

RRST-Zoology

## New Tapeworm *Lytocestus gariepinusae* n. sp. from a Freshwater Fish *Clarias gariepinus* at Makani Dam, Dist. Osmanabad, M.S. India

Karmveer N. Kadam<sup>1\*</sup> and Jaywant S. Dhole<sup>2</sup>

<sup>1</sup>Department of Zoology, Shri Kumarswami Mahavidyalaya, Ausa. Latur (M.S.), India

<sup>2</sup>Department of Zoology, Dr. B. A. Marathwada Univerasity Aurangabad (M.S.), India

Article Info	Abstract
<b>Article History</b> Received : 16-01-2011 Revised : 02-04-2011 Accepted : 02-04-2011	The present communication deals with description of a new species <i>Lytocestus gariepinusae</i> n. sp. is reported from freshwater fish <i>Clarias gariepinus</i> at Makani dam, Dist. Osmanabad.. It differs from all known species of the genus, with the characters like, head is short, elongated, narrow anteriorly broad posteriorly; neck wide, medium squarish; gonads situated in posterior most region of worm, testes 1375 – 1385 in number, preovarian, scattered in middle region of worm; ovary large, butterfly shaped, Vitellaria granular.
<b>*Corresponding Author</b> Tel : +91-9970129919 Fax : +91-9970129919  Email: dkarmveerkadam@gmail.com	<b>Key Words:</b> Tapeworm, <i>Lytocestus gariepinusae</i> n. sp, <i>Clarias gariepinus</i> , Osmanabad

### Introduction

Cohn [3] erected the genus *Lytocestus* with its type species *L. adhaerens* from *Clarias fuscus* in Hong-Kong. This genus was first confirmed by Woodland [39] that included four more species in addition to the type species. They are *L. filiformes* Woodland, 1923 in *Mormynus caschive*, Egypt Sudan; *L. chalmersius* Woodland [34]; *L. cunningtoni* [4] and *L. indicus* [21] (Syn. *Caryophyllaeceus indicus*) from *Clarias batrachus* in India. Mehra [20] recorded the same species from *Clarias magur* and [27] from *Clarias batrachus* in India. [7] placed the genus in sub-family 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 works [40,6] have adhered to these changes. Wardle and McLeod [35] followed Hunter's classification but raised the status of *Lytocestinae* from Sub family to family. Wardle, McLeod and Radinovsky [36] suggested a new system of classification of cestodes, which used the term Cotyloda as a class and order Caryophyllidea is kept in this class [19] and included the species *L. javanicus* [2]. Here considered *L. alestesii* as Syn. of *L. barmanicus* [5, 17]. But [18] after examination of original material *L. alestesii* [17] concluded that it should be considered as syn. of *L. filiformis* [37]. *L. longicollis* [27] described from *Clarias batrachus* in India.

Later on *L. marathwadensis* isolated from *Clarias batrachus* from India [30]. Later two species added to this genus i.e. *L. alli* and *L. clariasae* [8] from *Clarias batrachus*. *L. naldurgensis* [11] from *Clarias batrachus*, *L. teranaensis* [15] recovered from *Wallago attu* and *L. chalisgaonesis* [12] in *Clarias batrachus*. *L. kopardaensis* [30], *L. govindae* [23], *L. batrachusae* [24], *L. shindei* [14] and *L. nagapurensis* [16] were recovered from *Clarias batrachus*. Later on four new species

*L. clariae*, *L. allenuateus*, *L. assamensis* in *Clarias batrachus* and *L. heteropneustii* in *Heteropneusteus fossils* [33]. Two species added *L. mujumdari*, *L. bokaroensis* [25,26] from *Clarias batrachus*. Later on no. of species added like *L. paithanesis* [28], *L. jagati* [34], *L. subhapradhi* [10], *L. punensis* [9], *L. follicularae* and *L. osmanabadensis* [1], *L. shindei* [32] and lastly *L. murhari* [13] were added.

