



## **Bio-Systematic Studies on Cestode Genus *Senga* (Dollfus, 1934) (Ptychobothridae, Luhe, 1902) from *Mastacembelus armatus* (Lacepede, 1800) with Description of a New Species**

**Sanjay Shamrao Nanware<sup>a</sup>, Vikram Satwarao Deshmukh<sup>b</sup>,  
Dhanraj Balbhim Bhure<sup>c</sup>**

Post Graduate, Department of Zoology, Yeshwant Mahavidyalaya, Nanded - 431 602, (M. S.), India

<sup>a-c</sup>E-mail address: [snanware@rediffmail.com](mailto:snanware@rediffmail.com) , [vikram.deshmukh792@gmail.com](mailto:vikram.deshmukh792@gmail.com) ,  
[drajbhure82@gmail.com](mailto:drajbhure82@gmail.com)

### **ABSTRACT**

Present investigation deals with taxonomic studies of Pseudophyllidean cestode *Senga triangulata* Sp. Nov. collected from the intestine of *Mastacembelus armatus* (Lacepede, 1800) at Hadgaon Dist. Nanded (M.S.) India during the period of February, 2011 to January, 2013. Worm comes closer to all known species of this genus in general topography of organs but differs having triangular scolex, narrow anteriorly and broad posteriorly, having pair of bothria, which is sessile, extends from the anterior end to posterior end of the scolex, rostellum oval in shape, armed with single circled 28-30 hooks, neck absent, mature proglottids four to five times broader than long, testes 50-60 in number, pre-ovarian, scattered in two groups, cirrus pouch oval, vagina thin tube, runs posteriorly, ovary bilobed, dumb bell shaped, Gravid proglottids are 5-6 times broader than long, uterus sacular filled with eggs and vitellaria follicular.

**Keyword:** Bio-systematic Studies; *Mastacembelus armatus* (Lacepede, 1800); Ptychobothridae Luhe, 1902; *Senga* Dollfus, 1934

## 1. INTRODUCTION

The genus *Senga* was established by Dollfus (1934) with its type species *S.besnardii* from *Betta splendens*, the Siamese fighting fish, in an aquarium at Vincennes, France. *S. ophiocephalina* Tseng, 1933, syn. *Anchisrocephalus o. T.*, *A. polyptera* Southwell, 1913 nec *A. polypteri* (Leydig) of Montic., 1890, occurs in *Ophiocephalus argus*; Tsian and Pieping, China. *S. pcynomera* (Woodland, 1924), syn. *Bothriocephalus p.W.*, is reported from *Ophicephalus marulius* at Allahabad, India. Johri (1956) described *Senga lucknowensis* from the spiny eel, *Mastacembelus armatus* Lacep. from Lucknow, India. After that, many researchers reported and described some new *Senga* species parasitizing freshwater fishes. It indicates that genus *Senga* is very abundant and diversified. Fernando and Furtado (1964) Recorded *Senga malayana* from *Channa striatus*; *Senga parva* and *Senga filiformis* from *Channa micropeltes* at Malacca. P. Ramadevi and K. Hanumantha Rao (1966) reported pleurocercoid of *Senga* sp. from freshwater fish *Panchax panchax* (Ham. and Buch.) at Kondakarla, (Vishakapatnum), A.P. Beside, Furtato and Chauhan (1971) reported *Senga pahangensis* from *Channa micropeltes* at Tesak Bera. P. Ramadevi and Rao (1973) described *Senga vishakapattanensis* from intestine of freshwater fish *Ophiocephalus punctatus*. *Senga taunsaensis* was described by Zaidi Daulat Ali and Khan Daler (1976) from *Channa gachua* (Hamilton) at Taunsa Barrage, Pakistan Gupta and Sinha (1980) described *Senga punctati* from *Ophiocephalus puntatus* and *Senga mastacembali* from *Mastacembalus armatus*, Lukhnow, India.

Shinde and Deshmukh (1980) described *Senga khami* from freshwater fish *Ophiocephalus marulius* at Kham river, Aurangabad, India. Jadhav and Shinde (1980) added *Senga aurangabadensis* in *Mastacembelus armatus* at Aurangabad, India. Shinde and Jadhav (1980) reported *Senga godavari* from *Mastacembelus armatus*, at Nanded, India. Kadam, Jadhav and Shinde (1981) described *Senga paithanensis* from intestine of *Mastacembelus armatus*. Majid and Shinde (1984) added *Senga raoii* and *Senga jagannathe* from freshwater fish *Channa puntatus*, Jagannathpur, Orissa. Gupta and Parmar (1985) reported *Senga indica* from intestine of freshwater fish *Mastacembelus armatus* (Lacepede, 1800); from Lucknow India. Gariola and Malhotra (1986) reported *Senga gangesii* from *Mystus vittatus* found in river Ganges at Allahabad, U.P., India. *Senga pathankotensis* was reported by Duggal, C.L. and Bedi, H. (1989). Jadhav and Deshmukh and Gavhane (1991) described *Senga gachuae* from freshwater fish *Channa gachua* at Aurangabad, M.S. India. *Senga maharashtrii* was reported by Jadhav B.V., Gavhane A.B. and Jadhav A.P. (1991) from intestine of *Mastacembelus armatus* at Daryapur, M.S. India. *Senga chauhani* was reported by Hasnain M. (1992) from fish host *Channa puntatus* at Jamshedpur, India. Mathur, Srivastav and Daisy Rani (1994) described *Senga jhasiensis* from *Mastacembelus armatus* (Lecepede,1800); Jhansi (M.P.), India.

*Senga mohekarae* from *Mastacembelus armatus* added by Tat and Jadhav (1997). Wangswad, Marayong and Jadhav (1998) described *Senga chiangmaiensis* from *Mastacembelus armatus*, Maesa Stream, Chiang Mai, Thailand. *Senga armatusae* (Hiware 1999) was described and reported in *Mastacembelus armatus* at Pune, India. Patil and Jadhav (2003) described *Senga tappi* from *Mastacembelus armatus* at Shrirpur, Dhule, India. Jadhav (2005) published review article of genus *Senga* from freshwater fishes in India. *Senga sharpiloi* (Polyakova and Kirin, 2005) was recovered and reported in *Channa micropeltes*, Vylov-Lennogo of the coast of Singapur. Pande *et al.* (2006) added two species, *Senga*

*ayodhensis* from *Amphinothus cuchia* (Ham.) at Ayodhya, U.P. and *Senga baughui* from *Rita rita* (Ham.) Basti, U.P. India. Bhure *et al.*, (2007) described *Senga jadhavae* from *Mastacembelus armatus* at Aurangabad. *Senga chandkapurensis* (Khadap *et al.*, 2007) was reported from freshwater teleost *Mastacembelus armatus* at Chandikapur. Dist. Bidar, Karnataka, India. Srivastava *et al.*, (2007) reported *Senga ticto* from intestine of freshwater fish *Puntius ticto* at Jhansi, U.P., India. Kankale Nilima (2008) described *Senga nathsagarensis* from freshwater fish *Mastacembelus armatus* at Nathsagar Dam, Paithan, Dist Aurangabad (M.S.) India *Senga kaigaonensis*, (Wankhede and Reddy, 2009) was recorded from freshwater fish *Mastacembelus armatus* (L.) Kaigaon toka, Dist Aurangabad (M.S.) India.

