

**THE EXISTENCE OF *LYTOCESTUS PAITHANENSIS* KALE, 2017 IS QUESTIONABLE –
A CRITICAL STUDY**

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ABSTRACT

Kale (2017) described a new species of cestode *Lytocestus paithanensis* from *Clarias batrachus* belonging to Caryophyllidea:Lytocestidae family knowing fully well that Shelke (2007) had described a species of the genera *Lytocestus* and named it *Lytocestus paithanensis* from the same fish host in 2007. The epithet '*paithanensis*' cannot be duplicated as per the rules of nomenclature. Besides the above lacuna, there are other lacunae in his paper published in *Int. J. of Life Sciences* vol. 5(3) concerning comparison of the so called *L. paithanensis* Kale (2017) with only *L. filiformis* Woodland (1923) *L. indicus* Moghe (1925) and *L. longicollis* Ramadevi (1973) and ignoring comparison with other existing 48 species (published prior to 2017) invalidates the species described by Kale (2017).

KEY WORDS: cestode, invalidation, *Lytocestus paithanensis*,

INTRODUCTION

The parasites in general remain in a complex dynamic equilibrium with plants and animals- Hoffman (1967). But helminthes are supposed to influence the weight and reproductions of the host, alter its population characteristics- Rohde (1993).

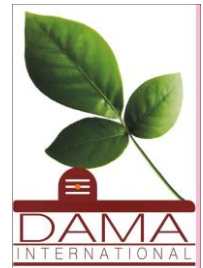
Caryophyllidea (Cestode) has four families viz; Caryophyllaeidae Leuckart (in Luhe, 1910); Lytocestidae Wardle and McLeod (1952); Capingentidae Wardle and McLeod (1952) and Balanotaenidae Mackiewicz and Blair (1978).

The parasites belonging to above families are interesting cestodes having unique morphology, evolutionary status and genetic variability showing high degree of endemism. Only *Archigetes siebobli* Leukart (1878) and *Glaridacris catostomi* Cooper (1920) are represented from more than one geographical region.

Of the families stated above Lytocestidae and Capingentidae are represented in India (Oriental Region). Host specificity has been observed in case of Lytocestidae, whether the basis of host specificity is physiological, gained through a long period of association and selection or ecological, associated with benthic feeding? Possibly is a combination of both Agarwal (1985). Nearly more than 52 species of the genus *Lytocestus* (A genus of Lytocestidae family) are known, mostly reported from Maharashtra (Sahay *et al.* 2019). Such a huge number of species based on morphological characteristics is a matter of investigation. The shape of ovary is of taxonomic importance in Caryophyllideans Mackiewicz (1994) and the position of ovarian isthmus.

What other characters are important in taxonomic determination has never been dealt with. It seems therefore that the authors of *Lytocestus* species took the advantages of personal decision while proposing new species. "The aim of modern taxonomy is not only to describe, identify and arrange organisms in convenient systematic categories, but also to understand their evolutionary histories and mechanisms (Boero, 2010). Earlier approaches were mainly based on morphological characters without considering interspecific differences and without any knowledge on the population variability and genetic characteristic, which resulted in inflation descriptions of conspecific taxa"- Ash (2012).

Ash (2011, 12) synonymized most of the *Lytocestus* species with whatever genus and species he felt suitable with no consistency of opinion. For example,