The present communication deals with the description of new species *Lytocestus gariepinusae* n. sp selected from a fresh water fish *Clarias gariepinus* at Makani dam, Makani, Tq. Lohara, Dist. Osmanabad M.S., India

### Material and Method

The present specimens were recovered from the intestine of the freshly killed fish *Clarias gariepinus* from Makni Dam, Osmanabad District in the month of January 2009. These fishes were dissected opened up dorso-ventrally and the internal organs examined. The entire digestive system was removed and placed in a Petri dish with physiological saline. Infection of each group of parasites was treated as follows: collected single segmented tapeworm were first relaxed and then fixed in hot 4% formalin and stain using Harris haematoxyline. Stained parasites were washed in distilled water, dehydrated in ascending grades of alcohol, cleared in xylene, mounted in D.P.X. Drawings were made using a camera lucida. The identification is made with the help of "Systema Helminthum" by [40]

**Description:** *Lytocestus gariepinusae* n. sp. (Based on five specimens)

The head is short, elongated narrow anteriorly, broad posteriorly with convex lateral margin and measure 0.500 - 0.571 in length and 0.303 – 0.552 in breadth, neck is wide,

medium, squarish, narrow anteriorly, broad posteriorly with convex, lateral margins and measures 0.642 – 0.750 in length and 0.642 – 0.893 in breadth.

Gonads are situated in the posterior most region of the worm, testes numerous, medium, oval 1375 – 1385 (1380) in number, preovarian, scattered in middle region of worm, from base of neck to ovary and from one lateral to other side of worm, almost unevenly distributed, in a single field and measure 0.053 – 0.125 in length and 0.035 – 0.107 in breadth, cirrus pouch is small, oval, flask shaped preovarian, transversely placed, curved anteriorly, narrow posteriorly, broad distally, open in middle of body and measure 0.161-0.178 in length and 0.035 – 0.089 in breadth; cirrus thin, coiled, contain within cirrus pouch and measures 0.178 – 0.195 in length and 0.017 in breadth; vas deferens thin, long tube, coiled, runs anteriorly and measures 2.042 – 2.142 in length and 0.017 in breadth; ovary large, butterfly shaped, distinctly bilobed, with loose mass of ovas, with irregular margin, antero posteriorly elongated and measure 0.893 – 1.124 in length and 0.053 – 0.464 in breadth; ovarian follicles are 40 – 49 in number, medium, oval and measures 0.035 – 0.071 in length and 0.017 – 0.071 in breadth, isthmus wide, medium, highly muscular, connecting two ovarian lobes, transversely and obliquely placed and measures 0.464 in length and 0.107 – 0.195 in breadth; vagina thin, long tube, arises from genital pore, runs posteriorly, dorsal to uterus, for a long distance, crosses isthmus, reaches and opens in to ootype and measures 1.903 – 2.000 in length and 0.017 breadth; ootype medium, oval, roughly triangular, obliquely placed, post-ovarian and measures 0.107 in length and 0.035 – 0.071 in breadth; uterus large, irregular, arises from ootype, runs posteriorly for a short distance, turns anteriorly, crosses the isthmus, runs and enlarges to form transverse branches, loop shaped in appearance, extend up to genital pore, opens separately by an uterine pore, present at distal end of uterus and measures 3.872 – 3.427 in length and 0.011 – 1.696 in breadth; uterine pore large, oval, double walled, anteroposteriorly elongated and measures 0.303 in length and 0.178 in breadth; eggs medium, oval and measure 0.035 in length and 0.017 in breadth; Vitellaria granular, strips of medium width, on each lateral side of the worm from base of the neck region to posterior end of worm.

## Discussion

The genus *Lytocestus* is established by Cohn [3] with its type species *L. adhaerens* from *Clarias fuscus* at Hong-Kong. The present worm comes closer to all the known species of the genus *Lytocestus* [3] general topography of organs. But differs due to some characters from following species. The present form differs from *L. adhaerens* [3] in having head undifferentiated from body, cirrus pouch strongly muscular, ovary bilobed, uterus looped, vitellaria granular and reported from *Clarias fuscus*, in Hong Kong. The present cestode differs from *L. filiformis* [37] in having testes numerous, large, rounded, in central medulla, ovary bilobed, containing 6-11 large follicles, cirrus pouch small, uterus convoluted, tubular, pre-ovarian and reported from *Mormyrus caschive*, in Sudan. The present worm differs from *L. indicus* [21] in having head bluntly rounded, testes 230-270 in numbers, cirrus pouch small, ovary with numerous follicles and uterus is thick. The present cestode differs from *L. biramanicus* [17] in having

