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**BIOSYSTEMATIC STUDIES ON CARYOPHYLLIDEAN CESTODE GENUS
LYTOCESTUS⁴ FROM FRESHWATER CATFISH CLARIAS BATRACHUS²⁴ WITH
DESCRIPTION OF NEW SPECIES**

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ABSTRACT

Present study deals with Biosystematics of Piscean tapeworm *Lytocestus indica* Sp.Nov. collected from intestine of freshwater catfish host *Clarias batrachus*²⁴ at Nanded (M.S.) India. Worm comes closer to all known species of *Lytocestus*⁴ in general topography of organs but differs due to mature specimens long, single segmented, tapering at both ends, head long, well marked off from body, Testes rounded, 1000-1100 in number, pre-ovarian, placed centrally, evenly distributed, Cirrus pouch large, cylindrical, pre-ovarian, transversely placed, cirrus thin, curved, vas deferens short, thin, genital pore small, oval, vagina long, thin tube, Ovary bilobed, 'V' shaped, situated near posterior region of worm, uterus saccular, filled with numerous non-operculated eggs and Vitellaria follicular, arranged in two rows.

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Table : 00

KEY WORDS : Biosystematic studies, Caryophyllidean Cestode, *Clarias batrachus*, *Lytocestus indica* Sp.Nov.

Introduction

Cohn⁴ erected genus *Lytocestus* with its type species *L. adhaerens* in siluroid host, *Clarias fuscus*, from Hongkong. Generic diagnosis was given as: holdfast undifferentiated and not broader than body, parenchyma muscles in a ring around the testes, and no postovarian yolk glands present. To the type species *L. adhaerens*⁴, several species have been added to date. They are *L. filiformis*⁽⁵²⁾⁵ [= *Caryophyllaeus filiformis*⁵²; *Monobothrioides filiformis*^{(52),54}; *L. alestes*²⁵ fide Mackiewicz²⁶ from *Mormyrus coschive* of river Nile at Khartoum; *L. indicus*^{(30),53} [= *Monobothrioides indicus*³⁰ according

to Woodland⁵⁴ from *C. batrachus* in India; *L. javanicus*⁽³⁾⁶ from *C. batrachus* in Java [= *Caryocestus javanicus*⁽³⁾; *L. birmanicus*²⁵ [= *L. alestes*²⁵, according to Johri¹³ from *C. batrachus* from Rangoon, Burma; *L. parvulus*⁶ from *C. batrachus* in Singapore and Malacca; *L. longicollis*³⁸ from *C. batrachus* in India; *L. lativitellarium*⁷ from *C. batrachus* in Malaysia; *L. puylaerti*²⁰ from *C. batrachus* in Sierra Leone (Africa); *L. fossilis*⁴⁵ from *H. fossilis* from Kathmandu (Nepal); and *L. marcuseni*⁵⁰ from *Marcusenius harringtoni* from Chad basin in Africa. *L. fossilis* is only species included in genus which possesses post-ovarian

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Fig. 1 : *Lytocestus indica* sp. Nov.

vitelline follicles. Though its author placed this species under genus *Lytocestus*, the histological details for ascertaining the family or genus allocation are lacking in its account, thus raising a doubt for including the form with post-ovarian vitelline follicle in the genus. Likewise another genus *Lucknowia*⁸ that was erected as a new genus distinct form *Lytocestus* on the basis of extension of vitelline glands upto posterior end of the body⁸ was considered synonymous with *Lytocestus* by Mackiewicz²⁹, who opined that the ovarian follicles of *Lucknowia* were mistaken for postovarian vitelline follicles^{27,28}.

Later on, Shinde and Phad⁴², reported *L. marathwadensis*⁴²; *L. alii*⁹; *L. clariasae*⁹; *L. naldurgensis*¹⁵ were reported from *Clarias batrachus*. *L. teranaensis*²² from *Wallago attu*, *L. kopardaensis*⁴³, *L. chalisgaonensis*¹⁶, *L. govindae*³¹, *L. batrachusae*³⁵, *L. clariasae (minor)*³⁴, *L. shindae*¹⁹, *L. nagapurensis*²³ were reported from *Clarias batrachus*. Tandon *et al.*⁴⁸ erected four new Caryophyllaeid species viz. *L. clariae*, *L. attenuatus*, *L. assamensis* in *Clarias batrachus* and *L. heteropneustii* in *Heteropneustes fossilis* from Guwahati (Assam) and Shella (Meghalaya). Subsequently *L. mujumdari*³⁶, *L. bokaroensis*³⁷, *L. paithanensis*⁴¹ from *Clarias batrachus*, *L. jagtai*⁴⁹ from *Heteropneustes fossilis*, *L. punensis*¹⁰ from cat fish *Clarias batrachus* of Maharashtra, *L. subhadradi*¹², *L. follicularae*², *L. osmanabadensis*², *L. puranensis*¹⁷, *L. shindei*⁴⁷, *L. murhari*¹⁸, *L. vyasae*³³, *L. purnensis*³³, *L. gariepinusae*¹⁴, *L. khami*¹¹, *L. manjaraensis*⁴⁶, *L. thapar*³⁹ and *L. alii (minor)*³⁹, *L. godavariensis*³² from freshwater fish *Clarias batrachus* were described and reported.

