REPORTING A NEW CARYOPHYLLIDEAN WORM FROM A FRESHWATER *CLARIAS BATRACHUS*

[1]Khushal Bhavsar, [2]Avinash Bhangale and [3]Ajit Kalse,
[1]Researcher, [2]Associate Professor, & [3]Professor
Helminth Research Laboratory, P.G. Department of Zoology,
Nanasaheb Y. N. Chavan ASC College, Chalisgaon Dist. Jalgaon-424101, (M.S.)

Abstract: Present study deals with reporting of a Caryophyllidean tapeworm *Lytocestus sahayi n. sp.* collected from intestine of freshwater catfish *Clarias batrachus* (Linneus, 1758) from Mundkhede Dam near Chalisgaon (M.S.) India. Worm comes closer to all known species of the genus *Lytocestus,* in general topography of organs, but differs due to long head, tapering anteriorly, well-marked off from body. Testes oval to rounded, 500- 530 in number, unevenly distributed. Cirrus pouch large, oval, preovarian, vertically placed, cirrus thin, straight, vas deferens short, thin, coiled. Ootype is small, oval. Vagina long, thin tube, coiled. Ovary bilobed, 'Butterfly' shaped, with 25-28 ovarian follicles, situated in posterior region of the worm. Eggs are oval, operculated. Vitellaria are granular, arranged in two rows.

Index Terms- Cestode, *Clarias batrachus, Lytocestus,* Mundkhede.

INTRODUCTION

Cohn, 1908 erected the genus *Lytocestus* with its type species L. *adhaerens* from edible cat fish *Clarias fuscus* at HongKong. This genus was first confirmed by Woodland, 1926 that included four more species in addition to the type species. They are *L. filiformis* Woodland, 1923 in *Mormyrus caschive*, Egyptian Sudan; *L. chalmersius* Woodland, 1924; *L. cunningtoni* Fuhrmann and Baer, 1925 and *L. indicus* Moghe, 1925 (Syn. *Caryophyllaeces indicus*) from *Clarias batrachus* in India. Later, Hunter, 1927 placed the genus in subfamily of its own, viz. Lytocestinae and retained only three species i.e. *L. adhaerens, L. filiformis* and *L. indicus*. He put the species *L. cunningtoni* and *L. chalmersius* in the Genus *Monobothrioides*. Subsequent workers Yamaguti, 1959, Gupta, 1961 and Murhar, 1963 have adhered to these changes. Wardle and McLeod, 1952 followed Hunter's classification but raised the status of Lytocestinae from Sub family to family. Furtado, 1963 and Lynsdale, 1956 considered *L. alestesi* as Syn. of *L. birmanicus*. But Mackiewicz, 1962 after examination of original material *L. alestesi* (Lynsdale, 1956) concluded that it should be considered as syn. of *L. filiformis* (Woodland, 1923). Murhar, 1963 included *L. moghei* from *Clarias batrachus* in Nagpur, India. Mackiewicz, 1972 included the species *L. javanicus* (Bovien, 1926). Ramadevi, 1973 described *L. longicollis* from *Clarias batrachus* in India. Wardle, McLeod and Radinovsky, 1974 suggested a new system of classification of cestodes, they used the term Cotyloda as a class and order Caryophyllidea is kept in this class. Later on Singh 1975 erected *L. fossilis* from *Heteropneusteus fossils.* Shinde and Phad, 1988 described *L. marathwadaensis* from *Clarias batrachus.* Jadhav and Gavhane, 1991 added *L. alii* and *L. clariasae* from *Clarias batrachus.* Kadam et.al, 1999 erected *L. naldurgensis* in *Clarias batrachus*. Kalse and Shinde, 1999 described *L. chalisgaonensis* from *Clarias batrachus.* Shinde and Borde, 1999 describe *L. kopardaensis* from *Clarias batrachus.* Kolpuke and Shinde, 1999 erected *L. teranaensis* from *Wallago attu* at Aurangabad. Patil and Jadhav, 2002 added *L. govindae* from *Clarias batrachus*. Pawar and Shinde, 2002, added *L. batrachusae* and *L. clariasae* (minor) from *Clarias batrachus*. Shomendra et al., 2003 described *L. bishnupurensis* from *Mystus seenghala,* its critical study was done by Singh et al., in 2018. Khadap *et al.,* 2004 erected *L. shindae*, from *Clarias batrachus*. Lakhe et al., 2004 reported *L. nagapurensis* from *Clarias batrachus*. Tandon *et al.,* 2005 erected four new species *L. clariae, L. allenuateus, L. assamensis* from *Clarias batrachus* and *L. heteropneustii* in *Heteropneusteus fossils, L. heteropneusti* Tandon Chakravarty & Das 2005 *syn.* of *Lucknowia fossilisi* by Ash 2012. Sahay, Mandal, Saxena & Singh 2017 held this species valid under *Lytocestus.* Poonam, 2007 added *L. mujumdari* and *L. bokaroensis* from *Clarias batrachus*, Shelke, 2007 erected *L. paithanensis* from *Clarias batrachus*, Tripathi 2007 reported *L. jagtai* from *Heteropneustes fossilis* its critical study was done by Sahay and Ekka in 2019. Jadhav et al., 2008 added *L.* punensis from *Clarias batrachus*. Jawalikar et al., 2008 reported *L. subhapradhi* from *Clarias batrachus.* Later Kaul, Kalse and Suryawanshi 2010 added *L. murhari* from *Clarias batrachus.* Bhure *et al.*, 2010 reported *L. follicularae* and *L. osmanabadensis* from *Clarias*