testes medullary, extend upto genital pores, ovary wing like, with numerous follicles, cirrus pouch medullary in position, uterus consist of number of loose cells and reported from *Clarias batrachus*, in Burma. The present tapeworm differs from *L. alestei* [17] in having testes more or less spherical, ovary bilobed, and cirrus pouch small, oval in medullary region, uterus short, vitellaria extend from short distance behind most anterior and reported from *Alestes nurse*, in Sudan. The present parasite differs from *L. longicollis* [27] in having head long, testes 105 to 140 in numbers, arranged in two layers, ovary 'H' shaped, corticular with closely packed follicles, cirrus pouch small, oval, vas deferens much convoluted and vitellaria corticular, rounded, in 1-2 rows on each lateral side, extending to anterior tip of ovary. The present worm differs from *L. fossilis* [31] in having head stumpy, testes numerous, cirrus pouch oval, ovary follicular, 'H' shaped, uterus compactly coiled and vitellaria granular, post ovarian. The present parasite differs from *L. marathwadensis* [29] in having head stumpy, testes oval, arranged in 2 or 3 rows, in central medulla, ovary 'H' shaped, uterus saccular and vitellaria small, oval, in a single row on lateral side. The present cestode differs from *L. alii* [8] in having head bluntly rounded, testes 460-480 in numbers, cirrus pouch small, oval, ovary bilobed, butterfly shaped, uterus convoluted tube and vitellaria follicular, corticular, in 5-6 rows. The present parasite differs from *L. clarisae* [8] in having head bluntly rounded, testes 700-750 in numbers, small, oval, cirrus pouch medium, ovary bilobed, like bunch of grapes and vitellaria follicular, arranged in 5-6 rows. The present form differs from *L. naldurgensis* [11] in having head long, conical, blunt, spatulate, testes 500-600 in numbers, scattered in medullary region, cirrus pouch small, oval, vertical, obliquely placed, ovary bilobed, butterfly shaped, uterus wide, convoluted tube, vitellaria follicular, arranged in 3-4 in rows. The present parasite differs from *L. teranaensis* [15] in having head conical, long, bluntly rounded, testes numerous, rounded, 1200-1500 in numbers, pre-ovarian, ovary bilobed, each lobe triangular, uterus convoluted tube, vitellaria follicular, smaller, oval, arranged in 4-5 rows and reported from *Wallago attu*, in India. The present form differs from *L. chalisgaonesis* [12] in having head bluntly rounded, marked off from body, testes 1500-1600 in numbers, cirrus pouch elongated, pre-ovarian, ovary bilobed, each lobe triangular, uterus convoluted tube and vitellaria granular, corticular in position. The present tapeworm differs from *L. kopardaensis*, [30] having head long, elongated testes 1600- 1700, oval, genital pore is large, oval, ovary distinctly bilobed with irregular margin, vagina is wide tube, uterus is wide, coiled loop shaped, vitellaria follicular, corticular in position. The present cestode differs from *L. govindae* [23] in having head long, testes numerous, 1425-1475 in numbers, pre-ovarian, evenly distributed, scattered in single field, cirrus pouch small, oval, obliquely placed, ovary bilobed, butterfly shaped, receptaculum seminis coiled, uterus wide, convoluted tube and vitellaria granular, corticular in position. The present worm differs from *L. batrachusae* [24] in having head spatulate, testes 3800-4000 in numbers, rounded, pre-ovarian, scattered centrally, ovary bilobed, butterfly shaped, uterus convoluted tube, transversely placed and vitellaria small, oval, arranged in two rows. The present parasite differs from *L. shindei* [14] in having head long, testes 350-360 in numbers, cirrus pouch small, oval, pre-ovarian, obliquely placed, ovary butterfly

