post ovarian region and bilobed, operculated eggs [6].

- 3) The Present form differs from *Lytocestus follicularae* (Bhure et. al., 2010) having mediums size of worm, H butterfly-shaped ovary in absence of Mehlis gland [7].
- 4) The present form differs from *Lytocestus puranensis* (Kasar et. al., 2010) in having a well-developed Scolex with neck, internal seminal vesicle present, and H shaped ovary [8].
- 5) This form differs from *Lytocestus clariae* in having medium-sized worms, presence of neck (under segmented), presence of internal seminal vesicle and butterfly-shaped ovary [9].
- 6) The present form differs from *Lytocestus longicollis* in having internal seminal vesicle, H shaped ovary and bilobed eggs [10].
- 7) The present form differs from *Lytocestus parvulus* in having an H shaped ovary and bilobed, operculate eggs [11].
- 8) Thus the studied parasites show the taxonomic difference from all known genera of the family Lytocestidae.

Taxonomic Summary

Family : Lytocestidae Wardle et McLeod, 1952 [12]

Genus : *Lytocestus* Cohn, 1908 [13]

Species : *clariae* (Redescribed)

Host : *Claris batrachus* (Linn. 1758) [14]

Habitat : Intestine

Locality : Ganga river at Prayagraj district (U.P.)

Number of parasites : 02/06

V. CONCLUSION

The *Lytocestus* genus is one of the most important Caryophyllidea cestodes of *Clarias batrachus* in the Ganga river at the Prayagraj region. The morphological diversity of its population is found in the host. The spawning season of host fish, physiological and environmental factors, availability of infected food may be associated causes for its invasion, development, and variation. In case of heavy infection, it can cause serious injuries by its scolex and hooks penetration to the fish intestine. Further research is therefore necessary for observing the morphotaxonomy, histology and cladistics morphometry.

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