batrachus. Surayawanshi *et al.*, 2010 reported *L. shindei* from *Clarias batrachus*, Pawar and Hiware, 2011 added *L. vyasaei* and *L. purnensis*, from *Clarias batrachus*, Kadam and Dhole, 2011 describe *L. gariepinusae* from *Clarias gariepinus*, Jawale and Borde, 2011 added *L.* khami from *Clarias batrachus*. Sawarkar, 2012 describe *L. thapari* and *L. alii*; but *L. alii* is already described by Jadhav & Gavahne in 1991 and its critical study was done by Sahay et al., in 2019. Salunke *et al.*, 2012 added *L. manjaraensis* from *Clarias batrachus* at Manjara river, Latur. Nimbalkar et al., 2012 describe *L. rekhaensis* from *Heteropneustes fossilis* at Jaikwadi Dam, Augangabad, its critical study was done by Sahay and Khalkho in 2017. Deshmukh et al., 2015 added *L. indica,* from *Clarias batrachus.* Its critical study was done by Sahay et al., in 2018. Pawar and Dandwate, 2016 added *L. godavariensis* from *Clarias batrachus.* Pardeshi, 2016 describe *L. mastacembellusi*, from *Mastacembellus armatus,* its critical study was done by Sahay et al., in 2019. Kankale 2017, reported *L. ambe* from *Clarias batrachus.* Kale 2017, describe *L. paithanensis* from *Clarias batrachus* but this species is already described by Shelke in 2007 and same species was critically studied by Sahay et al., in 2019. Dandawate, 2018 gives *L. mulaansis* from *Clarias batrachus* but the figures of the species *L. mulaansis* and *L. godavariensis* 2016 is similar given by same author. Also its critical study is done by Sahay et al., in 2020. Patil, 2018 describe *L. bharatae* from *Clarias batrachus.* Its critical study is also done by Sahay et al., in 2020, Recently, Barshe et al., 2018, added *L. elongates*, from *Clarias batrachus* at Latur.

The present communication deals with the reporting of *Lytocestus sahayi n. sp.* from a catfish *Clarias batrachus* (L.) At. Mundhekede Dam, Tq. Chalisgaon, Dist. Jalgaon, Maharashtra State, India.