shaped, uterus convoluted tube and vitellaria granular. The present form differs from *L. nagapurensis* [16] in having head spatulate, bluntly rounded, testes numerous, 1100-1150 in numbers, oval, scattered all over the segment, cirrus pouch medium, medullary, pre-ovarian, ovary 'H' shaped with numerous oval follicles, uterus convoluted tube and vitellaria granular. The present worm differs from *L. clariae* [33] in having head undifferentiated from body, testes 270-495 in numbers, oval, cirrus pouch compact, ovary 'H' shaped and uterus glandular. The present parasite differs from *L. attenuatus* [33] in having head undifferentiated from body, testes 155-398 in numbers, cirrus pouch medullary, ovary inverted 'A' shaped and uterus glandular. The present worm differs from *L. assamensis* [33] in having head undifferentiated from body, testes 266-565 in numbers, cirrus pouch prominent, ovary inverted 'A' shaped and uterus glandular. The present parasite differs from *L. heteropneustii* [33] in having head undifferentiated from body, testes 235-340 in numbers, ovary bilobed, uterus glandular and reported from *Heteropneustes fossilis*, in India. The present tapeworm differs from *L. pailhanesis*, [28] having testes 1550; shape oval, number of ovarian follicles. The present tapeworm differs from *L. jagati*, [34] having head rounded, testes numerous, shape oval, vitellaria oval. The present worm differs from *L. mujumdari* [25] in having head undifferentiated from body, testes numerous, ovary large, bilobed, 'H' shaped and uterus saccular. The present tapeworm differs from *L. bokaroensis* [26] the body is long, head is basically undifferentiated, ovary is bilobed, bent inwards in the shape of inverted 'A', receptaculum seminis is absent. The present tapeworm differs from *L. subhadradi* [10] having shape of head spatulate, testes 300 – 310, shape of ootype is oval, vitellaria follicular. The present tapeworm differs from *L. punensis*, [9] having head is long, well marked off from body, testes 1450 – 1500, receptaculum seminis distinct, shape of uterus is saccular. The present tapeworm differs from *L. follicularae* [1] in having head undifferentiated from body, testes 400-500 in numbers, oval, large, cirrus pouch oval, ovary bilobed, 'H' shaped, uterus saccular and vitellaria follicular, arranged in 2-3 rows. The present tapeworm differs from *L. osmanabadensis* [1] having head is long well marked off from the body, testes 300 – 350 in number, large oval to round receptaculum seminis is thin tube, ootype is small, rounded, ovary is bilobed 'V' shaped, uterus is saccular. The present tapeworm differs from *L. shindei* [32] long, head medium, neck large, testes 1580 in number, oval in shape, ovary distinctly bilobed, with irregular lateral margin, vitellaria granular cortical and subcortical in position. The present tapeworm differs from *L. murhari* [13] having head bluntly elliptical, elongated marked narrower than the body, testes 600 – 650 in number, preovarian, scattered in the medullary region of the worm, ovary large, bilobed, uterus wide, convoluted, coiled tube.

In view of the above differences justify the recognition of the present tapeworm, as a new species and hence the name *Lytocestus gariepinusae n. sp.* is proposed, after the species name of the host *Clarias gariepinus*.

#### Taxonomic Summary

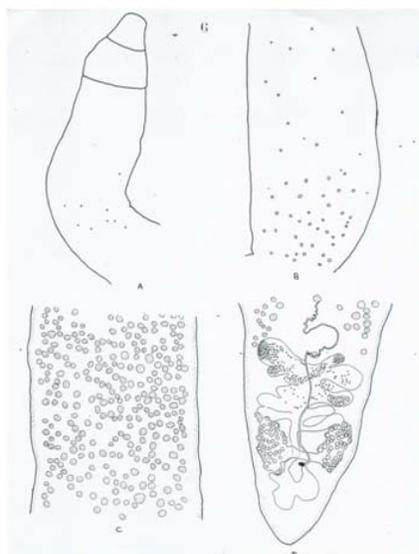
Genus : *Lytocestus* Cohn, [3]  
 Type Species : *Lytocestus gariepinusae n. sp.*  
 Host : *Clarias gariepinus*.

