



TAXONOMIC STUDIES ON NEW CESTODE OF GENUS SENGA (DOLLFUS, 1934) (PTYCHOBOTHRIDAE, LUHE, 1902) FROM MASTACEMBELUS ARMATUS (LACEPEDE, 1800)

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ABSTRACT

Present investigation deals with taxonomic studies of Pseudophyllidean cestode *Senga follicularae* sp. nov. collected from the intestine of *Mastacembelus armatus* (Lacepede, 1800) at Ahmedpur (M.S.) India during the period of February, 2012 to January, 2014. Worm comes closer to all known species of this genus in general topography of organs but differs having Scolex triangular, having pair of sessile bothria, Rostellum oval to rounded, present at anterior end of scolex, armed with double row of 40-44 hooks, 20-22 hooks in each row, Neck is absent, Mature proglottids five times broader than long, Testes are medium in size, oval to rounded in shape, pre-ovarian, 50-55 in numbers, Cirrus pouch cylindrical, pre-ovarian in position, located in the centre of the proglottids, cirrus is thin, lies within the cirrus pouch, Vas deferens is short, thin, straight tube, measures Vagina and cirrus pouch open a common pore as genital pore, which is small in size, oval in shape, Vagina thin, tubular, arises from the genital pore, runs posteriorly, slightly curved, Receptaculum seminis is straight tube, short, open into ootype, Ovary distinctly bilobed, transversely placed at posterior margin of the segment, Vitellaria follicular, arranged in two rows, Gravid segments three to four times broader than long, Uterus saccular, filled with eggs, Eggs elongated, oval in shape, pointed at both ends, Uterine pore rounded, lies to words anterior region of the segments.

Key Word: Bio-systematic Studies, *Mastacembelus armatus* (Lacepede, 1800) Ptychobothridae Luhe,1902, *Senga* Dollfus,1934.

INTRODUCTION

Dollfus, 1934 erected the genus *Senga* with its type species *S. besnardi* from *Betta splendens*, the Siamese fighting fish, in an aquarium at Vincennes, France. Tseng, 1933 reported *Senga ophiocephalina*, (syn. *Anchirocephalus o.*); Woodland, 1924 described *S. pycnomera* (syn. *Bothriocephalus p.W.*) from *Ophicephalus marulius* at Allahabad, India. Johri, 1956 recorded *Senga lucknowensis* from *Mastacembelus armatus* from Lucknow, India. Later on many workers reported some new *Senga* species parasitic to freshwater fishes. It indicates, genus is very diversified and abundant. Fernando and Furtado, 1964 described *S. malayana* from *Channa striatus*; *S. parva* and *S. filiformis* from *Channa micropeltes* at Malacca. Pleurocercoid of *Senga* sp. was reported by Ramadevi and Hanumantha Rao (1966) from *Panchax panchax* at Vishakapatnum. Later *S. pahangensis* (Furtado and Chauhan, 1971) from *Channa micropeltes* at Tesak Bera; *S. vishakapattanensis* (Ramadevi and Rao, 1973) from intestine of *Ophiocephalus punctatus*; *S. taunsaensis* (Ali and Khan, 1976) reported from *Channa gachua* at Taunsa Barrage, Pakistan. Gupta and Sinha, 1980 recorded *S. punctati* and *S. mastacembali* from *O. punctatus* and *M. armatus* respectively. *Senga khami* (Shinde and Deshmukh, 1980) reported from *Ophiocephalus marulius* at Kham river, Aurangabad, India; *S. aurangabadensis* (Jadhav and Shinde, 1980); *S. godavari* (Shinde and Jadhav, 1980); *S. paithanensis* (Kadam, Jadhav and Shinde, 1981) reported from intestine of *Mastacembelus armatus*. Majid and Shinde, 1984 described *S. raoii* and *S. jagannathe* from freshwater fish *Channa punctatus* at Jagannathpur, Orissa. *S. indica* (Gupta and Parmar, 1985) recorded from *M. armatus* at Lucknow India; *S. gangesii* (Gariola and Malhotra, 1986) from *Mystus vittatus* found in Ganga river at Allahabad; *S. pathankotensis* (Duggal and Bedi, 1989); *S. gachuae* (Jadhav, Deshmukh and Gavhane, 1991) reported from *Channa gachua* at Aurangabad, M.S.; *S. maharashtrii* (Jadhav B.V., Gavhane A.B. and Jadhav A.P., 1991) from intestine of *Mastacembelus armatus* at Daryapur; *S. chauhani* (Hasnain M., 1992) from intestine of *Channa punctatus* at Jamshedpur; *S. jhasiensis* (Mathur et al., 1994) from *Mastacembelus armatus* at Jhansi (M.P.), India; *S. mohekarae* (Tat and Jadhav, 1997); *S. chiangmaiensis* (Wangswad, Marayong and Jadhav, 1998); *S. armatusae* (Hiware, 1999); *S. tappi* (Patil and Jadhav, 2003) were reported from *Mastacembelus armatus*; *S. sharpiloi* (Polyakova and Kirin, 2005) reported in *Channa micropeltes*, Vylov-Lennogo of the coast of Singapur. Pande et al., 2006 added *S. ayodhensis* from *Amphinuus cuchia* and *S. baughui* from *Rita rita*. *S. jadhavae* (Bhure et al., 2007); *S. chandkapurensis* (Khadap et al., 2007) reported from freshwater fish *Mastacembelus armatus*. Srivastava et al., (2007) described *S. tictoii* from intestine of *Puntius ticto* at Jhansi, U.P., India. *S. nathsagarensis* (Kankale, 2008); *S. kaigaonensis*, (Wankhede and Reddy, 2009) *S. panzaraensis* (Mangnale and Kalse, 2009); *S. madhavae* (Bhure et al., 2010); *S. satarensis* and *S. mangalbaiiae* (Bhure and Nanware, 2011) were reported from intestine of freshwater fish *Mastacembelus armatus* from different localities of Maharashtra State. Pardeshi and Hiware (2011) recorded *S. rupchandensis* from *Channa straitus* at Jalana, M.S. India. Dhole et al., (2011) reported *S. rostellarae* and *S. chandrashekhari* from *Mastacembelus armatus*. Maharashtra state India. Jadhav et al., (2012) added *S. govindii* from *Mastacembelus armatus* from Sina kolegaon Dam, Osmanabad Dist. (M.S.). *Senga silcharensis* (Puinyabati et al., 2013) reported from intestine of freshwater fish *Channa punctatus* from Chatla Haor, Silchar, Assam. Recently *S. microrostellata* (Bhure et al., 2014); *S. nandedensis* (Fartade Asawari and Fartade Madhukar, 2014); *S.*