Material and Methods

(Based on Forty Two Specimens)

During collection of Piscean cestode parasites, Forty Two cestodes were collected from Thirty Four infected intestine out of One Hundred Twenty examined freshwater fish host *Clarias batrachus*²⁴ in Nanded districts (M.S.) India during February, 2011 to January, 2013. These cestodes were preserved in hot 4% formalin and specimens are stained with Harris haematoxylin and Borax carmine, dehydrated in ascending grades of alcohol, cleared in xylene, mounted in D.P.X. and drawings were made with the aid of camera lucida attachments. Photomicrographs were taken by Trinocular computerized Research microscope. All

measurements were recorded in millimeters. Cestode were prepared for identification by standard methods^{1-21,40,51,55}.

Mature specimens description are long, single segmented, tapering at both ends and measures 18.25 (18-18.5) in length and 1.5 (1.0-2.0) in width. Head is long, well marked off from the body and measures 1.55 (1.5- 1.6) in length and 0.55 (0.5-0.6) in width.

Testes are rounded, 1000-1100 in number, pre-ovarian, placed centrally, evenly distributed and measures 0.196 (0.168-0.224) in length and 0.247 (0.224-0.269) in width. Cirrus pouch is large, cylindrical, pre-ovarian, transversely placed and measures 0.882 (0.823-0.941) in length and 0.367 (0.294-0.441) in width. Cirrus is thin, curved and measures 0.676 (0.647-0.705) in length and 0.044 (0.029-0.058) in width. Vas deferens is short, thin and measures 0.264 (0.235-0.294) in length and 0.073 (0.058-0.088) in width. Vagina and cirrus pouch opens a common pore known as genital pore, which is small, oval and measures 0.132 (0.117 -0.147) in length and 0.102 (0.088-0.117) in width.

Vagina is long, thin tube, starts from genital pore and runs posteriorly to cirrus pouch, forms receptaculum seminis and measures 1.529(1.470-1.588) in length and 0.073(0.058-0.088) in width. Receptaculum seminis is thin tube, it opens into the ootype and measures 0.558 (0.529-0.588) in length and 0.102 (0.088-0.117) in width. Ootype is rounded to oval and measures 0.117 in diameter. From the ootype ovarian lobes start. Ovary is bilobed, 'V' shaped, situated near the posterior region of the worm and measures 1.661 (1.617-1.705) in length and 0.602 (0.470-0.735) in width. Uterus is Saccular, filled with numerous eggs and measures 1.544 (1.323-1.705) in length and 1.211(0.823- 1.676) in width. Eggs are non-operculated, oval in shape and measures 0.235(0.205-0.264) in length and 0.044(0.058-0.088) in width. Vitellaria are follicular, arranged in two rows.

Result and Discussion

Cohn⁴ established the genus *Lytocestus* with its type species *L. adhaerens* in siluroid host *Clarias fuscus* from Hong-Kong. So far several species have been added to the genus *Lytocestus*.

On comparison with known species of *Lytocestus*, present form stands close to them in

general topography of organs but differs from *L. adhaerens*⁴ in having head undifferentiated from body, cirrus pouch strongly muscular, uterus looped, vitellaria granular, collected from *Clarias fuscus* in Hong Kong.

It differs from *L. filiformis*^{5,52} in having body elongated, 7.5-24 × 1-2 mm receptaculum seminis absent, male and female genital pore separate, genital atrium absent, interpore distance 0.025 mm, postovarian vitellaria absent, eggs 0.062-0.070 × 0.029-0.033 mm and recovered from *Mormyrus caschive*; Egyptian Sudan.

The present form *L. indica* Sp.Nov. differs from *L. indicus*^{30,53} in having body 15-29 × 1.82-2.73 mm, Testicular follicles 0.095-0.119 × 0.002 mm, ovary 'H' shaped, receptaculum seminis absent, male and female genital pore separate, genital atrium absent, interpore distance 0.220-0.270 mm, vitelline follicles 0.077-0.088 × 0.088-0.112mm and postovarian vitellaria absent, eggs 0.080 × 0.040 mm.

It differs from *L. alestus*²⁵ in having testes more or less spherical, numerous and uterus short collected from *Alestes nurse* in Sudan.

Present worm differs from *L. biramanicus*²⁵, in having body Elongated, 10-12 × 0.9 mm, Testicular follicles 0.15-0.18 × 0.10-0.13 mm, 'H' shaped ovary, receptaculum seminis absent, male and female genital pore separate, genital atrium absent, interpore distance 0.180 mm, previtelline distance 4.0 mm, vitelline follicles 0.10-0.12 × 0.04-0.06mm, vitelline follicles distributed in two lateral bands and postovarian vitellaria absent, eggs 0.050 × 0.030 mm and reported from *Clarias batrachus*; Burma.

The *L. indica* Sp.Nov. differs from *L. parvulus*⁶ in having body 3.6-5.7 × 0.24-0.90 mm, neck 0.75-2.10 mm, Testicular follicles 0.10-0.15 × 0.05-0.10 mm, Cirrus sac 0.12-0.15 mm, ovary 'H' shaped, measures 0.3-0.45 mm, receptaculum seminis absent, male and female genital pore separate, genital atrium absent, interpore distance 0.045 mm, vitelline follicles 0.100 × 0.050 mm, vitelline follicles distributed in five rows encircling testes, postovarian vitellaria absent, eggs 0.026-0.033 × 0.023-0.045 mm and recovered from *Clarias batrachus*; Singapur and Malacca.