Habitat : Intestine  
 Locality : Makani, Osmanabad, M.S. India.  
 Etymology : Named after the species name of

the host.

#### A key to the species of the genus *Lytocestus*, cohn, 1908:

- Testes in between 100 – 105 in numbers - *L. longicollis* [27]  
 Testes in between 230 – 270 in numbers - *L. indicus* Moghe [21]  
 Testes in between 300 – 350 in numbers - 1  
 Testes in between 350 - 360 in numbers - *L. shindei* Khadap, [14]  
 Testes in between 460 - 480 in numbers- *L. alii* Jadhav [8]  
 Testes in between 500 - 600 in numbers- *L. naldurgensis* [11]  
 Testes in between 600 – 650 in numbers- *L. murhari* [13]  
 Testes in between 700 - 750 in numbers- *L. clariasae* [8]  
 Testes in between 1100 - 1150 in numbers - *L. nagapurensis* [16]  
 Uterus looped, behind shell gland - *L. adhaerens* [3]  
 Uterus short - *L. alestes* [17]  
 Uterus wide, coiled, loop shaped- 2  
 Uterus glandular - *L. heteropneustii* [33]  
 Uterus convoluted - 3  
 Ovary 'A' Shaped - 4  
 Ovary butterfly shaped - 5  
 Ovary 'H' shaped - 6  
 Ovary wing like - *L. biraminicus* [17]  
 1) Head blunt - *L. osmanabadensis* [1]  
     Head spatulate - *L. subhadradi* [10]  
 2) Testes 1650 - *L. kopardaensis* [30]  
     Testes 1550 - *L. pailhanesis* [28]  
 3) Head rounded - *L. jagati* [34]  
     Head short - *L. filiformis* [37]  
     Head medium - *L. shindei* [32]  
     Head long conical - *L. teranaensis* [15]  
     Head bluntly rounded - *L. chalisgaonensis* [12]  
 4) Neck absent - *L. bokaroensis* [26]  
     Neck long narrow - *L. attenuates* [33]  
     Neck short - *L. assamensis* [33]  
 5) Head spatulate - *L. batrachusae* [24]  
     Head short - *L. gariepinusae n. sp.*  
     Head long - 7  
 6) Neck short - *L. clariae* [33]  
     Neck absent - 8  
 7) Uterus saccular - *L. punensis* [9]  
     Uterus wide convoluted - *L. govindae* [23]  
 8) Head undifferentiated - *L. mujumdari* [25]  
     Head differentiated - *L. follicularae* [2]  
     Head stumpy - 9  
     Uterus coiled - *L. fossilis* [31]  
     Uterus saccular - *L. marathwadadensis* [29]



A) Head  
B) Middle region

C) Middle Region  
D) Posterior Region

#### Acknowledgements

The author is very much thankful to the Principal Shri Kumarswami Mahavidyalaya, Ausa. Dist. Latur (M.S.), and Head Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S.), India for providing the laboratory facilities during this work.