Mangnale and Kalse (2009) reported *Senga panzaraensis* from small intestine of *Mastacembelus armatus* caught at Panzara river, Dhule, M.S., India. *Senga madhavae* (Bhure *et al.*, 2010); *Senga satarensis* and *Senga mangalbaiae* (Bhure and Nanware, 2011) were reported from freshwater fish *Mastacembelus armatus* from Maharashtra state. Pardeshi and Hiware (2011) described *Senga rupchandensis* from *Channa straitus* at Jalana, M.S. India. Dhole *et al.*, (2011) *Senga rostellarae* and *Senga chandrashekhari* from *Mastacembelus armatus*. Maharashtra state India. Jadhav *et al.*, (2012) added *Senga govindii* from intestine of *Mastacembelus armatus* from Sina kolegaon Dam, Osmanabad Dist. (M.S.) *Senga silcharensis* (Puinyabati, H., Shomorendra, M. and Kar Devashish, 2013) was reported from intestine of freshwater fish *Channa puntatus* (Bloch) from Chatla Haor, Silchar, Assam. Bhure *et al.*, (2014) described *Senga microrostellata* from *Mastacembelus armatus* (Lacepede, 1800); at Parabhani (M.S.) India. Fartade Asawari and Fartade Madhukar, 2014 described *Senga nandedensis* from freshwater fish *Mastacembelus armatus* in Godavari basin (M.S.) India. More recently Deshmukh *et al.*, 2016 described *Senga rostellata* from the intestine of *Mastacembelus armatus* (Lacepede, 1800) at Nanded (M.S.), India.

## 2. MATERIALS AND METHODS

During collection of Piscean cestode parasites, One Hundred Two cestodes were collected from the Eighty Four infected intestines out of One Hundred Twenty examined freshwater fish host *Mastacembelus armatus* (Lacepede, 1800) at Hadgaon Dist. Nanded (M.S.) India during the period of February, 2011 to January, 2013.

These cestodes are preserved in hot 4% formalin and Eight 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 are made with the aid of camera lucida attachments. Photomicrographs were taken by Trinocular computerized Research microscope. All measurements are recorded in millimeters.



Figure 1. Fish Host *Mastacembelus armatus* Lacepede, 1800

### 3. RESULTS (Description Based on Five Specimens)

All the cestodes are long, consisting of scolex, immature, mature and gravid proglottids. The scolex is triangular, tapering anteriorly and broad posteriorly and measures 2.388 (2.359-2.416) in length and 0.494 (0.449-0.539) in breadth. The scolex having pair of bothria, which are sessile, extends from the anterior end to posterior end of the scolex. The bothria measures 1.668 (1.517-1.820) in length and 0.562 (0.337-0.786) in breadth. The anterior end of the scolex terminates in a rostellum, which is oval in shape and measures 0.258 (0.202-0.315) in length and 0.550 (0.506-0.595) in breadth. The rosetellum is armed with 28-30 hooks, which are arranged in circle unequal length and measures 0.152(0.135-0.168) in length and 0.017(0.011-0.022) in breadth. The neck is absent.

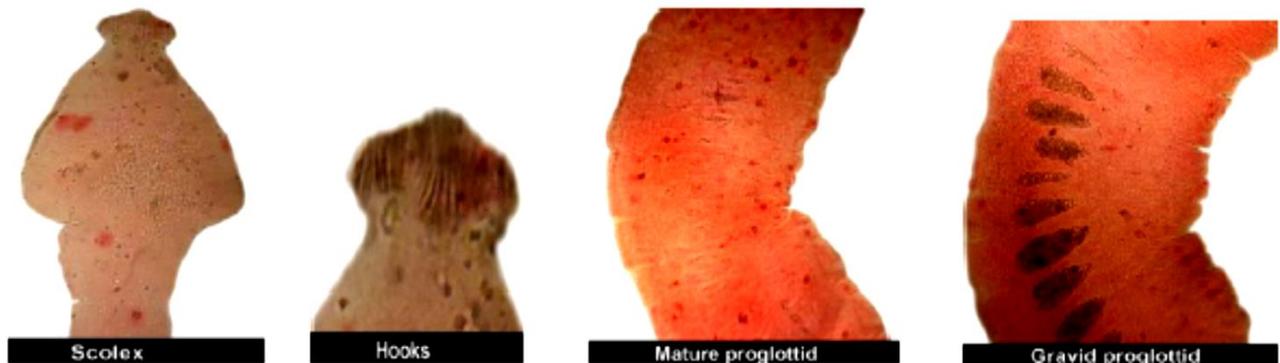


Fig.2- Microphotplate of *Senga triangullata* Sp. Nov.

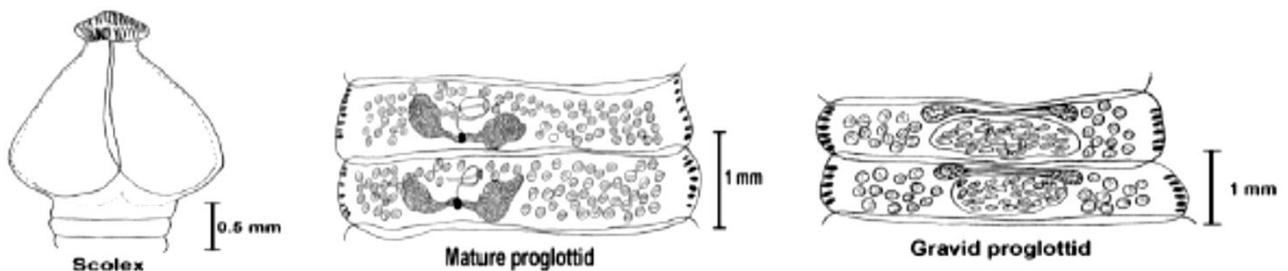


Fig.3- Cameralucida Diagram of *Senga triangullata* Sp. Nov.

Mature proglottids are about 4-5 times broader than long and measures 0.429 (0.393-0.472) in length and 2.725 (2.640-2.809) in breadth. The testes are medium, oval in shape, 55-60 in number, scattered throughout the proglottids and measures 0.045 (0.034-0.056) in length and 0.067 (0.056-0.078) in breadth. The cirrus pouch is oval in shape, pre – ovarian in position, situated in the centre of the segment and measures 0.264 (0.247-0.281) in length and 0.107 (0.089-0.123) in breadth. The cirrus is thin, curved tube, present within the cirrus pouch and measures 0.213 (0.202-0.225) in length and 0.017 (0.011-0.022) in breadth. The vas deferens is short, thin tube and measures 0.123 (0.112-0.134) in length and 0.017 (0.011-0.022) in breadth. The vagina and cirrus pouch open a common pore known as genital pore, which is small in size, oval in shape and measures 0.062 (0.056-0.067) in length and 0.039

(0.034 - 0.045) in breadth. The vagina is a thin tube, slightly curved, arises from the genital pore, posterior to cirrus pouch and forms receptaculum seminis and measures 0.298 (0.281-0.315) in length and 0.017(0.011-0.022) in breadth. The receptaculum seminis is swallowed tube open into ootype and measures 0.123 (0.112-0.134) in length and 0.028 (0.022 - 0.034) in breadth. The ootype is oval, medium in size and measures 0.056 in diameter. From the ootype ovarian lobes start. The ovary is large, distinctly bilobed, dumbbell shaped transversely placed at posterior margin of the proglottids and measures 0.534 (0.506-0.561) in length and 0.197 (0.168-0.225) in breadth. The vitellaria are follicular, on each lateral side from anterior to posterior margin of the proglottids.