The worm under discussion differs from *L. lativittarium*⁷ in having body 25-31 × 1.35-1.95 mm, neck 9.9-10.6 mm, pre testes distance 0.6-0.8 mm, Testicular follicles 0.105-0.325 × 0.030-

0.90 mm, Cirrus sac 0.225-0.238 mm, ovary 'H' shaped, 0.094-0.138 × 0.044-0.067 mm, receptaculum seminis absent, male and female genital pore separate, genital atrium absent, interpore distance 0.150 mm, vitelline follicles 0.067-0.086 × 0.030-0.050 mm, vitelline follicles concentrated laterally, postovarian vitellaria absent, eggs 0.019-0.023 × 0.030-0.033 mm and collected from *Clarias batrachus*; Malaysia.

It differs from *L. longicollis*³⁸ in having body elongated, 10.8-20 × 0.5-0.84 mm; neck 5.36-7.6 mm, Testicular follicles 0.10-0.16 mm, Cirrus sac 0.24-0.31 × 0.16-0.23 mm, Ovary 'H' shaped, 0.46-0.78 mm, presence of receptaculum seminis, male and female genital pore separate, genital atrium absent, interpore distance 0.05-0.08 mm, vitelline follicles 0.0339-0.07 mm, postovarian vitellaria absent, eggs 0.046-0.054 × 0.023-0.031 mm and collected from *Clarias batrachus* L.; India.

The *L. indica* Sp. Nov. differs from *L. puylaerti*²⁰ in having body 3.06-4.12 × 0.67-0.7 mm, pre testes distance 0.602-0.723 mm, testicular follicles 0.058-0.14 × 0.105-0.195 mm, Cirrus sac 0.27-2.29 × 0.105-0.195 mm, Ovary 'H' shaped, 0.046-0.058 × 0.035-0.039 mm, absence of receptaculum seminis, male and female genital pore separate, genital atrium absent, interpore distance very short, 0.602-0.723 mm, vitelline follicles, 0.58-0.116 × 0.015-0.027 mm, annular distribution of Vitelline follicles, postovarian vitellaria absent, eggs 0.046-0.058 × 0.035-0.039 mm and recovered from *Clarias liberiensis*; Sierra Leone (Africa).

The new species differs from *L. fossilis*⁴⁵ in having body 16.0-20.5 × 2.4-3.2 mm, neck 1.6-1.9 × 0.86-1.2 mm, testicular follicles 0.16-0.22 × 0.35-0.44 mm, cirrus sac 0.72-0.8 × 0.54-0.62 mm, ovary 'H' shaped, receptaculum seminis absent, male and female genital pore common, genital atrium present, pre vitelline distance 3.5-4.0 mm, vitelline follicles 0.15-0.19 × 0.30-0.35 mm, post ovarian vitellaria present, eggs 0.32-0.04 × 0.024-0.028 mm, collected from *H. fossilis*; Nepal.

The new species further differ from *L. marcuseni*⁵⁰ in possessing body 8-11 × 1.1 mm, testicular follicles 0.480-0.375 mm, receptaculum seminis absent, male and female genital pore separate, genital atrium absent, interpore distance 0.065 mm, previtelline distance 2.5 mm., vitelline follicles 0.30-0.60 × 0.010-0.020 mm, postovarian vitellaria absent, eggs 0.045-0.055 × 0.030-0.035

mm and recorded from *Marcusenius harringtoni*; Chad Basin in Africa.

It differs from *L. marathwadensis*⁴² in having testes 100-105, arranged in 2 or 3 rows, in central medulla, 0.005 × 0.006 mm, cirrus pouch large, oval, 0.04 × 0.03 mm, ovary 'H' shaped, closely packed with follicles, receptaculum seminis absent and vitellaria follicular, small and oval, arranged in single row on lateral side, 0.03 × 0.04 mm and recovered from *Clarias batrachus* L., India.

The present form differs from *L. alii*⁹ in having head bluntly rounded, 6.248 × 0.893-1.607 mm, testes 460-480 in numbers, in 2-3 rows, 0.005 × 0.006 mm, cirrus pouch small, oval, vas deferens short, ovary bilobed, butterfly shaped, receptaculum seminis small, ootype round, posterior to isthmus, uterus wide, convoluted tube, vitellaria follicular, arranged in 4-5 rows, corticular in position.

The *L. indica* Sp. Nov. differs from *L. clariasae*⁹ in having head bluntly rounded, 4.105 × 1.696-1.785 mm, testes 700-750 in numbers, rounded, 0.178-0.357 mm, vas deferens coiled, cirrus pouch medium, 0.499 × 0.089-0.196 mm, ovary bilobed, ovarian follicle 36-42 in numbers, vagina wide, receptaculum seminis present, uterus convoluted, vitellaria follicular, corticular, arranged in 5-6 rows.

The present form differs from *L. naldurgensis*¹⁵ in having head long, conical, blunt, spatulate, neck short, testes 500-600 in numbers, cirrus pouch small, oval, vertical, obliquely placed, vagina wide, ovary bilobed, butterfly shaped, uterus convoluted, vitellaria follicular, arranged in 3-4 rows and recovered from *Clarias batrachus* L.

It differs from *L. teranaensis*²² in having head long, conical, blunt, spatulated, 2.522 × 0.398-0.717 mm, neck wide, 1.045 × 0.791-1.311 mm, testes 1200-1250 in numbers, unevenly distributed, 0.034-0.008 mm, cirrus pouch small, oval, transversely placed, 0.363-0.432 × 0.023 mm, vas deferens long, wide, coiled, 0.646 × 0.011-0.023 mm, ovary bilobed, large, each lobe triangular, 0.738-1.045 × 0.043-0.125 mm, vagina wide, 2.236 × 0.023-0.045 mm, vitellaria follicular, arranged in 4-5 rows, 0.023 × 0.011-0.022 mm, uterus wide, loop shaped, 4.249 × 0.068-0.114 mm and reported from *Wallago attu*; Terna River, Aurad Shahajani, Latur (M.S.), India.