#### References

- [1] Bhure, D. B., S. B. Waghmare, C. R. Kasar and K. M. Shaikh. 2010. Taxonomic Observation of the Caryophyllidean Tapeworm *Lytocestus* Cohn, 1908 from *Clarias batrachus* (Linnaeus, 1758), Journal of Ecology and Environmental Sciences 1(1):2010, 01-06.
- [2] Bovien, P. 1926. Caryophyllaeidae from Java. Videnskabelige Meddeleser fra Dansk naturhistorisk Forening L. Kobenhavn. 82: 157-181.
- [3] Cohn, 1908. Die Anatomie eines neuen fischeestoden. Centrabl. Bakt. Parasitenk., 46, 134-139. Rivista Di Parasit Vol. VIII: 1:19-22.
- [4] Fuhmann, O. and J. G. Bear. 1925. Zoological results of the third Tanganyika Expedition conducted by Dr.W.A. Cunington, 1904-1905. Report on the Cestoda. Proceedings of the Zoological Society of London. 79-100.
- [5] Furtado, J. I. 1963. A new caryophyllaeid cestode, *Lytocestus parvulus* sp. nov. from a Malayan cat fish. Annal and Magazine of Natural History (Ser B). 6: 93-106.
- [6] Gupta, S. P. 1961. Caryophyllaeids (Cestoda) from fresh water fishes of India. Proceedings of the Helminthological Society of Washington. 28, 38-50.
- [7] Hunter, G. W. 1927. Studies on the Caryophyllaeidae of North America. Illin. Biol. Monogr. 11:1 – 186.
- [8] Jadhav, B. V. And A. V. Ghavane, 1991. Two new cestode from *Caryophyllaeidae* at Aurangabad. Ind. J. Inv. Zoo. And Aqu. Biol. 3 (1) 28-31.
- [9] Jadhav, B. V., D. B. Bhure and Nitin Padwal. 2008. Caryophyllidean review from catfishes of Maharashtra (India). Flora and Fauna 14 (1): 03-22
- [10] Jawalikar, J. D., S. B. Pawar and G. B. Shinde 2008. A new species *Lytocestus subhpradhi* n. sp. (Eucestoda: Lytocestidae) from *Clarias batrachus*. Uttar Pradesh J. Zool. 28(3): 3654-369
- [11] Kadam, M. N., C. J. Hiware, and B. V. Jadhav, 1998: On a new *Caryophyllid* cestode of genus *Lytocestus* Cohn, 1908 from *Clarias batrachus*. Dr. B. A. M. Uni. Aurangabad J. of Sci.29(6) 143-148.
- [12] Kalse, A. T. and G. B. Shinde, 1999. *Lytocestus chalisgaonesis* n.sp. (Cestoidea: Caryophyllidea) from the catfish *Clarias batrachus* at Chalisgaon, M.S. India Riv. Parasit. 16 (60): 1:39-42
- [13] Kaul, S. S. A. T. Kalse and R. B. Suryawanshi. 2010. *Lytocestus murharisp.* Nov. (Cestoda : Caryophyllidea) from the catfish *Clarias batrachus* (L) at Chaalisgaon. Decc. curr. Sci. 3 (1), 73-814
- [14] Khadap, R. M. B. V. Jadhav and N. V. Suryavanshi. 2004. A New Species of the Genus *Lytocestus* (Cohn, 1908), from *Clarias batrachus* at Aurangabad. Nat. J. of Life Sciences, 1(2), 2004 pp. 413-416.
- [15] Kolpuke, 1999. On a new species of the genus *Lytocestus* Cohn, 1908 (Cestoda *Caryophyllidea*) from Wallago attu from Terna river at Aurad, India. Utt. Pra. J. Zoo. 19(1) 93-95
- [16] Lakhe, A. D., S. B. Pawar and G. B. Shinde (2004): A new cestode *Lytocestus nagapurensis* n.sp. (Cotyloida - Lytocestidae) Riv. Di. Para XXI (LXV-N-2) 95-98.
- [17] Lynsdale, J. A. 1956. On two new species of *Lytocestus* from Burma and Sudan respectively. J. Helm. 30 (2-3) 87-96
- [18] Mackiewicz, J. S. 1962. Systematic position of *Caryophyllaeus fuhrmani* Szidat, 1937 and *Lytocestus*