The gravid proglottids are about 5-6 times broader than long and measures 0.559 (0.529-0.588) in length and 3.162 (3.088-3.235) in breadth. The uterus is Saccular, filled with eggs and measures 0.265(0.176-0.353) in length and 0.985(0.941-1.029) in breadth. Eggs are elongated, tapering at both ends and measures 0.132(0.118-0.147) in length and 0.044(0.029-0.059) in breadth. The uterine pore is rounded, towards anterior region of the proglottids and measures 0.089 in diameter.

#### 4. DISCUSSION AND CONCLUSIONS

Species of the genus *Senga* are reported from labyrinthiform and cypriniform fishes of South East Asia. *S. besnardi* Dollfus, 1934 is from *Betta splendens* the Siamese fighting fish, in an aquarium at Vincennes, France.

The present worm comes closer to all the known species of the genus *Senga* Dollfus, 1934 in general topography of organs, but differs from *Senga ophiocephalina* Tseng, 1933 in having pear shaped scolex, shallow bothria, neck absent, testes 50-55 in numbers and vitellaria lobate. The present form differs from *S. besnardi* Dollfus, 1934 in having scolex triangular, hooks 50 in numbers, neck absent, mature segment wider than long, testes 160-175 in numbers, vagina posterior to cirrus pouch, compact ovary and Vitellaria granular. It differs from *S. pycnometra* Woodland, 1934 in having elongated scolex, hooks 60 in numbers, neck absent, ovary discontinuous in two groups and indistinct segmentation, Vitellaria granular and reported from *Ophiocephalus marulius* at Allahabad, India.

The Cestode *S. triangulata* Sp. Nov. differs from *S. lucknowensis* Johri, 1956 in having body 210-212 mm, Scolex pear shaped, narrow anteriorly and broad posteriorly, bothria paired, fleshy, terminating anteriorly in disc, which is notched on two side, disc bears two half crown of hooks, 36-48 in numbers, neck absent, immature segment square, mature proglottids wider than long, testes numerous, around the ovary, lies in medullary region, cirrus sac muscular, cirrus coiled, cirro-vaginal opening lies at anterior to ovary, ovary bilobed, uterus anterior to ovary, it winds anteriorly in irregular fashion making about 7-10 turns, vitelline follicles are situated in groups, in cortical parenchyma, eggs oval, thin shelled, without opercula and reported from freshwater fish *Mastacembelus armatus* (Lecep); Lucknow, India. The present worm differs from *S. malayana* Fernando and Furtado, 1964 in having Scolex tubular, cylindrical or circular, hooks 60 in numbers, bothrium 0.49-0.91 x 0.2-0.225mm, neck absent, mature proglottids broader than long, 100-500 in numbers, testes 120-150 in numbers, ovary bilobed, vagina short tube vitellaria lobate and reported from Malayan freshwater fishes. It differs from *S. parva* Fernando and Furtado, 1964 in having pear shaped scolex, apical disc 0.1-0.12 x 0.12-0.3 mm, hooks 42-44 in numbers, neck absent, mature segment

broader than long, 80-100 in numbers, testes 150-180 in numbers, ovary globular, Vitellaria granular and reported from Malayan freshwater fishes. The Cestode differs from *S. filiformis* Fernando and Fertado, 1964 in having scolex 0.64-0.3 mm, apical disc 0.15 x 0.2 mm, hooks 55-57 in numbers, mature proglottids >70 in numbers, testes 350-370 or 120-150 in numbers, vitellaria follicular and reported from Malayan freshwater fishes. The present form differs from *S. pahangensis* Furtado et. al., 1971 in having scolex triangular, hooks 52 in numbers, neck present, mature proglottids broader than long, testicular lobes situated laterally in the medulla, ovary bilobed, vitellaria lobulate and reported from *Channa micropeltes*, Cuvier (Ophicephalae) of Malaysia. It differs from *S. visakhapatnamensis* Ramadevi et. al., 1973, in having circular scolex, 46-52 hooks, neck absent, testes 50-55 in numbers collected from *Ophiocephalus punctatus*, Visakhapatnam. Present form differs from *Senga taunsaensis* Zaidi Daulat Ali and Khan Daler, 1976 in having scolex rectangular, bears two shallow bothria and apical disc, apical disc bears crown of 44-46 hooks and is notched at two opposite ends, long hooks 42-44 in numbers, rudimentary hooks 04 in numbers, neck absent, proglottids acraspedote and broader than long, testes numerous, occupied lateral medullary field, ovary bilobed, submedian, medullary, post equatorial, uterus coiled, lie in medial medulla, opens at cirrovaginal apperture, eggs numerous, small, oval and reported from the intestine of *Channa gachua* (Hamilton) at Taunsa Barrage, Pakistan. The present cestode differs from *S. punctati* Gupta and Sinha, 1980 in having body 150-180 x 1.20-1.49mm, hooks small, 28-30 in numbers, neck absent, mature proglottids longer than broad, interrupted vitellaria, bilobed ovary, gravid proglottid 1.21-1.31 × 0.56-0.60 mm and reported from the intestine of *Ophicephalus punctatus* from Lucknow, India. It differs from *S. mastacembali* Gupta and Sinha, 1980 in having scolex 0.92-0.99mm, rostellar hooks 30-36 in numbers, neck absent, mature proglottids broader than long, subequal ovary, vitellaria scattered in the cortical parenchyma and reported from the intestine of *Mastacembelus armatus* caught at Lucknow, India.