The present parasite differs from *L. kopardaensis*⁴³ in having head long, testes 1650 in

numbers, ovary distinctly bilobed with irregular margin, cirrus pouch large, elongated, uterus wide, coiled loop shaped and vitellaria arranged in 2-3 rows;

It differs from *L. chalisgaonesis*¹⁶ in having head bluntly rounded, 1.874 × 0.982 mm, testes 1500-1600 in numbers, unevenly distributed, 0.038 × 0.030 mm, cirrus pouch 1.533 × 0.247 mm, vas deferens short, coiled, 0.225 × 0.011 mm, ovary bilobed, lobes triangular, 1.33 × 0.77 mm, vagina long, 0.965 × 0.136 mm, uterus wide, convoluted tube, 4.203 × 0.147 mm, vitellaria granular, thin strips, cortical in position and reported from *Clarias batrachus*; Chilsgaon (M.S.), India.

The present worm differs from *L. govindae*³¹ in having head long, well marked off from body, testes numerous, 1425-1475 in numbers, pre-ovarian, evenly distributed, cirrus pouch small, ovary butterfly shaped and vitellaria granular.

It differs from *L. batrachusae*³⁵ in having head spatulate, 1.963 × 0.624-1.428 mm, neck long, wide, 4.006 × 1.071-2.409 mm, testes medium, rounded, pre ovarian, 3800-4000 in numbers, 0.089-0.167 mm, cirrus pouch long, elongated, 2.052 × 0.089-1.998 mm, cirrus thin, curved, 1.774 × 0.034 mm, vas deferens long, thin, curved, 1.982 × 0.017-0.034 mm, ovary bilobed, large, butterfly shaped, 0.446-0.893 × 1.071-1.250 mm, uterus wide, convoluted, loop shaped, 0.178 × 0.107 mm, uterine pore small, oval, vitellaria follicular, small, arranged in two rows and collected from *Clarias batrachus*; Aurangabad (M.S.), India.

The *L. indica* Sp. Nov. differs from *L. clarisuae* (Minor)³⁴ in having body elongated with thin musculature, head spatulate, roughly triangular, 0.681 × 0.454-0.737 mm, neck long, wide, narrow anteriorly broad posteriorly, 4.589 × 0.965-

1.361 mm, testes small, rounded, 5800-6000 in numbers, 0.089-0.160 mm, cirrus pouch medium, cylindrical, 1.071 × 0.089-0.213 mm, vas deferens thin, curved, 0.588 × 0.035 mm, ovary bilobed, with loose, big, acini, 0.803 × 0.357 mm, vagina thin, curved, 2.023 × 0.053 mm, receptaculum seminis small, oval, posterior to isthmus, 0.107 × 0.089 mm, ootype big, oval, bean shaped, 0.624 × 0.267 mm, vitellaria follicular, arranged in single row, 0.071 × 0.035 mm, uterus wide, long, convoluted, loop shaped, 8.925 × 0.160-0.267 mm, uterine pore big, oval, 0.320 × 0.249 mm and

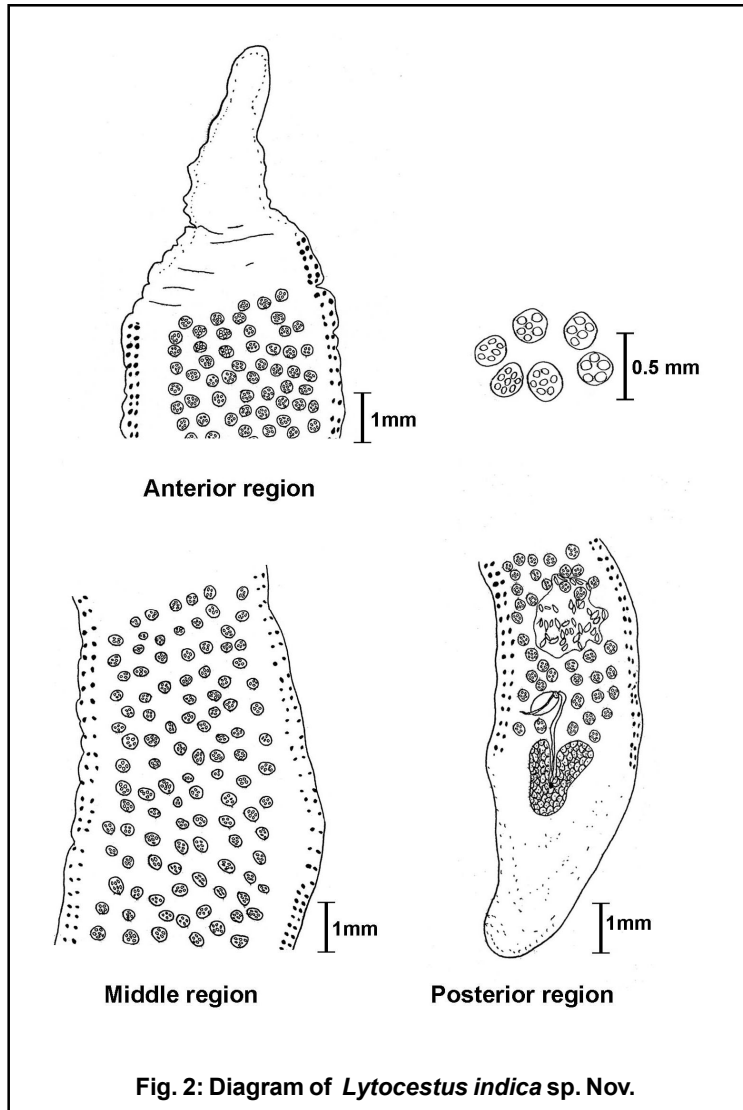


Fig. 2: Diagram of *Lytocestus indica* sp. Nov.

reported from *Clarias batrachus*; Kallam (M.S.), India.