1. *L.heteropneusti* Tandon *et al.* (2005) and *L.jagtai* Tripathi *et al.* (2007) were synonymised with *Lucknowia fossilis* Gupta (1961).
2. *L.lativitellarium* Furtado and KimLow (1973) and *L.assamensis* Tandon *et al.* (2005) were synonymised with *Lucknowia microcephala* Bovien (1926).
3. *Lytocestus alii* Jadhav and Gavahne (1991); *L.clariasae* Jadhav and Gavahne (1991); *L.chalisgaonensis* Khalse and Shinde (1999); *L.kopardaensis* Shinde and Borde (1999); *L.naldurgensis* Kadam, Hiware and Jadhav (1998); *L.teranaensis* Kolpuke, Shinde and Begum (1999); *L.batrachusae* Pawar and Shinde (2002); *L.clariasae* Pawar and Shinde (2002) homonym; *L.govindae* Patil and Jadhav (2002); *L.nagapurensis* Lakhe, Pawar and Shinde (2004); *L.shindei* Khadap, Jadhav and Suryavanshi (2004); *L.paithanensis* Shelke (2007); *L.punensis* Jadhav, Bhure and Padwal (2008); *L.subhpradhi* Jawalikar, Pawar and Shinde (2008); *L.murhari* Kaul, Khalse and Suryavanshi (2010); *L.shindei* Suryavanshi, Maske, Shinde and Bhagwan (2010); were considered synonym of *L.indicus* Moghe (1925).
4. *L.marathwadensis* Shinde and Phad (1988) was considered synonym of *Pseudocaryophyllaeus ritai* Gupta and Singh (1983).
5. *L.birmanicus* Lynsdale (1956); *L.parvulus* Furtado (1963); *L.moghei* Murhar (1963); *L.longicollis* Ramadevi (1973) and *L.majumdari* Poonam (2007) were considered synonym of *Pseudocaryophylleus tenuicollis* Bovien (1926)
6. Sahay and Khalkho (2017) considered *L.rekhaensis* Nimbalkar *et al.* (2012) a species under enquiry.
7. Singh, Sahay and Sadaf (2018) held *L.bishnupurensis* Shomendra *et al.* (2003) synonym of *L.indicus* Moghe (1925).

The aim of present study is to assess the status of *Lytocestus paithanensis* Kale (2017) who inadvertently proposed the species naming it as *L. paithanensis* knowing very well that the epithet 'paithanensis' already exist and was proposed by Shelke for *Lytocestus paithanensis* proposed by him in the year 2007 (This is proved by the fact that he has given the name of Shelke (2007) in the reference chapter.

Not only this there are serious mistakes which Kale (2017) committed while describing the species (*L.paithanensis*) from *Clarias batrachus* in Paithan district Aurangabad.

MATERIALS AND METHODS

Several research paper and few available slides were consulted and observed.

OBSERVATION AND DISCUSSION

The description of species *Lytocestus paithanensis* Kale (2017) suffers from several lacunae these are:

Kale (2017) seems to have described the species knowing fully well that Shelke (2007) had already described a *Lytocestus* species and named *Lytocestus paithanensis* (specific name in both the species same) hence Kale's species is considered to be a homonym.

Kale (2017) compared his specimens with only *L.indicus* Moghe (1925); *L.filiformis* Woodland (1923) and *L.longicollis* Ramadevi (1973) because his specimen showed 220-250 testicular follicles and ignored comparison with other species more than 50 described prior to 2017 (see enclosed list above).

Kale (2017) mentioned that his studies were based on nine cestodes but he failed to provide range for head length, neck length, genital pore length, vas deference length and ootype length.

Kale (2017) observed the "uterus is tubular, a wide transverse convoluted tube coiled loop shaped, pre ovarian starts from ootypes narrow proximally wider distally, crosses and extends anterior to the isthmus, coils arranged in pre ovarian region open separately by a uterine pore, which is large double walled pre ovarian".

He further says

"Vagina is a thin tube starts from the genital pore runs medially and posteriorly slightly curved extends posterior to isthmus reaches and opens into ootype whereas ootype is large oval behind isthmus slightly obliquely placed".

Vagina never opens in ootype rather “posteriorly it drains into the oviduct but anteriorly it does not open independently on the ventral surface of body. Usually it joins with the terminal part of the uterus to form an uterovaginal duct which communicates to the ventral surface of the body as female pore”. Hafezullah (1993)

Mackiewicz (1972) opines that “vagina communicates between the oviduct and the ventral surface. At its proximal end it may join the uterus to form utero vaginal duct opening posterior to the male gonopore” [see Mackiewicz 1972 page 431 *Experimental Parasitology* vol **31(3)**] For other explanations too.

Kale (2017) has not mentioned anything about vagina joining the uterus and forming utero vaginal duct which opens through female gonopore is a serious lapse.