The Cestode differs from *S. khami* Shinde et. al., 1980 in having rectangular scolex, bothria 0.65 × 0.22 mm, hooks 55-57 in numbers, neck present, mature proglottids slightly broader than long, testes 155 in numbers, ovary bilobed, post equatorial, vitellaria follicular and reported from *Mastacembelus armatus* Kham River, Aurangabad, India. The Cestode differs from *S. aurangabadensis* Jadhav et. al., 1980 in having oval scolex, hooks 50-52 in numbers, neck absent, mature proglottids two times broader than long, cirrus pouch medullary, testes 240-260 in number, ovary bilobed, post equatorial, vagina short tube, vitellaria follicular, cortical in position. It differs from *S. godavarii* Shinde et. al., 1980 in having pear shaped scolex, neck absent, testes rounded, 220-230 in numbers, arranged in two fields, cirrus pouch Oval, situated in anterior half of the proglottids, vagina anterior to cirrus pouch, vitellaria follicular, arranged in 3-4 rows and reported from *M. armatus*, Nanded M.S. India. It differs from *S. paithanensis* Kadam et. al., 1981 in having scolex triangular, prominent, large, hooks 54 in numbers, neck present, testes rounded, oval, 130-135 in numbers, scattered in two lateral groups, ovary bilobed with long blunt acini, vagina thin tube, vitellaria follicular, arranged in 2-3 rows and collected in *Mastacembelus armatus* at Paithan, Dist. Aurangabad, M.S., India. Present Cestode differs from *S. raoi* Majid et. al., 1984 in having pear shaped scolex, broad at middle and tapering at both the ends, bothria two, shallow, latter extending up to the posterior region of scolex, hooks 46 in numbers, neck absent and testes small, rounded, 65-170 in numbers, cirrus pouch oval, Ovary post-equatorial, bilobed, each lobe compact, vitellaria granular and reported from *Channa*

*punctatus* at Jagannathpuri, Orissa, India. It differs from *S. jagannathae* Majid et. al., 1984 in having scolex pear shaped, broader at posterior ends, bothria two, spoon shaped, hooks 44 in numbers, neck short, testes small, rounded and 240-250 in numbers, cirrus pouch oval, ovary Bilobed, compact, spatulate, vagina anterior to cirrus pouch, vitellaria granular and reported from freshwater fish *Channa punctatus* at Jagannathpuri, Orissa.

*Senga triangulatta* Sp.Nov. differs from *Senga indica* Gupta and Parmar, 1985 in having scolex  $0.78 \times 0.62$  mm, bothria 0.62 mm, rostellar hooks 36, neck absent, mature proglottids longer than broad, Ovary  $0.18 \times 0.16$  mm, gravid proglottid longer than broad and collected from intestine of freshwater fish *Mastacembelus armatus* (Lacepede, 1800); from Lucknow, India. The present specimen differs from *S. gangesii* Gairola, D. and Malhotra, S.K., 1986 in having body 200 mm, rostellar hooks 72-75 in numbers, arranged in two semicircle and reported from *Mystus vittatus*. The Cestode *Senga triangulatta* Sp. Nov. differs from *Senga pathankotensis* Duggal, C.L. and Bedi, H., 1989 in having 52+4 apical hooks; post-equatorial, distinctly bilobed ovary; continuous vitellaria in mature proglottids; vitelline follicles larger than testicular follicles and distinct as well as indistinct type of segmentation and reported from freshwater fish, Punjab, India. It differs from *S. gachauae* Jadhav et. al., 1991 in having pear shaped scolex, hooks 22-25 in numbers, testes 60-70 in numbers, oval, arranged in two fields and collected from *Channa gachua* at Solapur, M.S. India; from *S. maharashtrii* Jadhav et.al., 1991 in having oval scolex, hooks 45-47 in numbers, neck absent, testes oval, arranged in two fields and 80-90 in numbers and reported from *Mastacembelus armatus* at Amravati (Daryapur) M.S. India. The present Cestode differs from *S. chauhani* M. Hasnain, 1992 in having scolex large, oval, rostellar hooks 40-44 in numbers, neck short, mature proglottids broader than long, testes oval, 200-210 in numbers, vagina thin tube, ovary bilobed and vitellaria follicular, arranged in 4-5 rows and collected from fish host *Channa punctatus* at Jamshedpur.

It differs from *Senga jhansiensis* Mathur, Srivastav and Daisy Rani, 1994 in having size of worm  $110-125 \times 0.98-1.23$  mm, scolex  $0.98-1.4 \times 0.23-0.61$  mm, bothria  $1.11-1.23 \times 0.001-0.32$  mm, rostellar hooks 28-32 in numbers, neck present, mature proglottids broader than long,  $0.26-0.49 \times 0.78-1.23$  mm, ovary  $0.013-0.021 \times 0.196-0.390$  mm, gravid proglottids broader than long,  $0.39-0.58 \times 0.78-1.23$  mm and collected from *Mastacembelus armatus* (Lacepede, 1800); Jhansi (M.P.), India. It differs from *S. mohekarae* Tat and Jadhav, 1997 in having elongated scolex, hooks 151 in numbers, arranged in two semicircle groups, testes 300-310 in numbers. The new specimen differs from *Senga Chiangmaiensis* Wongsawad, Marayong & Jadhav, 1998 in having scolex large, pear-shaped,  $0.75-1.54 \times 0.50-1.20$  mm, bothria four, large, elongated, occupying major portion of the scolex, rostellum large, located on the anterior end of the scolex, consists of 28 hooks, placed in 4 quadrants, arranged in a circle, ovary bilobed, butterfly-shaped, situated in the posterior third of the segment, testes ovoid, distributed in 2 fields in the central medulla, 0.03-0.05 mm diameter, eggs ovoid, round, 0.04-0.05 mm and collected from *Mastacembelus armatus*, Maesa Stream, Chiang Mai, Thailand.

The present form differs from *S. armatusae* Hiware, 1999 in having scolex triangular, 32-40 hooks, neck absent, mature proglottids four times broader than long, testes small, rounded, 230-240 in numbers, vagina anterior to cirrus pouch, ovary bilobed, post equatorial, vitellaria follicular, arranged in double rows and reported from freshwater fish, *Mastacembelus armatus* at Pune (M.S.); from *S. tappi* Patil et. al., 2003 in having scolex triangular, 42-44 hooks, testes 285-295 in numbers, rounded, distributed in two fields, vagina

anterior to cirrus pouch. It differs from *Senga sharpiloi* Polyakova and Kirin, 2005 in having adult cestodes medium, thin body, fusiform, scolex pyramidal, pear-shaped, provided armed apical disc and a pair of shallow bothria, bothria oval, almost oblong, with thick edges, cross section of bothria scolex H-shaped, hooks large, arranged in two semicircle rings, 44-50 in numbers, mature segments rectangular, testes rounded, located in the medullary parenchyma, cirrus sac small, located in median field of segments, ovary consists of two symmetrical wings joined in the middle by a narrow isthmus, numerous yolk follicles corticle in position, vitellaria very close to each other, genital atrium lies at center dorsal segment in its median field ahead ovary, vagina straight tube, oviduct short, uterine pore involutive (false), lies on the ventral surface at the anterior margin of the segment, eggs oval, small, thin shell, smooth, without a lid and recovered from *Channa micropeltes*, Vylov-Lennogo off the coast of Singapore. It differs from *S. ayodhensis*, Pandey 2006 in having scolex conical, hooks 29 in numbers, neck absent, testes numerous, rounded, ovary bilobed, vagina thin coiled, vitellaria follicular; from *S. baghuai*, Pandey 2006 in having scolex pear shaped, hooks 28 in numbers, neck long, mature segment broader than long, testes 40-50 in numbers, ovary compact, vagina thin, vitellaria follicular.