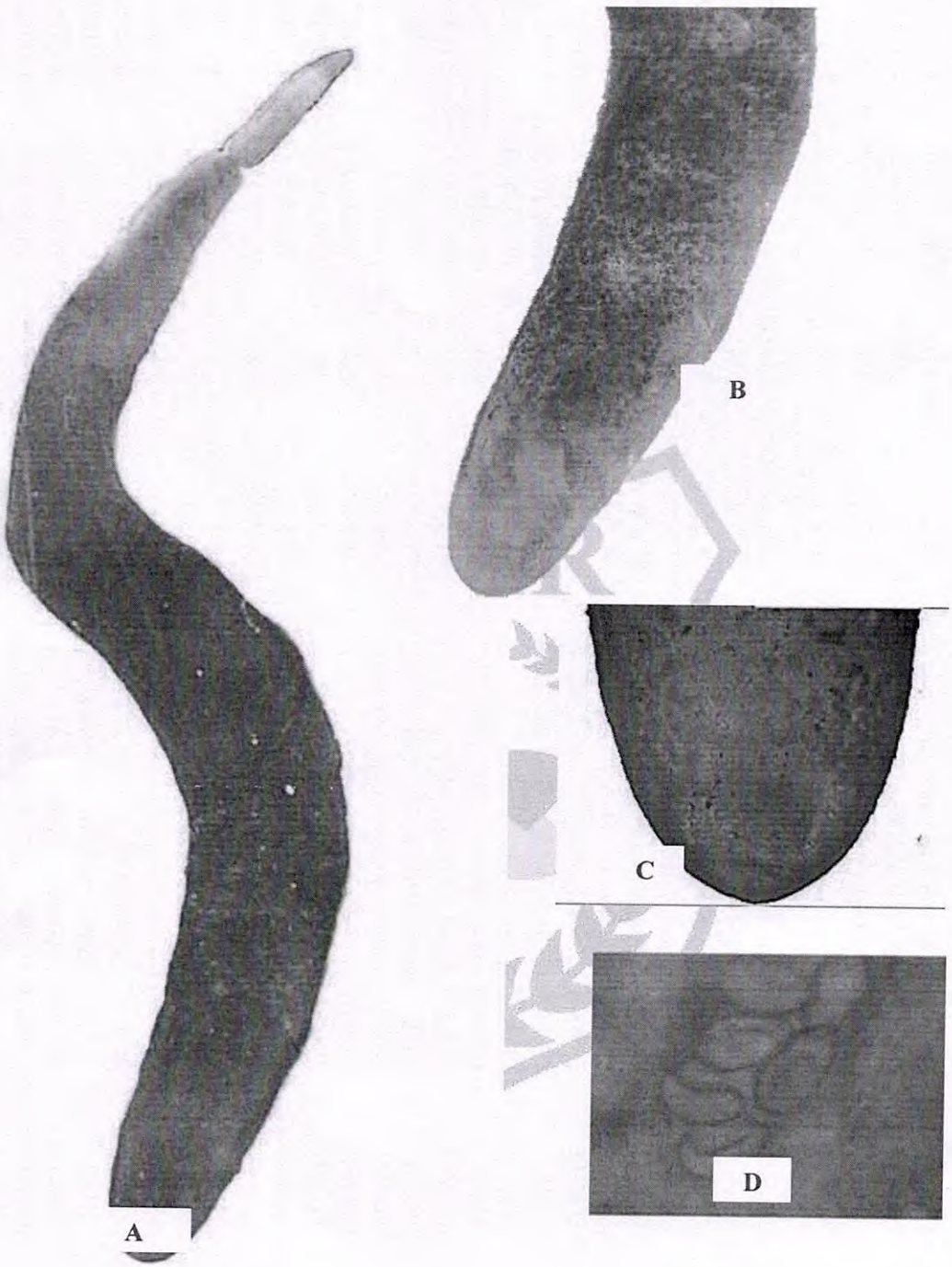
MATERIALS AND METHODS:

About 15 specimens of the cestode parasites were collected from 05 intestines of freshwater cat fish *Clarias batrachus* (L.) at Mundkheda Dam, Tq. Chalisgaon, District Jalgaon (M.S.) India, in September, 2020. These cestodes were flattened and preserved in 4% formalin. 10 specimens of different age were stained with Harris Hematoxyline, dehydrated in series of alcoholic grades, cleared in xylol and mounted in DPX. Microphotographs were taken with the help of digital camera. Measurements are recorded in millimetres (mm). The identification is made with the help of books, 'How To Know The Tapeworms' by Gerald D. Schmidt.; 'Systema Helminthum Volume II' by S. Yamaguti; 'Advances in the Zoology of Tapeworms, 1950-1970' by Wardle, R.A., Mcleod, J.A. and Radinovsky and 'Keys to the Cestode Parasites of Vertebrates' by Khalil, Jones and Bray.

RESULTS AND DISCUSSION

Description (Based on 10 Specimens: Figs. 1A, B, C and D).

Mature specimens are long, elongated, with single segment, tapering at anterior ends and blunt at posterior end, and measures 30.0 (15.0-37.0) in length and 3.0 (4.0-3.0) in breadth. Head is long, tapering anteriorly, well-marked off from body, measures 3.010 in length and 0.407 in breadth. Neck absent. Testes oval to round in shape, 500-530 in number, pre-ovarian, unevenly distributed measure 0.0372 (0.0290-0.057) in length and 0.0365 (0.0290-0.753) in breadth. Cirrus pouch medium, oval, preovarian, vertically placed measures 0.534 in length and 0.463 in breadth, cirrus thin, straight, within cirrus pouch and measures 0.490 in length and 0.055 in breadth. Vas deferens short, thin, coiled and measures 0.106 in length and 0.055 in breadth. Ovary large, bilobed, 'Butterfly' shaped, situated near the posterior end of the worm, each lobe triangular, measures 0.509 - 0.476 in length and 0.265 -0.315 in breadth. ovarian follicles 25-28 in number, lobes connected by isthmus, measure 0.324 in length and 0.0395 in breadth. Vagina long, thin tube, coiled starts from female genital pore, runs medically and posteriorly, opens into ootype, measures 1.9420 in length and 0.0466 in breadth. Ootype small, rounded to oval, situated on either side below ovarian lobe, in posterior region of body and measures 0.147 in length and 0.144 in breadth. Vitellaria are granular, arranged in two rows and measures 0.079 (0.066-0.080) in length and 0.083 (0.071-0.088) in breadth. Eggs are oval in shape, operculated and measure 0.0153 in length and 0.041 in breadth.