Kale (2017) states in *L. paithanensis* (?) that “testis are numerous small and large in size oval in shape 220- 250 in number, pre ovarian scattered in middle region of the worm. Unevenly distributed, not distributed in the posterior region of the worm, in 4-5 rows. [not depicted in camera lucida drawing AandC on page 457 of *Int. J. of Life Sciences* vol **5(3)**] from base of the neck to anterior region of cirrus pouch”.

Species preposition based on the number of testicular follicles has been questioned by Sahay, Singh and Saxena (2018). They opine that range of testicular follicles depicts that the worms studied were not of the same age. [the number of testicular follicles should be constant for a species of the same age].

The testicular follicles range creates problems- for example.

The range 230- 270 *L. indicus* Moghe (1925) fits very well in the testicular follicle range 190-450 of *L. attenuatus* Tandon *et al.* (2005) and 230- 340 for *L. heteropneusti* Tandon *et al.* (2005).

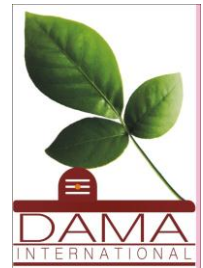
The range of 460 -480 of *L. alii* Jadhav *et al.* (1991) fits in the range of 400- 500 of *L. follicularae* Bhure *et al.* (2010).

In case investigator gets *Lytocestus* species having testicular follicles in the range of 240- 250 where he would place the worm with *L. indicus* Moghe (1925) or *L. attenuatus* Tandon *et al.* (2005)? Likewise there are so many examples. Therefore, the authenticity of the number of testicular follicles for species determination stands at a negative footing as such existing keys based on the number of testicular follicles such as that of Jadhav, Bhure and Padwal (2008); Solunke, Fadke, Borde and Jawle (2012) and of Jawle and Borde (2011) stands negated. That is redundant and supposed to be of no value. - Sahay, Singh and Saxena (2018) vide Trends in Parasitology (2018) pp 1-7.

Kale (2017) states that in his species *Lytocestus paithanensis* (?) “ovary is medium in size, ‘H’ shaped in appearance, bilobed, lobes with irregular margin due to the presence of numerous short blunt acini, anteroposteriorly elongated extends laterally up to the cortical region of the worm and measures 0.410 in length and 1.028 in breadth. The lobes are connected by a wide tube which measures 0.482 x 0.125 in length and breadth respectively.”

The shape of ovary is of taxonomic importance in Caryophyllideans (Mackiewicz, 1994) and is ‘H’ shaped i.e., with two lateral lobes (arms) connected by ovarian isthmus (bridge) in most species. However the shape and length of lateral lobes may differ remarkably being.

1. Short and wide (butterfly or dumbbell shaped in species of *Archigets* Leuckart (1878) *Djombangia* Bovien (1926), *Notolytocestus* Johnston and Muirhead (1950) or *Paracaryophyllaeus* Kulakovskaja (1961)- see Mackiewicz (1994), to
2. Long and narrow such as in *Khawia baltaica* Szidat (1942) or *Wenyonia accuminata* Woodland (1923). (see Schaeffner *et al* 2011; Scholz *et al*, 2011).
3. In some species such as *Khawia rossittensis* Szidat (1937) of genera *Adenoscolex* Fotedar (1958) and *Caryophyllaeides* Nybelin, (1922) posterior lobes may be joined together thus making the ovary inverted A-shaped (Mackiewicz 1972; Oros and Hanzelova, 2007)
4. In *Bialovarium* Fischthal (1954), *Calentinella* Mackiewicz (1974) and *Spartoides* Hunter (1929) the ovary is U shaped (Mackiewicz, 1994)



5. In *Lobulovarium longiovatum* Oros *et al.* (2012) the ovary is roughly H shaped, but the ovarian isthmus is situated rather posteriorly, the lobation of the ovary is more pronounced. The lobes are irregular in shape and asymmetrical.