The present worm differs from *S. jadhavae* Bhure et al., 2007 in having scolex triangular,  $1.332-1.458 \times 0.258-0.918$  mm, rostellum rounded,  $0.043-0.061 \times 0.231-0.241$  mm, rostellar hooks 50-54 in numbers, neck short,  $0.230-0.295 \times 0.390-0.565$  mm, mature proglottids  $0.425-0.480 \times 1.495-1.625$  mm, testes small, rounded, 310-320 in numbers,  $0.020-0.025$  mm, cirrus pouch  $0.170-0.180 \times 0.070-0.080$  mm, ovary bilobed, vagina coiled tube,  $0.245-0.255 \times 0.010$  mm, vitellaria follicular, arranged in 4-5 rows, uterus Saccular and recovered from *Mastacembelus armatus* (Lacepede, 1800); Aurangabad (M.S.), India. The *S. rostellata* Sp. Nov. differs from *S. chandkapurensis* Kahadap et al., 2007 in having scolex barrel shaped, bothria  $0.577-0.579 \times 0.024-0.160$  mm, rostellum armed, rostellar hooks 28-30 in numbers, circularly arranged, neck short,  $0.010-0.087 \times 0.180-0.194$  mm, mature proglottid broader than long,  $0.735-0.811 \times 1.243-1.379$  mm, testes small, rounded, 170-180 in numbers,  $0.023-0.045$  mm, cirrus pouch oval, obliquely placed, ovary large, distinctly bilobed, transversely placed,  $0.023-0.144 \times 0.681-0.932$  mm, vagina anterior to cirrus pouch, uterus Saccular, eggs  $0.028-0.051 \times 0.001-0.023$  mm, Vitellaria granular and reported from intestine of freshwater fish *Mastacembelus armatus* at Chandikapur Dist Bidar, Karnataka, India. It differs from *S. ticto* Shrivastava, 2007 in having scolex oval, narrow at both ends, rostellum bilobed, rostellar hooks 24-28 in numbers, bothria elongated, deep, neck absent, proglottids broader than long, craspedote, testes oval to round, 60-120 in numbers, cirrus pouch bounded by thin membrane, ovary bilobed, medial, posteriorly located, receptaculum seminis absent, vitelline follicles corticle, arranged in two lateral bands, uterus median, sac like, eggs oval, operculated and reported from intestine of freshwater fish *Puntius ticto* at Jhansi U.P., India.

It differs from *S. nathsagensis* Kankale, 2008 in having scolex long, elongated, slightly cone shaped, rostellum round to oval, hooks long, unequal, 30-32 in numbers, neck long, mature proglottids broader than long, testes 200-250 in numbers, cirrus pouch oval, pre ovarian, cirrus short, thin, curved, vagina thin long tube, seminal receptaculum long, ovary bilobed, dumbbell shaped, ootype small, gravid proglottids broader than long, uterus Saccular, lies at middle region of segment, eggs 25-27 in numbers, uterine pore oval, vitellaria follicular, arranged in 2-3 rows and reported from fresh water fish *Mastacembelus armatus* (L.) Nathasagar Dam, Paithan, Dist Aurangabad (M.S) India. The present form differ from *S.*

*kaigaonensis*, Wankhede and Reddy, 2009 in having scolex triangular, anterior end pointed, rounded and posterior end broad, hooks 36 in numbers, mature segment broader than longer, testes 285-295 in number, cirrus pouch pre-ovarian, obliquely placed and reported from fresh water fish *Mastacembelus armatus* (L.) Kaigaon toka, Dist Aurangabad (M.S) India. It differs from *S. panzaraensis*, Mangale and Kalse, 2009 in having scolex triangular, scolex bears two bothria, rostellum oval, hooks 58 in numbers, neck short, mature segment five times broader than long, testes small, rounded, 40-45 in numbers, cirrus pouch oval, medium, transversely placed, genital pore small, oval, ovary large, bilobed, vagina thin tube, slightly curved, ootype rounded, vitellaria granular, arranged in four to five rows, eggs oval, operculated and collected from small intestine of *Mastacembellus armatus* caught at Panzara river, Dhule, M.S., India

The *S. triangulata* Sp.Nov. differs from *S. madhavae* Bhure et al., 2010 in having Scolex triangular,  $0.910 \times 0.519$  mm, rostellum rounded,  $0.101 \times 0.247$  mm, Rosetellum armed with 40-44 hooks, which arranged in two semicircle unequal length i.e. long and short, Long hooks  $0.108 \times 0.010$  mm, short hooks  $0.85 \times 0.006$  mm, neck absent, mature proglottids 5-6 times broader than long, testes small, oval, 200-220 in number,  $0.021 \times 0.031$  mm, Cirrus pouch oval, pre-ovarian, situated in the centre of the proglottids,  $0.058 \times 0.024$  mm, Vagina thin tube,  $0.094 \times 0.009$  mm, receptaculum seminis straight tube,  $0.029 \times 0.009$  mm, ootype oval, medium, 0.024 mm, ovary dumbbell shaped,  $0.992 \times 0.116$  mm, Vitellaria granular, uterus Saccular,  $0.065 \times 0.538$  mm and recovered from *Mastacembelus armatus* (Lacepede, 1800); Pune (M.S.), India.

The Cestode *Senga triangullata* Sp.Nov. differs from *S. satarensis* Bhure et al., 2011 in having Scolex pear shaped, tapering anteriorly and broad posteriorly and measures  $0.635 \times 0.410$  mm, pair of sessile bothria,  $0.684 \times 0.067$  mm, rostellum oval to rounded,  $0.030 \times 0.070$  mm, armed with 28-30 hooks, long hooks measures  $0.083 \times 0.009$  mm, short hooks measures  $0.071 \times 0.009$  mm, neck absent, mature proglottids 6-7 times broader than long,  $0.337 \times 1.618$  mm, testes small, oval, 175-200 in number,  $0.024 \times 0.019$  mm, cirrus pouch oval,  $0.065 \times 0.021$  mm, vas deferens short, thin, straight tube,  $0.019 \times 0.009$  mm, Vagina thin tube, slightly curved,  $0.065 \times 0.009$  mm, receptaculum seminis  $0.021 \times 0.014$  mm, Ovary large,  $0.497 \times 0.055$  mm, vitellaria granular, uterus Saccular,  $0.145 \times 0.342$  mm, eggs elongated,  $0.040 \times 0.015$  mm and recovered from *Mastacembelus armatus* (Lacepede, 1800); Satara (M.S.), India.