The new species *L. indica* Sp. Nov. differs from *L. shindae*¹⁹, Khadap et.al., 2004 in having body long, 12.128-13.102×0.491-2.820mm, head long, well marked off from body, 1.421-2.245mm, testes 350-360 in numbers, evenly distributed, small, 0.096-0.102×0.050-0.065mm, cirrus pouch small, oval, pre ovarian, obliquely placed, 0.303-0.374×0.036-0.090mm, cirrus thin straight, 0.219-0.226×0.015-0.023mm, vas deferens short, straight, 0.642mm, ovary bilobed, butterfly shaped, follicle 33-36 in numbers, 0.893×0.464mm, vagina long, coiled, 2.678-3.202×0.015-0.107mm, uterus wide, transversely situated, 2.872-7.782×0.125-1.642mm, vitellaria granular, corticular, eggs operculate, oval, 0.080×0.034mm and collected from small intestine of *Clarias batrachus*; Aurangabad (M.S.), India.

It differs from *L. nagapurensis*²³ in having head spatulate, bluntly rounded, 2.320-2.445×1.428-1.732mm, neck short, 1.035-1.517×1.625-2.145 mm, testes 1100-1150 in numbers, 0.071-0.125×0.035-0.071mm, cirrus pouch cylindrical, pre ovarian, oblique, 0.357-0.392×0.125-0.160 mm, cirrus coiled, curved, 0.357×0.035mm, vas deferens thin, curved, 0.340×0.017-0.035mm, ovary bilobed, with loose mass of acini, irregular in margin, 1.732-2.231×0.535-0.642 mm, isthmus long, wide, 0.767-0.820×0.089-0.142mm, vagina long, 1.714-1.749×0.017-0.035mm, ootype oval, 0.178×0.107-0.129 mm, uterus wide, convoluted, loop shaped, 0.053-1.517×2.070-2.552mm, vitellaria granular and collected from large intestine of *Clarias batrachus*; Nagapur Dam, Beed (M.S.), India.

The new species differs from *L. clariae*⁴⁸ in having body elongated and flat, 8.58-22.44×0.66-2.31 mm, scolex undifferentiated, smooth and unarmed followed by short neck, neck measures 1.18-6.93 mm, testes 270 – 495 in numbers, ovoid, 0.06-0.22×0.04-0.11 mm, cirrus sac compact, bulbous, ovary bilobed, 'H' shaped, follicular, 0.53-1.65×0.46-1.32 mm, uterus glandular, vitelline follicles ovoid, pre ovarian, arranged in 2 rows, 0.05-0.18×0.02-0.08 mm, eggs oval, spinous, operculate, 30-50×20-30µm and erected from *Clarias batrachus* L.; Guwahati (Asam) Shella (Meghalaya), India.

The *L. indica* Sp. Nov. further differs from *L. attenuatus*⁴⁸ in having body thin, slender, elongated,

flattened, 11.88-35.44 × 0.66-1.18 mm, scolex smooth, undifferentiated, unarmed, with bluntly rounded extremity, neck 6.14-7.06 mm, testes 155-398 in numbers, ovoid, 0.08-0.18×0.03-0.15 mm, cirrus sac medullary, ovary bilobed, follicular, inverted 'A' shaped, 0.53-1.52×0.53-0.92 mm, vagina distinct, uterus glandular, vitelline follicles ovoid, arranged in 2 rows, 0.05-0.17×0.03-0.15 mm, excretory pore terminal, eggs smooth, operculate, 40-60×20-30µm and recovered from *Clarias batrachus* L.; Guwahati (Asam) Shella (Meghalaya), India.

The present form differs from *L. assamensis*⁴⁸ in having body Very Long, slightly tapering anteriorly, 25.54- 50.82 × 1.32-4.62 mm, scolex undifferentiated, Smooth and unarmed, neck 4.62-15.18 mm, testes 266 – 565 in numbers, ovoid, 0.10-0.53×0.06-0.15 mm, cirrus sac Prominent, ovary bilobed, bent inwards in shape of inverted 'A', 1.52-5.08×0.79-2.62 mm, vagina distinct, joining terminal end of uterus, open unitedly to exterior at utero vaginal pore immediately posterior to male opening, uterus glandular, vitelline follicles corticle, 0.06-0.14×0.04-0.08 mm, excretory pore at terminal hind end, eggs smooth, operculate, 30-50×20-30µm and collected from *Clarias batrachus* L.; Guwahati (Asam) Shella (Meghalaya), India.

The new form differs from *L. heteropneustii*⁴⁸ in possessing body elongate, Flat, 9.57-19.14 × 1.06-1.45 mm, scolex undifferentiated, Smooth, Unarmed and base conical, neck 1.98-5.41 mm, testes 235 – 340 in numbers, ovoid, 0.11-0.19×0.03-0.08 mm, cirrus sac Prominent, ovary Bilobed, Follicular, 'H' Shaped, 0.99-3.10×0.92-1.32 mm, vagina distinct, joining terminal end of uterus, open unitedly to exterior at utero vaginal pore, receptaculum seminis absent, uterus glandular, Vitelline follicles ovoid or spherical, corticle in disposition, 0.07-0.13×0.03-0.08 mm, excretory pore terminal, eggs smooth, ovoid, operculate, 30-40×20-50µm and collected from *Heteropneustes fossilis* Bloch.; Guwahati (Asam) Shella (Meghalaya), India.