In *L. paithanensis* (?) Kale (2017) the diagram of ovary on page 457 of *Int. Jour. of Life Sciences* vol. 5(3) has been shown to be median (inside inner longitudinal muscle) this is against the character of *Lytocestus* where “ovary is bilobed lateral lobe lie outside the inner longitudinal muscle sheath.” i.e. in cortex. This condition is also found in few other genera. Ovarian wings and isthmus both medullary is the characteristic of *Pseudolytocestus clariae*, Gupta (1961).

CONCLUSION

On the basis of above lacuna the present authors consider.

L. paithanensis (?) Kale (2017) to be invalid of course his worms need reevaluation by the author himself.

Studies based on morphological grounds leads to difficulties under different physiological conditions or in different hosts the same species may manifest striking morphological differences- Vik (1964) and Stunkard (1965).

Therefore other biological technique is needed to establish their status. Protein pattern of an organism is a reflection of a genetic constitution Sibley (1960).

It is suggested that electrophoretic analysis of tissue protein of the worm be done to ascertain if taxon specific protein profile exists which could be a great tool in delineation of helminth as has been done by Niyogi, Gaur and Agarwal (1985) in case of *L. indicus*, *L. indica* Niyogi, Gupta and Agarwal (1982) and *Introvertus raipurensis* Satpute and Agarwal (1980).

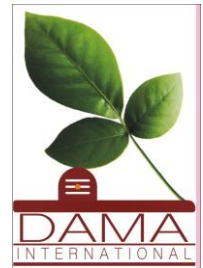
They found 24 bands in *L. indicus* out of which disc number 5, 6, 33, 34, 40 and 41 were specific to *L. indicus*. Discs 11, 26, 29 occurred in *L. indicus* as well as *Introvertus raipurensis*, disc no. 38 was found in *L. indicus* and *L. indica* whereas disc no. 9 and 14 corresponded in *Introvertus raipurensis* and *L. indica*. Disc no.1-4 were high molecular (?) proteins in *L. indica*.

Kale should try to work upon the partial sequence of first 1st rDNA to clearly delineate *Lytocestus paithanensis* as a distinct species.

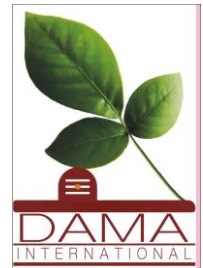
In case no such facilities are available at least the author can take up karyotypic studies. In case the above are not possible a fresh collection from *Paithan* fish *Clarias batrachus* be made, prepare excellent slides of whole mounts as well of cross sections for a detailed study and for correct placement of the worm. Last but not the least the specimens should be deposited in a national organization like ZSI.

REFERENCES

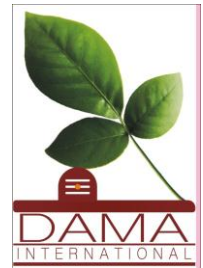
- Agarwal S.M. (1985).** Caryophyllaeids and Caryophyllidiasis in India. *Rev. Lif. Sci.* 5:139-161.
- Ash A., Scholz T., Oros M. and Kar P. K. (2011a).** Tapeworms (Cestoda: Caryophyllidea), parasites of *Clarias batrachus* (Pisces: Siluriformes) from the Indomalayan Region. *J. Parasitol.* 97(3): 435-459.
- Ash Anirban, Thomas Scholz, M. Oros, Celine Levron and Pradip Kumar Kar (2011,b).** Cestodes (Caryophyllidea) of the stinging catfish *Heteropneustes fossilis* (Siluriformes: Heteropneustidae) from Asia. *J. Parasitol.* 97(5): 899-907.
- Ash Anirban. (2012).** Diversity of tape worms (Cestoda) in freshwater fishes of India. Ph.D thesis. School of Doctoral Studies in Biological Sciences, University of South Bohemia in Ceske Budejovice Faculty of Science. 1-135.
- Bhure, D.B., Waghmare S.B., Kasar C.R. and Shaikh K.M. (2010).** Taxonomic observation of the Caryophyllidean tapeworm *Lytocestus* Cohn, 1908 from *Clarias batrachus* (Linneus, 1758). *J Eco. Environ. Sci.* 1(1): 01-06.
- Boero F. (2010).** The study of species in the era of biodiversity: a tale of stupidity. *Diversity.* 2: 115-126.
- Bovien P. (1926).** Caryophyllaeidae from Java. *Videnskabelige Meddelelser Fra Dansk. Naturhistorisk Forening Kobenhavn.* 82:157-181.