It differs from *S. mangalbaiiae* Bhure et al., 2011 in possessing Scolex conical, tapering at the apex and broad at the base, distinctly marked off from the strobilia,  $2.038 \times 0.878$  mm, bothria two, fleshy,  $1.662 \times 0.349$  mm, rostellum oval to rounded,  $0.116 \times 0.266$  mm, armed with 38-42 hooks, long hooks  $0.093 \times 0.010$  mm, short hooks  $0.064 \times 0.008$  mm, neck absent, mature proglottids 2-3 times broader than long,  $0.449 \times 1.084$  mm, testes oval to rounded, 70-80 in numbers, scattered lateral side of segment,  $0.024 \times 0.019$  mm, cirrus pouch small, oval,  $0.080 \times 0.041$  mm, cirrus thin, straight,  $0.084 \times 0.009$  mm, genital pore small, oval  $0.019 \times 0.012$  mm, Vagina arises from the gonopore, thin tube,  $0.050 \times 0.007$  mm, receptaculum seminis thin, short tube,  $0.031 \times 0.012$  mm, Ootype small, oval 0.029 mm, Ovary large, distinctly bilobed, each lobe like a nut shaped, situated near posterior margin of segment,  $0.439 \times 0.077$  mm, uterus Saccular,  $0.196 \times 0.415$  mm, eggs oval, non-operculated,  $0.034 \times 0.016$  mm, vitellaria granular, arranged in 2-3 rows and collected from *Mastacembelus armatus* (Lacepede, 1800); Osmanabad (M.S.), India. It differs from *S. rupchandensis*, Pardeshi et. al., 2011 in having body long, scolex flat, tubular, cylindrical,

scolex bears two bothria, overlapping one another, bothria flat or elongated, sac like, rostellum flat, having two rows of semicircular hooks, 42-55 in number, neck absent, mature proglottids  $1.2523 \times 0.4514$  mm, testes rounded, 350-370 in number, cirrus pouch sac like, oval, vagina elongated, tubular, ovary bilobed, vitellaria follicular, eggs oval, non-operculate and recovered from *Channa striatus* (Bloch, 1793) at Jalna District (M.S.), India.

The present differs from *Senga rostellare*, Dhole et. al., 2011 in having body long, Scolex pear shaped, medium, elongated, bothria two, large, rostellum armed with a semi circle 41 hooks, neck absent, mature segments medium, quadrangular, testes medium, rounded, 217-242 in numbers, almost in single field, crowded together, overlapping on each other, cirrus pouch elongated, oval, cirrus short, thin, curved, ovary medium, distinctly bilobed, each lobe with 2- 3 blunt round acini, vitellaria follicular, arranged in one row, on each lateral side of segment, gravid segment slightly longer than broad, uterus sac like, eggs oval, operculate and collected from intestine of *Mastacembelus armatus* L.; M.S. India.

It differs from *Senga chandrashekhari* Dhole et. al., 2011 in having scolex large, broad at the posterior end, narrow at the anterior end, bothria two, fleshy, rostellum armed with 78 hooks, neck short, mature segment broader than long, slightly squarish, testes medium, rounded, 98-117 in numbers, evenly distributed, in two lateral fields, cirrus pouch small, cylindrical, ovary medium, bilobed, transversely placed, vagina long, broad tube, vitellaria follicular, arranged in 1-2 rows, on each lateral side, gravid segment broader than longer, uterus sac like, eggs oval, operculated and reported from intestine of *Mastacembelus armatus* L.; M.S. India.

It differs from *S. govindii*, Jadhav et. al., 2012 in having worm long, thin, milky white in colour, with scolex, numerous immature and mature segments, scolex large, triangular, rostellum, armed with 45-50 hooks, bothria two, sac like, neck present, mature proglottids rectangular, three times broader than long, testes medium, oval, 100-130 in numbers, cirrus pouch oval, cirrus thin tube, ovary bilobed, large, situated middle of the segment, vagina thin tube, posterior to cirrus pouch, genital pore small, rounded, gravid segment broader than long, uterus large, Saccular, eggs oval, non operculated, vitellaria granular, arranged in two-three rows at each lateral margin of the segment and reported from intestine of *Mastacembelus armatus* (Lacepede, 1800) at Sina kolegoan Dam, Osmanabad Dist (M.S.) India. It differs from *Senga silcharensis* Puinyabati, H., Shomorendra, M. and Kar Devashish, 2013 in having Scolex pear shaped, bluntly rounded apically, bothria two, shallow, oval, extending up to the posterior region of the scolex, Anterior region of scolex having rostellum with 44 hooks in two semi-circles, Hooks neck absent, mature and gravid segments broader than long, gravid segments testes small, rounded, 60 in number, ovary post-equatorial, bilobed, vitelline follicles  $0.02 \times 0.02$  mm and collected from the intestine of freshwater fish *Channa punctatus* (Bloch) from Chatla Haor, Silchar, Assam.

The *S. triangulata* Sp. Nov. differs from *S. microrostellata* Bhure et.al., 2014 in having Scolex triangular, tapering at apex and broad at base, distinctly marked off from strobilia, bothria two, sessile, rostellum oval, armed with 18-20 hooks, arranged in a circle, neck absent, mature proglottids 8-9 times broader than long, testes small, oval to rounded, 250-300 in numbers, scattered lateral side of segment on either side of ovary and cirrus pouch, Cirrus pouch small, elongated, transversely placed, cirrus thin, short, straight, vas deferens short, thin tube, genital pore small, oval, vagina arises from gonopore, thin tube, runs towards posterior side, receptaculum seminis thin, short tube, ootype oval to rounded, Ovary large, distinctly bilobed, dumbbell shaped, Uterus Saccular, eggs oval, non-operculated, vitellaria

follicular, arranged in a line and recovered from *Mastacembelus armatus* (Lacepede, 1800); Parbhani (M.S.), India.

It differs from *Senga nandedensis* Fartade Asawari and Fartade Madhukar, 2014 in having scolex large, well developed, triangular, rostellum prominent, armed with 60-62 hooks, arranged in semicircle, bothria two, spatulate, extended up to posterior end of scolex, neck absent, mature segment small, rectangular, eight times broader than long, testes oval, small, 150-200 in numbers, cirrus pouch oval, medium, cirrus thin tube, ovary small, bilobed, dumbbell shaped, vagina thin tube, posterior to cirrus pouch, genital pore small, rounded, vitellaria follicular, arranged in two lateral margin of the segment and collected from the fresh water fish *Mastacembelus armatus* in Godavari basin (M.S.) India.

*S. triangulata* Sp. Nov. differs from earlier described *S. rostellata* Deshmukh et.al., 2016 in having scolex is triangular, narrow anteriorly and broad posteriorly, bothria paired, sessile, rostellum oval to rounded, armed with 20-22 hooks, neck long, mature proglottids three times broader than long, testes small, oval, pre-ovarian 25-30 in number, scattered in two groups, cirrus pouch cylindrical, pre-ovarian, cirrus thin, present within cirrus pouch, vas deferens short, thin, straight tube, genital pore small, oval, vagina thin tube, slightly curved, receptaculum seminis straight tube, ootype oval, medium, ovary distinctly bilobed, transversely placed at posterior margin of proglottids, each lobe  $0.264 \times 0.067$  mm, vitellaria follicular, Gravid proglottids 4-5 times broader than long, uterus Saccular, filled with 30-35 eggs, Eggs elongated, tapering at both ends, uterine pore rounded, lies at anterior region of proglottids.

In view of the above differences, the present form is regarded as a new species of the genus *Senga* Dollfus, 1934 and named *Senga triangulata* Sp. Nov. on account of triangular scolex.