- alestes* Lynsdale, 1956 (Cestoidea: Caryophyllaeida), Revue Suisse de Zoologie 69: 729-735.
- [19] Mackiewicz, J. S. 1972. Caryophyllidea (Cestoidea): A review Exp. Parasit 31:417-512.
- [20] Mehra, H. R. 1930. On a new species of Caryophyllid of Muller from Kashmir with remarks on *Lytocestus indicus* (Moghe, 1925). Proc. 17. Ind. Sci. Congr. 247.
- [21] Moghe, M.A. 1925. *Caryophyllaeus indicus* n. sp. (Cestoda) from the catfish *Clarias batrachus* (L) Parasitology. 17: 232 – 335.
- [22] Moghe, M. A. 1931. A supplementary description of *Lytocestus indicus*. (syn. *Caryophyllaeus*) from India. Parasitology (23) 84-87.
- [23] Patil, D. N. and B. V.Jadhav 2002. On a new caryophyllid cestode of the genus *Lytocestus* Cohn, 1908, from *Clarias batrachus*. Ind. J. Hel. (N.S.) Vol. 20PP 45-48.
- [24] Pawar, S.B and Shinde, G.B 2002. A new species *Lytocestus batrachusae* n.sp (Cotyloda- Lytocestidae) From *Clarias batrachus* at Aurangabad India. Riv. Di. Para. Vol XIX (LXIII) No 2, 153-156.
- [25] Poonam, 2007. On a new species of the genus *Lytocestus* (Caryophyllidea-Lytocestidae) from *Clarias batrachus*. Proc. Zool. Soc. Of India Vol – 6 (1) 77-81
- [26] Poonam, 2007. On *Lytocestus bokaronensis* n. sp.(Caryophyllidea: Lytocestidae) for *Clarias batrachus* Proc. Zool. Soc. Of India Vol – 6 (2) 73 – 78
- [27] Ramadevi, P. 1973. *Lytocestus longicollis* sp. nov. (Cestoda: Caryophyllaeida). from cat fish. *Clarias batrachus* in India. J. Hel. 47: 415-420.
- [28] Shelke, V. P. 2007. *Lytocestus paithanensis* n. sp. From *Clarias batrachus*. Nat. J. Life Sci. 4(3) :151 - 152
- [29] Shinde, G. B. and A. N. Phad. 1988. On a new cestode *Lytocestus marathwadensis* from fresh water fish. Riv. Di. Para. 47 (2) 295-298.
- [30] Shinde, G. B. and Sunita Borde. 1999. on *Lytocestus kopardaensis* n. sp. cestode *Lytocestidae* Hunter from a fish in Maharashtra state, India. Utt Pra. Jour. 19 (3): 211-213, 1999
- [31] Shingh, K. S. 1975. On *Lytocestus fossilis* n. sp (Cesotoda-Lytocestidae) from *Heteropneustus fossilis* from Nepal. Dr. B. S. Chauhan Commn. Vol 79-82
- [32] Surayawanshi, S. G., D.K. Maske, G.B. Shinde, H.K. Bhagwan. 2010. A new tapeworm *Lytocestus shindei* n.sp. (Cestoda : Lytocestidae) from *Calrias batrachus* at Rahuri Dist. Ahmednagar (M.S.) Life sci. Bulletin Vol. (1): 148-150
- [33] Tandon, V., R. Chakravarty and B. Das. 2005. Four new species of the genus *Lytocestus* (Caryophyllidea: Lytocestidae) from Edible Cat fishes in Assam and Meghalaya, India. Jour. of Parasitic Diseases Vol. 29 (2) 2005, 131-142.
- [34] Tripathi, N. P., S.P. Singh and A. K. Mishra. 2007. A new species of the genus *Lytocestus* (Cestoda: Lytocestidae) from *Heteropneustes fossilis* at Rewa (M.P.) Nat. J. Life Sci., 4(3):111-114
- [35] Wardle, R A. and J. A. Mcleod 1952. *The Zoology of tapeworms*. University of Minnesota Press, Minneapolis, pp 780.
- [36] Wardle, R A., J A. Mcleod and S. Radinovsky. 1974. Advances in the zoology of Tapeworm, 1950 – 1970. University of Minnesota Press, Minneapolis, 1-274,p
- [37] Woodland, W. N. F. 1923. On some remarkable new forms of Caryophyllaeidae from the Anglo-Egyptian Sudan and a revision of the families of the Cestodaria. Quart. J. Micr. Sc. (67) 435-472
- [38] Woodland, W.N.F. (1924): Parasit.(16) 441-451.
- [39] Woodland, WNF. (1926): On the genera and possible affinities of the caryophyllaeidae: a reply to Drs. Furhrmann O. and Baer JG. Proc. of the Zoo. Soc. of London. 1926: 49-69.
- [40] Yamaguti, S. (1959): The cestode of vertebrates. In: Systema helminthum. Vol 2. New York: Interscience: 860 pp.