- Cooper A.R. (1920).** *Glaridacris catostomi* n.g.n.sp. a Cestoderian parasite. *Trans.Am. Micr. Soc.* 39: 5-24
- Fischthal (1954).** *Bialovarium nocomis* Fischthal,. 1953 (Cestoda: Caryophyllacidae) from the hornyhead chub, *Nocomis biguttatus* (Kirtland). *Proc. Helminthol. Soc. Washington.* 21(2):117-120.
- Fischthal J.H. (1951).** *Pliovitellaria wisconsinensis* n.g.n.sp. (Cestoda:Caryophyllacidae) from *Wisconsin cyprinid* fishes. *J. Par.* 37(2): 190-194.
- Fotedar D.N. (1958).** On a new Caryophyllaeid cestode *Adenoscolex oreini* gen.el. sp.nov from a fresh water fish in Kashmir and a note on some related genera. *J. Helm.* 32(1/2) : 1-16
- Furtado J.I. and Jan Kim-Low. (1973).** Incidence of some helminth parasites in the Malaysian Catfish *Clarias batrachus* (L) *Verhandlungen Internationale fur Theoretische and Angewandte Limnol.* 18(3): 1674-1685.
- Furtado. J.I. (1963).** A new Caryophyllaeid Cestode *Lytocestus parvulus* sp.nov. from a Malayan catfish. *Ann. Mag. Nat.Hist* (Ser. XIII) 6: 97-106.
- Gupta S.P. (1961).** *Caryophyllaeids* (Cestoda) from freshwater fishes of India. *Proc. Helm. Soc. Wash.* 28(1): 38-50.
- Gupta V. and Singh S.R. (1983).** On a new species *Pseudocaryophyllaeus ritai* sp.nov. (Family Caryophyllacidae) from the intestine of a freshwater fish, *Rita rita*, from river Gomati at Lucknow, U.P. *Ind. J. Helminth.* 35 (1): 11-14.
- Hafeezullah, M. 1993.** Caryophyllidean Cestode Fauna of India (Occasional paper no.157). *Rec. Zool. Sur. India*, pp 1-101.
- Hoffman, G.L. 1967.** Parasites of the Northern American fresh water fishes. University of California Press, Berkley and Los Angeles.
- Hunter, G.W. III, 1929.** New Caryophyllacidae from North America. *J. Par.* 15: 185-192.
- Jadhav B.V. and Ghavane A.V. (1991).** Two new Cestodes from Caryophyllacidae at Aurangabad. *Ind.J.inv.zool and Aq. Biol.* 3(1): 28-31.
- Jadhav B.V., Bhure D.B. and Nitin Padwal (2008).** Caryophyllidean review from catfishes of Maharashtra (India). *Flora and Fauna.* 14(1): 3-22.
- Jawale Sushil and Sunita Borde (2011).** New species of the genus *Lytocestus* (Caryophyllidea: Lytocestidae) from catfish at Aurangabad district (M.S) India. *Int.Multidisciplinary Res. J.* 1(8): 27-30.
- Jawalikar J.D., Pawar S.B. and Shinde G.B. (2008).** A new species *Lytocestus subhapradhi* n.sp. (Eucestoda:Lytocestidae) from *Clarias batrachus*. *Uttar Pradesh. J. Zool.* 28(3): 354-369.
- Johnston T.H. and Muirhead N.G. (1950).** Some Australian Caryophyllaeid cestodes *Rec. S. Austr. Mus.* 9(3): 339-348.
- Kadam M.N., Hiware C.J. and Jadhav B.V. (1998).** On a new Caryophyllaeid Cestode of the Genus *Lytocestus* Cohn, 1908 from *Clarias batrachus* Dr. B.A.M. Univ. Aurangabad *J. Sci.* 29(6):143-148.
- Kale S.S. (2017).** A new species of cestode *Lytocestus paithanensis* (*Lytocestus* Cohn, 1908) from *Clarias batrachus* at Paithan MS, India. *Int. J. Life Sci.* 5(3): 455-458.
- Kaul S.S., Kalse A.T. and Suryavanshi R.B. (2010).** *Lytocestus murhari* sp.nov. (Cestoda:Caryophyllidea) from the catfish *Clarias batrachus* (L) at Chalisgaon. *Decc. Curr. Sci.* 3(1): 73-84.
- Khadap R.M., Jadhav B.V. and Suryavanshi N.V. (2004).** A new species of the genus *Lytocestus* (Cohn, 1908) from *Clarias batrachus* at Aurangabad. *Nat. J. Life. Sci.* 1(2): 413-416.
- Khalse A.T. and Shinde G.B. (1999).** *Lytocestus chalisgaonensis* n.sp. (Cestoidea: Caryophyllidea) from catfish *Clarias batrachus* at Chalisgaon M.S.India. *Riv.Di.Parasit.* XVI(LX)N-1: 39-42
- Kolpuke M.N., Shinde G.B. and Begum I.J. (1999).** On a new species of the genus *Lytocestus* Cohn, 1908 (Cestode:Caryophyllidea) from *Wallago attu* from Terna river at Aurangabad, India. *Uttar Pradesh. J. Zool.* 19(1): 93-95.
- Kulakovskaja, O.P. 1961:** Material on the fauna of *Caryophyllacidae* (Cestoda: *Pseudophyllidea*) of the Soviet Union *Parazitologicheskii Sbornik* 20: 339-355 (Russian Text: English Summary)
- Lakhe A.D., Pawar S.B. and Shinde G.B. (2004).** A new cestode *Lytocestus nagapurensis* n.sp. (Cotyloida:Lytocestidae). *Riv. Di. Parasitol.* XXI(LXV-N-2):95-98.
- Leuckart R. (1878).** *Archigetes sieboldi*, eine geschlechtsreife cestodenamme. *Z.Wiss.Zool.* 30 (Supplem): 593-606
- Luhe M.F. (1910).** "Parasitische plattwurmer." II Die Susswasserfauna Deutsch-Lands (Dr. Brauer, ed), *Heft 18 Gustav Fischer, Jena.* 153 pp.
- Lynsdale J.A. (1956).** On two new species of *Lytocestus* from Burma and Sudan respectively. *J. Helm.* 30(2-3): 87-96.