It differs from *L. mujumdari*³⁶ in having body thin, slender, elongated, flattened, 6.673×0.306 mm, scolex undifferentiated, oblong, 0.47×0.228mm, neck long, testicular follicles lie in medullary zone, cirrus sac 0.268×0.189mm, ovary cortical, 'H' shaped, uterus glandular, excretory pore terminal, egg smooth, operculate, vitelline follicles present and recovered from *Clarias batrachus* L. ; Bokaro,

India.

The present worm differs from *L. bokaronensis*³⁷ in having body long, 7.154×0.603mm, scolex undifferentiated, smooth, unarmed, testicular follicles 0.058×0.043mm, ovary bilobed, bent, inverted 'A' shaped, 0.608-0.675mm, cirrus sac prominent, vagina distinct, which joins with the terminal end of uterus to open to exterior through uterovaginal pore, immediately posterior to male opening, receptaculum seminis absent, uterus glandular, excretory bladder at posterior end with the terminal pore, eggs smooth, Vielline follicles present, operculate, 0.04×0.02 mm and described from intestine of *Clarias batrachus* L. at Bokaro, India.

The present parasite differs from *L. paithanesis*⁴¹ Shelke V.P., 2007 in having body long, thick, head long, elongated, 3.106-3.427×0.267-1.285mm, neck short, 0.624-0.714×1.856-1.963mm, testes oval, 1550-1575 in numbers, unevenly distributed, 0.035-0.125×0.035-0.107mm cirrus pouch medium, cylindrical, 0.446-0.535×0.053-0.160mm, cirrus thin, curved, 0.535×0.017mm, ovary big, distinctly bilobed, butterfly shaped, 0.107-0.677×1.107mm, ovarian lobes triangular, ovarian follicle 47-75 in numbers, vagina thin, 0.125×0.089-0.107mm, uterus coiled, loop shaped, 11.816×0.071-0.267mm, vitellaria granular and collected from intestine of *Clarias batrachus* L.; Paithan, Aurangabad (M.S.), India.

It differs from *L. jagtai*⁴⁹ in having body elongated, dorsoventrally flattened, scolex smooth unarmed, rounded and stumpy, posterior end of body is blunt and rounded, excretory pore is terminal, testes numerous, uterus well developed, eggs oval and thick shelled, vitelline follicle oval and collected from *Heteropneustes fossilis* Bloch in Behar river Reva (M.P.).

The present cestode differs from *L. punensis*¹⁰ in having head long, blunt, testes oval, 1400-1500, cirrus pouch oval, small, vas deferens short, vagina long, receptaculum seminis distinct, ovary butterfly shaped, uterus Saccular, vitellaria granular and recovered from *Clarias batrachus* L.; Pune (M.S.), India.

It differs from *L. subhpradhi*¹² in having body 1.695-2.463× 2.248-2.552mm, head spatulate, narrower than body, neck short, testes 300-310 in numbers, 0.071-0.107mm, cirrus pouch oblong, 0.385 ×0.225mm, cirrus thin, zig-zag, 0.351×0.011mm, vas deferens coiled,

0.454×0.034mm, ovary bilobed, lobes triangular, 0.943-1.124×0.304-0.340mm, vagina thin, coiled, 1.305×0.022mm, uterus wide, Convolutated, 4.374×0.079mm, vitellaria follicular, arranged in 5-7 rows, 0.017mm and recovered from *Clarias batrachus* L.; Paithan, Aurangabad (M.S.), India.

The present parasite differs from *L. follicularae*² in having mature specimens long, tapering at both ends, measures 32(31-33)× 2.5 (1.5-3.5) mm, head long, well marked off from body, 3.5 (3-4) × 2(1-3)mm, testes rounded, 400-500 in number, pre ovarian, placed centrally, evenly distributed, 0.106(0.087-0.126) × 0.152 (0.140-0.165) mm, cirrus pouch large, 0.696 (0.660-0.732) ×0.312(0.196-0.428)mm, cirrus thin, straight, 0.642 (0.607-0.678) ×0.035 (0.017-0.053)mm, vas deferens short, 0.142 (0.125-0.160) × 0.044 (0.035-0.053) mm, genital pore small, oval, 0.071(0.053-0.089) ×0.044(0.035-0.053)mm, vagina long, 2.258(2.107-2.410) × 0.053 (0.035-0.071)mm, receptaculum seminis thin tube, 1.098 (1.071-1.125)×0.071 (0.053-0.089) mm, ootype rounded to oval, 0.107mm, ovary bilobed, 'H' shaped, 1.723 (1.589-1.857)× 1.017 (0.964-1.071) mm, uterus Saccular, 0.071 (0.053-0.089)×0.044 (0.035-0.053)mm, eggs non-operculated, oval, 0.071 mm, vitellaria follicular, arranged in 2-3 rows and described from intestine of *Clarias batrachus* L.; M.S., India