### Taxonomic Summary

- Genus** : *Senga* Dollfus, 1934  
**Species** : *Senga triangulata* Sp. Nov.  
**Type host** : *Mastacembelus armatus* (Lacepede, 1800)  
**Habitat (Site)** : Intestine  
**Type locality** : Hadgaon Dist. Nanded, M.S., India  
**Prevalence** : 102 mature tapeworms collected from 84 infected host out of 120 examined  
**Period of collection** : February, 2011 to January, 2013.  
**No. of Specimen** : 102  
**Accession number** : PGDZ/YMN/1-05/ February, 2011 to January, 2013  
**Deposition** : Research and PG Department of Zoology, Yeshwant Mahavidyalaya, Nanded

#### ACKNOWLEDGEMENT

Authors express sincere thanks to Principal, Yeshwant Mahavidyalaya Nanded for facilities provided. VSD and DBB are indebted to SERB, New Delhi for sanctioning Fast Track Research Project No. SR/FT/LS-19/2010 Dt. 2nd May, 2012.

#### References

- [1] A. K. Srivastav, R. K. Khare, Jitendra Khare, V. K. Sahu and A R Singh (2007): A new species of genus *Senga* Dollfus(1934) from *Punctius ticto* at Jhansi (U.P.). Nat. Jr. of Life Sci. 4(3): 129-132.
- [2] Deshmukh Vikram Satwarao (2015): Biosystematic Studies on some Helminth Parasites of freshwater fishes. Ph.D. Thesis, S.R.T.M. University, Nanded, M. S. India. pp. 1-347.
- [3] Vikram Satwarao Deshmukh, Sanjay Shamrao Nanware and Dhanraj Balbhim Bhure (2016): Taxonomic Studies on Cestode Genus *Senga* (Dollfus, 1934) (Ptychobothridae, Luhe, 1902) From *Mastacembelus Armatus* (Lacepede, 1800) With Description of A New Species. Asian Journal of Agriculture & Life Sciences. Vol. 1(1), Jan. 2016: 33-42.
- [4] D. B. Bhure, N. D. Padwal and B. V. Jadhav (2007): A new tapeworm *Senga jadhavii* N. Sp.(Cestoda: Pseudophyllidea) from *Mastacembelus armatus* at Aurangabad. Proc. Zool. Soc. of India, 6(2): 45-52.
- [5] Dhanraj Balbhim Bhure (2008): Faunal diversity of helminth parasites of freshwater fishes from Maharashtra State, India. Ph.D. Thesis, Dr. B. A. M. U. Aurangabad, M. S. India. pp. 1-178.
- [6] D. B. Bhure, S. S. Nanware, D. M. Pathan and R. M. Dhondge (2010): Morpho-taxonomic observation of new Pseudophyllidean tapeworm *Senga* Dollfus,1934 from *Mastacembelus armatus*. The Asian Journal of Animal Science 5(2): 147-152.
- [7] Dhanraj Balbhim Bhure and Sanjay Shamrao Nanware (2011): Systematic observation of new pseudophyllidean tapeworm *Senga* from *Mastacembelus armatus*. International Multidisciplinary Research Journal. 1(10): 25-28.
- [8] Dhanraj Balbhim Bhure and Sanjay Shamrao Nanware (2011): Studies on cestode genus *Senga* (Dollfus, 1934) (Ptychobothridae, Luhe, 1902) from *Mastacembelus armatus* with description of a new species. Proceeding of the Zoological Society of India (Special Issue - Parasitology). 1: 91-98.
- [9] Dhanraj Balbhim Bhure, Sanjay Shamrao Nanware and Vikram Satwarao Deshmukh (2014): Biosystematic studies on Cestode genus *Senga* (Dollfus, 1934) (Ptychobothridae, Luhe, 1902) from *Mastacembelus armatus* with Description of a new species. Proceeding: Modern Parasitology, Narendra Publishing House, Delhi. International Conference on Recent Trends in Climate Change Researches vis-a-vis Biodiversity” Vol. 1, pp. 233-244.
- [10] Dhanraj Balbhim Bhure, Sanjay Shamrao Nanware and C.R.Kasar (2014): Report on Cestode genus *Senga* (Dollfus,1934) (Ptychobothridae, Luhe, 1902) of *Mastacembelus*

- armatus* from Marathwada Region Maharashtra, India. Environment Conservation Journal. Vol. 15(1&2), pp. 213-219
- [11] Dhole, J.S. Sonune, B.V. Reddy, Y.R. and Chavan R.J. (2011): Two Pseudophyllidean Tapeworms from Fresh Water Fish *Mastacembelus armatus* of Maharashtra State (India) with Revised Key to Species of Genus *Senga*. Acta Parasitologica Globalis 2 (2): 25-33
- [12] Dollfus R. Ph. (1934) : Sur un cestode pseudophyllidae parasite de poisson ornement. Bull.Sac. Zool. France 69: 476-490.
- [13] Duggal C.L. And Bedi H., (1989): On *Senga pathankotensis* new species and *Senga lucknowensis* Johri 1956 cestoda Ptychobothriidae infecting freshwater fishes of Punjab India. Research Bulletin of The Panjab University Science. 40(1-2): 35-38
- [14] Fartade, Asawari M. and Fartade, Madhukar M.(2014): A New Species of the Genus *Senga* (Ptychobothriidae) from Fresh Water Fish *Mastacembelus armatus* in Godavari Basin (M.S) India. International Science Journal, Volume 1, Issue 2, 23-29
- [15] Fernando C. H. and Furtado J. I.(1964): Helminth parasites of Some Malayan freshwater fishes. Bulletin of the National Museum of states of Singapore, 32: 45-71.
- [16] Furtado J. I. and Chowhan L. (1971): Two new helminth species from the fish *Channa micropeltes* Cuvier (Ophiocephalidae) of Malaysia. *Folia parasitol* 18: 365.
- [17] Gairola D. and Malhotra S. K. (1986): Cestode fauna of fishes in river Ganges around an Indian subhumid region I *Senga gangesii* n. sp. from *Mystus vittatus*. Japanese J. of Para 35(6): 471-474.
- [18] Gupta V. and Parmar S. (1985): On a new cestode *Senga indica* sp.nov. from the intestine of a freshwater fish, *Mastacembelus armatus* (Lacep) from Lucknow Indian J. Helminth 37(2): 96-99.
- [19] Gupta, S. P. And Sinha, N.(1980): Two new species of *Senga* Dollfus, 1934 (Cestoda: Ptychobothriidae) from fresh water fishes of Lucknow. Indian Journal of Helminthology Vol. 32, No. 2, pp. 124-128.
- [20] Hasnain, M., (1992): On a new cestode *Senga chauhani* n.sp. from fish host, *Channa punctatus* from Jamshedpur. *National Journal of Helminthology*. Vol. XXXIV, No. 1, 123-127.
- [21] Hiware C. J. (1999): On a new tapeworm *Senga armantusae* from freshwater fish, *Mastacembalus armatus* at Pune (M.S.). Rivista di Para XVI {LX (1)}: 9-12.
- [22] Jadhav B V and Shinde G B (1980): On a new cestode *Senga aurangabadensis* n.sp. from the fish *Mastacembalus armatus*. Bioresearch, 43(2): 25-27.
- [23] Jadhav B. V., Ghavane A. B. and Jadhav A. P. (1991): On a new Pseudophyllidean cestode from *Mastacembelus armatus* at Daryapur (M.S.) India. Rivista Di Parasit. 8(1):19-22.
- [24] Jadhav, B.V., Deshmukh, S.B. and Gavhane, A.B. (1991): A new tapeworm *Senga gachuae* n.sp. from the fish *Channa gachua* at Aurangbad. India. J. Inv. Zool and Aqu Biol. 3(1), 39-41