- Mackiewicz J.S. (1994).** Order Caryophyllidea Van Beneden in Carus, 1863. In L.F. Khalil, A.Jones and R.A. Bray (eds). Keys to the cestode parasites of vertebrates, CAB International, Wallingford, U.K pp. 21-43.
- Mackiewicz J. S. and Blair D. (1978).** *Balanotaeniidae* fam. n. and *Balanotaenia newguineensis* sp.n. (Cestoidea: Caryophyllidea) from *Tandanus* (Siluriformes: Plotosidae) in New Guinea. *J. Helminthol.* 52: 199-203.
- Mackiewicz J.S. (1974).** *Calentinella etnieri* gen.et.sp.n. (Cestoidea : Caryophyllaeidae) from *Erymyzon oblongus* (Mitchell) (Cypriniformes catostomidae) in North America. *Proc. Helm. Soc. Wash.* 41: 42-45.
- Mackiewicz, J.S. 1972.** Caryophyllaeidae (Cestoidea): A review. *Exp. Parasitol.* 31: 417-512.
- Moghe M.A. (1925).** *Caryophyllaeus indicus* n.sp. (Cestoda) from the catfish *Clarias batrachus*. (L). *Parasit.* 17: 232-235.
- Murhar B. M. (1963).** *Crescentovitus biloculus* gen. nov., sp. nov., a fish cestode (Caryophyllaeidae) from Nagpur, India. *Parasitology.* 53: 413-418.
- Nimbalkar R.K., Deolalikar R.V. and Muley S.P. (2012).** Study on a new species of *Lytocestus* (Cohn, 1908) *Heteropneustes fossilis* (Bloch) at Jaiwadi Dam of Aurangabad district (M.S). *Life Sci. Bull.* 9(2): 239-242.
- Niyogi A., Gaur A.S. and Agarwal S.M. (1985).** Protein profiles as an aid to taxonomy among Caryophyllidean Cestodes. *Curr. Sci.* 54(6): 277-278
- Niyogi A., Gupta A.K. and Agarwal S.M. (1982).** Morphology of *Lucknowia indica* sp.n. (Lytocestidae: Caryophyllidea). *Proc. Indian Acad. Parasitol.* 3(1and2): 17-22.
- Nybelin O. (1922).** Anatomisch-systematisch studien uber *Pseudophyllidien*. *Goteborgs Kgl. Velensks-Amt. Handl.* 26:1-228
- Oros M. and Hanzelova V. (2007).** The morphology and systematic status of *Khawia rossittensis* (Szidat, 1937) and *K.parva* (Zmeev, 1936) (Cestoda: Caryophyllidea) parasites of cyprinid fishes. *Systematic Parasitology.* 68: 129-136.
- Oros M., Anirban Ash., Jan Brabee., Pradip Kar and Thomas Scholz (2012).** A new monozoic tapeworm, *Lobulovarium longivatatum* n.g n.sp. (Cestoda:Caryophyllidea) from barbs *Puntius* spp. (Teleostei: Cyprinidae) in Indomalayan region, *Syst. Parasitol.* 83:1-13.
- Patil D.N. and Yadhav B.V. (2002).** On a new Caryophyllaeid Cestode of the genus *Lytocestus* Cohn, 1908 from *Clarias batrachus*. *Ind. J. Helm.* (N.S). 20:45-48.