The *L. indica* Sp.Nov. differs from *L. osmanabadensis*² in having mature specimens long, elongated, single segmented, tapering at both ends, measures 33 (32-34)× 2.8 (1.9-3.5) mm, head long, well marked off from body, 2.5 (2.0-3.0)×1.5 (1.0-2.0)mm, testes large, oval to rounded, having testicular follicles, 300-350 in number, pre-ovarian, scattered in central medulla, 0.132 (0.082-0.162)×0.179 (0.145-0.213)mm, cirrus pouch elongated, 0.660 (0.607-0.714)×0.312 (0.178-0.446)mm, cirrus thin, straight, 0.651 (0.607-0.696)× 0.035 (0.017-0.053)mm, vas deferens 0.169 (0.142-0.196)× 0.053 (0.035-0.071) mm, genital pore small, oval, 0.098 (0.071-0.125)×0.053 (0.035-0.071)mm, vagina long, thin tube, 2.410(2.375-2.446) × 0.044(0.035-0.053)mm, receptaculum seminis thin tube, 0.928 (0.910-0.946)× 0.062 (0.053-0.071)mm, ootype small, 0.089, ovary 'V' shaped, 2.321 (1.964-2.678)×0.339 (0.267-0.410) mm, uterus Saccular, diverticular, 2.616 (2.517-2.714) × 0.687 (-0.357-1.017)mm, eggs non-operculated, oval, 0.071mm, vitellaria follicular, arranged in two rows and recovered from

Clarias batrachus L.; Osmanabad (M.S.), India.

It differs from *L. puranensis*¹⁷ in having size of worm 17×3 mm, head long, blunt, conical, 1.704 (1.287- 2.121)×0.712 (0.454-0.969)mm, testes small, rounded, 1000-1200 in number, scattered in central medulla, 0.143 (0.136-0.151)×0.106 (0.098-0.113)mm, cirrus pouch obliquely placed, 0.250 (0.204-0.295)×0.140 (0.113-0.163)mm, cirrus thin, straight, 0.261 (0.257-0.265)× 0.011 (0.007-0.015)mm, vas deferens 0.344 (0.303-0.386)× 0.018 (0.015-0.022) mm, genital pore small, oval, 0.034 (0.030 -0.037)× 0.026 (0.022-0.030)mm, vagina long, thin tube, 4.049(3.439-4.459) × 0.037(0.035-0.039)mm, receptaculum seminis absent, ovary butterfly shaped, 0.575 (0.492-0.659)× 0.363 (0.340-0.386) mm, uterus wide, convoluted tube, 1.227 (1.143-1.310) × 0.681 (-0.371-0.992)mm, eggs operculated, oval, 0.037 (0.030-0.045) ×0.011(0.007-0.015) mm, vitellaria granular and recovered from *Clarias batrachus* L.; Purna River, Asegaon, Amaravati (M.S.), India.

The present worm differs from *L. shinderi*⁴⁷ in having head medium, testes oval 1580, ovary distinctly bilobed, with irregular lateral margin, cirrus pouch medium, transversely placed, uterus wide, convoluted tube and vitellaria granular corticular and subcorticular in position.

The present worm differs from *L. murhari*¹⁸ in having head bluntly elliptical, elongated, marked narrower than the body, 0.123×0.048mm, neck medium, 0.082×0.10mm, testes 600-650 in numbers, unevenly distributed, 0.06-0.014mm, cirrus pouch large, 0.131×0.034mm, vas deferens short, thin, coiled, 0.008×0.002mm, ovary large, bilobed, each lobe triangular, 0.062-0.069×0.02-0.03mm, ovarian follicles 25-40 in numbers, vagina long, slightly curved, 0.123×0.003mm, uterus wide, convoluted, 0.385×0.008mm, vitellaria granular, thin strip, corticular in position, eggs oval, operculate, 0.29×0.009mm and reported from catfish *Clarias batrachus* L.; Chalisgaon, Jalgaon (M.S.), India.

It differs from *Lytocestus vyasaei*³³ in possessing long with thin musculature, 14.6786-15.7143 ×1.6964-2.2857 mm, head large, conical 1.3393-1.875 × 0.4464-1.01785 mm, reproductive organs situated at posterior region of body, testes medium, rounded, 1022-1088 in numbers, 0.1071-0.1607 × 0.08929-0.1429 mm, cirrus pouch cylindrical, 0.3036-0.3571 ×0.08929-0.2321 mm, cirrus thin, with strong muscular wall, slightly curved, 0.1786-0.2321 × 0.01429-0.03571 mm, vas

deference long, stout, convoluted, 0.500-0.5714 ×0.0125-0.03393 mm, ovary bilobed, butterfly shaped, lobes triangular 1.5179-1.75 ×0.5357-1.0179 mm, vagina long tube, 1.3214-1.4285 × 0.03571-0.07143 mm, ootype big, bean shaped, uterus wide, long, convoluted tube, eggs large, oval, 0.1786-0.2679 ×0.01429-0.01786 mm, Vitellaria follicular, rounded, corticular, 2-3 rows on each lateral side and collected from *Clarias batrachus* L.; Aurangabad (M.S.), India.

The present worm differs from *Lytocestus purnensis*³³ in having body elongated, flattened, grass blade like, thin, 12.1428-14.4642 × 1.0714-2.1429 mm, head large, with bluntly rounded extremity, 1.428-1.785×0.0714-1.250 mm, neck short, wide, narrow, 0.535-0.804× 0.893-1.071 mm, testes ovoid, 844-859 in number, larger than vitelline follicles, 0.05357-0.08928×0.03571-0.07142 mm, cirrus pouch small, cylindrical, medullary, 0.3214-0.4464×0.0892-0.1428mm, ovary bilobed, 'H' shaped, 1.071-1.3928 ×0.0892-0.3214mm, ovarian lobes large, triangular, vagina long tube, 1.071-1.607 ×0.0178-0.357 mm, uterus wide, coiled, loop shaped, convoluted tube, 0.3214-0.357×0.08928-0.1428mm, Vitellaria follicular, rounded, arranged in 1-2 rows and recovered from *Clarias batrachus* L.; Purna, Parbhani (M.S.), India.