- [25] Jadhav B. V. (2005): Cestoda of the genus *Senga* (Cestoda Pseudophyllidea) from freshwater fishes in Maharashtra, India A survey of species. Riv di. Para. 22{LXVII; 2}: 93-101.
- [26] Jadhav, Swati, Borde, Sunita, Jadhav, Dilip and Humbe, Atul (2012): Occurrence of a new piscine tapeworm *Senga govindii* in *Mastacembelus armatus* (Lacepede, 1800) from Sina Kolegoan Dam. Journal of Experimental Sciences 3(5): 01-04.
- [27] Johri G. N. (1956): A New cestode *Segna lucknowensis* from *Mastacembalus armatus* (Lecep.). Supplement to Current Science 15: 193-195.
- [28] Kadam S. S. , B. V. Jadhav and G. B. Shinde (1981): On a new cestode *Senga paithanensis* n.sp. (Cestoda; Ptychobothriidae) from *Mastacemballus armatus*. Bioresearch 5(1): 95-96.
- [29] Lacepede (1800): National Museum of Natural History, Washington, D.C., *Mastacembelus armatus*.
- [30] Majid M. A. and Shinde G. B. (1984): Two new species of the genus *Senga* Dollfus, 1934 (Cestoda-Pseudophyllidea) from fresh water fishes at Jagannathpuri, Orisa. *India. J. of Para.* (1): 169-172.
- [31] Mangale, A.J. and A.T. Kalse (2009): *Senga panzaraensis* from *Mastacembelus armatus* at Dhule India. Uttarpradesh Journal of Zoology, 29(1); 105-108.
- [32] Mathur N., Srivastav A. K. and Daisy Rani (1994): Piscian cestodes of Bundelkhand region of U. P. *Senga jhansiensis* n.sp (Cestoda-Ptycholothridea) from *Mastacembalus armatus* (Lecepede). U. P. J. Zool, 14(1): 94-96.
- [33] Monticelli F.S. (1890): Note elmintologiche. Boll. Soc. Nat. Napoli 4: 189-208.
- [34] Nilima M. Kankale (2008): A new species of the genus *Senga nathsagarensis* from freshwater fish, *Mastacembelus armatus*. National Journal of Life Sciences, 5(3): 81-84.
- [35] P. N. Pande, Mamta Tripathi and Neetu Mittal (2006): On two new species of genus *Senga* Dollfus, 1934 (family-Ptychobothriidae Luhe, 1902) from the intestine of freshwater fishes. Indian Jr. Hel. (N.S.) 24: 6-10.
- [36] Pardeshi, P. R. and Hiware, C.J. (2011): A new pseudophyllidean *Senga rupchandensis* n. sp. from *Channa striatus* (Bloch, 1973) at Jalna District (M.S), India. R. R. S. T. 3(12): 17-22.
- [37] Patil D. N. and Jadhav B.V. (2003): On a new species of the *Segna* Dollfus 1934 Cestoda- Ptychobothridoe Luhe, 1902 as *S. tappi* n.sp. from the Shirpur Dist. Dhule (M.S.) India. J. Comp. Tox. Physiol (1): 68-72.
- [38] Polyakova, T. A. and Kirin, M. P. (2005): *Senga sharpiloi* sp. Nov. (cestoda: ptychobothriidae) a new cestode species from *Channa micropeltes* (Pisces: Channidae) from Singapore. Ecology of the Sea. Issue 68, pp. 68-75.
- [39] Puinyabati H., Shomorendra M. and Devashish Kar (2013): *Senga silcharensis*, a New Cestode Species from the Intestine of the Fresh Water Fish *Channa punctatus* (Bloch) from Chatla Haor, Silchar, Assam. Sci. & Cult. 79(5-6) 245-247.

- [40] Ramadevi P. and Rao K. H. (1966): Pleurocercoid of *Senga* (Pseudophyllidea: Ptychobothriidae) from the freshwater fish, *Panchax panchax* (Haml and Buch). *Current Sci.* 35(24): 626-627
- [41] Ramadevi P. (1973): On *Senga visakhapatnamensis* n. sp. (Cestoda - Pseudophyllidea) from the intestine of the freshwater fish *Ophiocephalus punctatus* Bloch. *Rivista Di. Para* 34(-4): 281-286.
- [42] R. M. Khadap, B. V. Jadhav and N. V. Suryawanshi (2007): A new species of the genus *Senga* (Dollfus, 1934) (Cestoda: Ptychobothridae) from fresh water teleost *Mastacembelus armatus*. *Nat. Jr. of Life Sci.* 4(3): 77-79
- [43] Shinde G. B. and Jadhav B. V. (1980): A new tapeworm *Senga godavarii* n.sp. from *Mastacembalus armatus* at Aurangabad India. *Biology* (2): 46-48.
- [44] Shinde G. B. and Deshmukh R. A. (1980): On *Senga khami* Cestoda Ptychobothridae from the freshwater fish. *Ind. J. Zoology* (8): 1-2.
- [45] Southwell T. (1913): Parasites from fish notes from the Bengal fisheries Laboratory. *Re. Ind. Mus.* (9) 79-103.
- [46] Tat M. B. and Jadhav B. V. (1997): *Senga mohekarae* n.sp (Cestoda-Ptychobothridae) from *Mastacembalus armatus*. *Riv. Di. Para.* {XVII (LVIII) N-2}: 203-296
- [47] Tseng's (1933): Study on some Cestode from fishes. *J. of Sci. National Univ. Shantuma. Tsingtao, China* (2): 1-21.
- [48] Wankhede, Hemlata and Reddy Yogesh (2009): On a new species of the genus *Senga* (Dollfus, 1934) (Cestode:Ptycobothridae, Luhe, 1902) from fresh water fish *Mastacembelus armatus*. *Environmental Conservation J.*, 10(3): 63-66.
- [49] Wongsawad C., Marayong T., Jadhav B.V.(1998b): A new Ptychobothriidae tapeworm from Maesa Stream, Chiang Mai, Thailand. *Rivista Di Parasitol.* Vol. XV, No 3: 295-298.
- [50] Woodland W. N. F. (1924): On a new *Bothriocephalus* and a new genus *Bothrioceohallidae* from Indian freshwater fishes. *Parasit.* (16): 441-451.
- [51] Zaidi Daulat Ali And Khan Daler (1976): Cestodes of fishes from Pakistan. *Biologia* 22(2): 157-179.
- [52] Yamaguti, S. 1959. *Systema Helminthum. II. The Cestodes of Vertebrates.* Intescience Publ., N.Y., pp. 860.

( Received 14 March 2016; accepted 29 March 2016 )