- Pawar S.B. and Shinde G.B. (2002).** A new species *Lytocestus batrachusae* n.sp. (Cotyloida: Lytocestidae) from *Clarias batrachus* at Aurangabad, India. *Riv. Di. Parasit.* XIX (LXIII) 2: 153-156.
- Pawar S.B. and Shinde G.B. (2002).** A new species *Lytocestus clariasae* n.sp. (Cotyloida: Lytocestidae) from *Clarias batrachus* at Kallam, India. *Riv. Di. Parasit.* XIX(LXIII) 2:157-160.
- Poonam (2007).** On a new species of the genus *Lytocestus* (Caryophyllidea:Lytocestidae) from *Clarias batrachus*. *Proc. Zool. Soc. India.* 6(1): 77-81.
- Ramadevi P. (1973).** *Lytocestus longicollis* sp. nov. (Cestoda:Caryophyllidea) from the catfish, *Clarias batrachus* in India. *J.Helm.* 47(4): 415-420.
- Rohde K. (1993).** Ecology of Marine Parasites, An Introduction to Marine Parasitology Ind Ed: CKB International pp.298.
- Sahay Umapati and Khalkho. A.P.V. (2017).** A discussion on the status of *Lytocestus rekhaensis* Nimbalkar *et al.* 2012. *Biospectra.* 12(1): 1-8.
- Sahay Umapati, Khalkho A.P.V., Ravi Rahul Singh and Dimple Mandal. (2019).** On the status of *Lytocestus mastacembellusi* (Caryophyllidea:Lytocestidae) Pardeshi, 2016- a critical study. *Asian J. Agri. Life Sci.* 4(1): 13-21
- Sahay Umapati, Ravi Rahul Singh and Nayni Saxena. (2018).** On the status of *Lytocestus indica* (Lytocestidae: caryophyllidea) Deshmukh *et al.* 2015- A critical review. *Trends in Parasitology Res.* 7(1): 1-7.
- Satpute L.R. and Agarwal S.M. (1980 b).** Morphology and Systematics of *Djombangia indica* Satpute and Agarwal, 1974, causing diverticulosis of duodenum of *Clarias batrachus* (Linn.) *Proc. Ind. Acad. Parsitol.* 1: 13-16.
- Schaeffner B.C., Jirku M., Mahmoud Z.N. and Scholz T. (2011).** Revision of *Wenyonia* (Cestoda:Caryophyllidea) from *Synodontis* cat fish in Africa. *Systematic Parasitol.* 79:83-107
- Scholz T. and V.Hanzelova (1998).** Tapeworms of the genus *Proteocephalus* Weinland, 1858 (Cestoda: Proteocephalidae) parasites of fishes in Europe. *Studie AVCR no. 2/98 Prague.Czech Republic: Academia* 119 pp.
- Scholz T., Brabec J., Kralova-Hromadova I., Oros M., E.Bazslovicsova; Ermolenko A. and Hanzelova V. (2011).** Revision of *Khawia* (Cestode:Caryophyllidea) parasites of cyprinid fish, including a key to their identification and molecular phylogeny. *Folia Parasitologica.* 58: 197-223