The present worm differs from *L. gariepinusae*¹⁴ in having head short, elongated, 0.500 -0.571× 0.303 - 0.552mm, neck wide, medium, squarish, 0.642- 0.750× 0.642 - 0.893mm, gonads situated in posterior region, testes oval 1375 - 1385 in number, 0.053 - 0.125× 0.035 - 0.107mm, cirrus pouch small, oval, flask shaped, 0.161-0.178 × 0.035 - 0.089 mm, cirrus thin, coiled, 0.178 - 0.195 ×0.017mm, ovary large, butterfly shaped, distinctly bilobed, 0.893 - 1.124×0.053 - 0.464mm, ovarian follicles 40 - 49 in number, vagina thin, long tube, 1.903 - 2.000× 0.017mm, uterus large, loop shaped, 3.872 - 3.427× 0.011 - 1.696 mm, eggs medium, oval, 0.035× 0.017mm, vitellaria granular and collected from *Clarias gariepinus*; Makni Dam, Osmanabad (M.S.), India.

The present worm differs from *L. khami*¹¹ in having mature specimens long, elongated, and single segmented, 22.35× 4.02 mm, head long, 2.64 ×1.4 mm, testes medium, round to oval, 1350-1400 in number, 0.14× 0.11mm, cirrus pouch small, elongated, 0.51× 0.29 mm, Ovary bilobed, butterfly shaped, Vagina long, 1.7× 0.03 mm, uterus Saccular, 4.30 × 1.33 mm, eggs non-operculated,

0.13×0.06 mm, vitellaria granular, arranged in 2-3 rows and collected from *Clarias batrachus* L. Tisgaon, Aurangabad (M.S.), India

The new species differs from *L. manjaraensis*⁴⁶ in having body long, buff coloured, single segmented, head big, cylindrical, slightly curved, 2.692 – 2.760×0.749-1.067 mm, neck short, 1.272-1.4372× 1.112-1.128 mm, testes oval, 460-470 in number, pre ovarian, in a single field, unevenly distributed, 0.022-0.090 × 0.022-0.079 mm, cirrus pouch cylindrical, globular, big, 0.236-0.281× 0.034-0.136 mm, ovary large, distinctly bilobed, 1.372× 0.488-0.670, ovarian lobes oval or triangular, uterus long, wide tube, loop shaped, 4.612× 0.045-0.136 mm, uterine pore large, oval, vitellaria granular, thin strips, corticular in position and described from intestine of *Clarias batrachus* L.; Aurangabad (M.S.), India.

It differs from *L. alii* (minor)³⁹ in having body long, cylindrical 4.805×0.674-1.484 mm, head bluntly oval, testes 580-590 in number, pre ovarian, arranged 9-11 rows, ovary bilobed, ovarian follicles 32-39 in numbers, vagina forms spindle-shaped receptaculum seminis, uterus wide, convoluted tube, coiled, uterine pore large, oval, with thick border, vitellaria follicular, oval, sub-corticular in position, arranged in 3-4 rows and recovered from *Clarias batrachus* L.; Amravati (M.S.), India.

The present tapeworm differs from *L. thapar*³⁹ which is having body 13-12×0.81-1.9 mm in length and width, testes 480-500 in number, arranged in 8-12 rows, ovarian follicles 30-31 in number, cirrus oblong in shape, obliquely placed, vas-deferens coiled, extends anteriorly and ootype large.

It differs from *L. godavariensis*³² in having body long, 12.4-24.23×2.1-4.2mm, head long, well marked, 3.116×1.999mm, testes 400-500 in numbers, 0.151×0.103mm, cirrus pouch small, 0.121×0.019mm, cirrus straight, thin,

0.057×0.012mm, vagina long, coiled, 0.084×0.012mm, vas deferens short, thin, 0.055×0.075mm, ovary bilobed, 0.352×0.364mm, each ovarian lobe contain 24-26 ovarian follicles, uterus wide, Convoluted, 0.167×0.034mm, eggs operculate, 0.181×0.220mm, vitellaria granular and collected from intestine of *Clarias batrachus* L.; Godavari River, Pravarasangam, Ahmednagar (M.S.), India.

In view of above differences, present form stands out as a species distinct from known species of genus *Lytocestus*⁴ and is therefore considered a new species and named as *Lytocestus indica* Sp. Nov. after the country India.

Taxonomic Summary

Genus	: <i>Lytocestus</i> ⁴
Type Species	: <i>Lytocestus indica</i> Sp. Nov.
Host	: <i>Clarias batrachus</i> ²⁴
Habitat (Site)	: Intestine
Locality	: Nanded, M.S., India.
Prevalence	: Forty Two mature tapeworms collected from Thirty Four infected fish host out of One Hundred Twenty examined.
Period of collection:	February, 2011 to January, 2013.
No. of Specimen	: 42
Accession number	: PGDZ/YMN/1-42/ February, 2011 to January, 2013
Deposition	: Research and PG Department of Zoology, Yeshwant Mahavidyalaya, Nanded M.S.
Etymology	: The present species is named after the Country India.

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