Microphotographs of *Lytocestus sahayi n.sp.*
A. Whole worm, B- Posterior region of worm, C- Close view of posterior region, D- Eggs.

The worm under discussion, in having the number of testes 500-530 and granular vitellaria, comes closer to L. *adhaerens,* Cohn, 1908, *L. filiformis,* Woodland, 1923; *L. naldurgensis,* Kadam et.al, 1999; *L. chalisgaonensis,* Kalse and Shinde, 1999; *L. govindae,* Patil and Jadhav, 2002; *L. shindae,* Khadap *et al.,* 2004; *L. nagapurensis,* Lakhe et al., 2004; *L. clariae,* and *L. assamensis,* Tandon *et al.,* 2005; *L. paithanensis,* Shelke, 2007; *L.* punensis, Jadhav et al., 2008; *L. murhari,* Kaul, Kalse and Suryawanshi 2010; *L. follicularae,* Bhure *et al.*, 2010; *L. shindei,* Surayawanshi *et. al.*, 2010; *L. gariepinusae,* Kadam and Dhole, 2011; *L.* khami, Jawale and Borde, 2011; *L. manjaraensis,* Salunke *et al.*, 2012; *L. godavariensis,* Pawar and Dandwate, 2016; *L. mastacembellusi,* Pardeshi, 2016; *L. mulaansis,* Dandawate, 2018; *L. bharatae,* Patil, 2018. AS *L. mastacembellusi*, *L. mulaansis* and *L. bharatae* is critically studied by Sahay et al., is not compared here. But the worm under discussion, differs from L. *adhaerens* in the shape of the scolex (differentiated Vs. undifferentiated) and in the host (*Clarias batrachus Vs. Clarias fuscus).*

The present form, differs from *L. filiformis* in the shape of the scolex (differentiated Vs. not distinctly marked off); in the neck (Absent Vs. Long slender); in the number of testes (500-530 Vs. 232-532); in the ovarian follicles (25-28 Vs. 6-11); and in the host (*Clarias batrachus Vs. Moryrus caschive).*

The present tapeworm, differs from *L. naldurgensis* in the shape of the scolex (differentiated tapering anteriorly Vs. conical blunt); in the neck (absent Vs. short); in the receptacle seminalis (absent Vs. present) and in the vitellaria (granular Vs. follicular).

The present cestode, differs from *L. chalisgaonensis* in the shape of the scolex (differentiated tapering anteriorly Vs. bluntly rounded elongated); in the neck (absent Vs. present, medium); in the number of testes (500-530 Vs. 1500-1600); in the receptacle seminalis (absent Vs. coiled) and in the ovarian follicles (25-28Vs. 36-40).

The present form, differs from *L. govindae* in the number of testes (500-530 Vs. 1425-1475); in the position of cirrus pouch (vertically placed Vs. obliquely placed) and in the receptacle seminalis (absent Vs. coiled)

The present cestode, differs from *L. nagapurensis* in the shape of the scolex (differentiated tapering anteriorly Vs. spatulate, bluntly rounded); in the number of testes (500-530 Vs. 1100-1150); in the shape of ovary (butterfly shaped Vs. H shaped); in the receptacle seminalis (absent Vs. coiled) and in the ovarian follicles (25-28 Vs. numerous).

The present worm, differs from *L. shindae* in the shape of the scolex (differentiated tapering anteriorly Vs. long); in the number of testes (500-530 Vs. 350-360); in the receptacle seminalis (absent Vs. long, coiled tube) and in the ovarian follicles (25-28Vs. 33-36).

The present cestode, differs from *L. clariae* in the shape of the scolex (differentiated tapering anteriorly Vs. undifferentiated); in the number of testes (500-530 Vs. 270-495); in the shape of ovary (butterfly shaped Vs. H shaped) and in the vitellaria (granular Vs. ovoid).