- Shelke V.P. (2007).** *Lytocestus paithanensis* n.sp. from *Clarias batrachus*. *Nat.J.Life. Sciences.* 4(3): 151-152.
- Shinde G.B. and Phad A.N. (1988).** On a new Cestode *Lytocestus marathawadensis* from freshwater fish. *Riv. Di Parasit.* 47(2): 295-298.
- Shinde G.B. and Sunita Borde (1999).** On *Lytocestus kopardaensis* n.sp. Cestoode (Lytocestidae:Hunter) from a fish in Maharashtra State India. *Utt. Pra. J.* 19(3): 211-213.
- Shomendra M., Jha A.N. and Pankaj Kumar. (2003).** A new cestode *Lytocestus bishnupurensis* from a fresh water fish *Mystus senghala* (Sykes). *J. Freshwater. Biol.* 15(1-4): 43-45.
- Sibley C.G. (1960).** *Science.* 102: 215
- Singh Ravi Rahul, Umapati Sahay and Fauzia Sadaf (2018).** On the synonymy of *Lytocestus bishnupurensis* Shomendra et al. (2003) with *L.indicus* Moghe (1925). *Jour. of Exp. Zool.* 21(2): 893-896.
- Solunke Ravi, Swati Fadke, Sunita Borde and Sushil Jawale. (2012).** New species of the genus *Lytocestus* (Caryophyllidea: Lytocestidae) from cat fish in Latur district M.S. India, *Trends in Parasitology Research.* 1(2): 25-30
- Stunkard H.W. (1965).** *J. Helminth.* 39: 281
- Suryavanshi S.G., Maske D.K., Shinde G.B and Bhagwan H.K. (2010).** A new tapeworm *Lytocestus shindei* n.sp. (Cestoda:Lytocestidae) from *Clarias batrachus* at Rahuri district Ahmednagar (M.S) *Life. Sci. Bull.* 1: 148-150.
- Szidat L. (1937).** Archigetes R. Leuckart, 1878, die progenetische Larve einer fiir Europa neuen Caryophyllaeiden-Gattung *Biacetabulum* Hunter, 1927. *Zool. Anz.* 119: 166-172.
- Szidat L. (1942).** Uber die. Caryophyllaeiden Gattung *Khawia*, H.F.Hsu 1935 and cine neue Art dieser Gattung *Khawia balyica* n. spec. *Zeitschrift fur ParasitKunde* 12: 120-132.
- Tandon V., R. Chakravarty and B. Das. (2005).** Four new species of the genus *Lytocestus* (Caryophyllidea:Lytocestidae) from edible catfishes in Assam and Meghalaya, India. *J. Parasitic. Dis.* 29(2): 131-142.
- Tripathi N. P., Singh S. P. and Mishra A. K. (2007).** A new species of genus *Lytocestus* (Cestoda: Lytocestiodae) from *Heteropneustes fossilis* at Rewa (M. P.). *Nat. J. Life Sci.* 4:111–114.
- Vik R. (1964).** *Exp. Parasit.* 15: 361.
- Wardle R.A and J.A McLeod. (1952).** The Zoology of Tapeworms, University of Minnesota Press, Minneapolis p.780.
- Woodland W.N.F. (1923).** On some remarkable new forms of *Caryophyllaeidae* from Anglo Egyptian Sudan and a revision of the families of Cestodaria. *Q J. Microsc. Sc.* 67: 435-472