The present form, differs from *L. assamensis* in the neck (absent Vs. present); in the number of testes (500-530 Vs. 266-565) and in the shape of ovary (butterfly shaped Vs. inverted 'A' shaped).

The present worm, differs from *L. paithanensis* in the neck (absent Vs. short); in the number of testes (500-530 Vs. 1550-1575); in the shape of cirrus pouch (oval Vs. cylindrical) and in the ovarian follicles (25-28Vs. 47-75).

The present cestode, differs from *L. punensis* in the number of testes (500-530 Vs. 1450-1500); in the position of cirrus pouch (vertically placed Vs. transversely placed) and in the receptacle seminalis (absent Vs. distinct).

The present form, differs from *L. murhari* in the shape of the scolex (differentiated, tapering anteriorly Vs. bluntly elliptical, elongated); in the neck (absent Vs. present); in the number of testes (500-530 Vs. 600-650); in the vagina (coiled Vs. slightly curved) and in the ovarian follicles (25-28Vs. 25-40).

The present worm, differs from *L. follicularae* in the number of testes (500-530 Vs. 400-500); in the shape of ovary (butterfly shaped Vs. 'H' shaped) and in the vitellaria (granular Vs. follicular, in 2-3 rows).

The present tape, differs from *L. shindei* in the shape of the scolex (differentiated, tapering anteriorly Vs. medium); in the number of testes (500-530 Vs. 1580); and in the position of cirrus pouch (vertically placed Vs. transversely placed).

The present form, differs from *L. gariepinusae* in the shape of the scolex (long Vs. short); in the neck (absent Vs. present); in the number of testes (500-530 Vs. 1375 – 1385); in the number of ovarian follicles (25-28 Vs. 40 – 49) and in the host (*Clarias batrachus* Vs. *Clarias gariepinus*).

The present worm, differs from *L. khami* in the number of testes (500-530 Vs. 1350-1400); in the receptacle seminalis (absent Vs. present) and in the eggs (operculated Vs. non operculated).

The present cestode, differs from *L. thapari* in the shape of the scolex (differentiated tapering anteriorly Vs. bluntly oval); in the number of testes (500-530 Vs. 480-500); in the position of cirrus pouch (vertically placed Vs. obliquely placed); in the receptacle seminalis (absent Vs. present); in the number of ovarian follicles (25-28 Vs. 30-31) and in the vitellaria (granular Vs. follicular).

The present tapeworm, differs from *L. manjaraensis* in the shape of the scolex (differentiated tapering anteriorly Vs. cylindrical); in the neck (absent Vs. present) and in the number of testes (500-530 Vs. 460-470(467)).

The present worm, differs from *L. godavariensis* in the number of testes (500-530 Vs. 400-500); in the position of cirrus pouch (vertically placed Vs. transversely placed) and in the number of ovarian follicles (25-28 Vs. 24-26).

It also differs from *L. indicus, L.birmanicus, L.moghei, L.longicollis, L.fossilis, L.marathawadensis, L.alii, L.clariasae, L.kopardaensis, L.teranaensis, L.batrachusae, L.subhapradhi, L.osamnabadensis, L.vyasaei, L.purnensis, L. ambe and L. elongates* in the form of vitellaria (granular Vs. follicular).

These characters justify the recognition of present worm as a new species and named *Lytocestus sahayi n.sp.* in honor of Prof. Umapati Sahay former University Professor and Dean, Faculty of Science, Ranchi University, Ranchi. Who has remarkably contributed in exploring helminthology.

TAXONOMIC SUMMARY

Type Species : *Lytocestus sahayi n.sp.*
Type host : *Clarias batrachus* (Linneus, 1758)
Habitat (Site) : Intestine
Type locality : Mundkhede Dam Tal- Chalisgaon, Dist. Jalgaon, M.S., India.
Period of collection : September 2020.
Holotype and Paratype: Deposited in Helminth Research lab, P.G. Department of Zoology, Nanasaheb Y. N. Chavan A S C College Chalisgaon, Dist. Jalgaon, M.S., India
Etymology : The species is named in the honor of Prof. Umapati Sahay.

Systemic Classification of genus *Lytocestus* :

Domain	-	Eukaryota
Kingdom	-	Animalia
Division	-	Metazoa
Sub-division	-	Eumetazoa
Group	-	Bilateria
Sub- group	-	Protostomia
Clade	-	Spiralia
Sub clade	-	Lophotrochozoa
Phylum	-	Platyhelminthes
Class	-	Cestoda
Sub-Class	-	Cestodaria
Order	-	Caryophyllidea
Family	-	Lytocestidae
Genus	-	*Lytocestus*