rostellata (Deshmukh et.al.,2016) and *S.triangullata* (Nanware et.al.,2016) were reported from *Mastacembelus armatus*.

MATERIALS AND METHODS

During present study, One Hundred Eighty Four cestodes were collected from the One Hundred Twenty Two infected intestine out of Two Hundred Forty examined freshwater fish host *Mastacembelus armatus* (Lecepede, 1800) at Ahmedpur (M.S.) India during the period of February, 2012 to January, 2014. Cestodes are preserved in hot 4% formalin, Eight specimens are stained with Borax carmine, dehydrated in series of 30 %, 50 %, 70%,90% and 100% alcoholic grades, cleared in xylol, mounted in DPX and drawings are done with the help of camera lucida. Photomicrographs were taken by Trinocular computerized Research microscope. All measurements are recorded in millimeters.

RESULTS (Description Based on Eight Specimens)

All the cestodes are consisting of scolex, immature proglottids, mature proglottids and gravid proglottids. Scolex is triangular in shape, narrow anteriorly and broad posteriorly, measures $1.537 (1.272-1.802) \times 0.901 (0.530-1.272)$ mm in length and breadth. Scolex having pair of sessile bothria, which extends from anterior end to posterior end of the scolex. Bothria measures $2.438 (1.06-1.378) \text{ mm} \times 0.424 (0.212-0.636)$ mm in length and breadth. Rostellum present at anterior end of scolex, which is oval to rounded in shape and measures $0.212 (0.190-0.233) \text{ mm} \times 0.450 (0.371-0.530)$ mm in length and breadth. Rostellum is armed with double row of 40-44 hooks, 20-22 hooks in each row, which are measures $0.116(0.106-0.127) \text{ mm} \times 0.015(0.010-0.020)$ mm in length and breadth. Neck is absent. The Mature proglottids are about five times broader than long, measures $0.477 (0.424-0.530) \text{ mm} \times 1.961 (1.908-2.014)$ mm in length and breadth. Testes are medium in size, oval to rounded in shape, pre-ovarian, 50-55 in numbers, measures $0.0371 (0.0318-0.0424) \text{ mm} \times 0.0583 (0.0530-0.0636)$ mm in length and breadth. Cirrus pouch is cylindrical in shape, pre-ovarian in position, located in the centre of the proglottids, measures $0.0742 (0.0636-0.0848) \text{ mm} \times 0.0477 (0.0424-0.0530)$ mm in length and breadth. The cirrus is thin, lies within the cirrus pouch, measures $0.795 (0.0742-0.0848) \text{ mm} \times 0.0159 (0.0106-0.0212)$ mm in length and breadth. Vas deferens is short, thin, straight tube, measures $0.201 (0.190-0.212) \text{ mm} \times 0.0265 (0.0212-0.0318)$ mm in length and breadth. Vagina and cirrus pouch open a common pore as genital pore, which is small in size, oval in shape, measures $0.0265 (0.0212 - 0.0318) \text{ mm} \times 0.0159 (0.0106 - 0.0212)$ mm in length and breadth. Vagina is a thin, tubular, arises from the genital pore, runs posteriorly, slightly curved, forms receptaculum seminis, measures $0.174 (0.159-0.190) \text{ mm} \times 0.0159(0.0106-0.0212)$ mm in length and breadth. Receptaculum seminis is straight tube, short, open into ootype, measures $0.0583 (0.0530 - 0.0636) \text{ mm} \times 0.0265 - (0.0212 - 0.0318)$ mm in length and breadth. Ootype is oval in shape, medium in size, measures 0.0530 mm in diameter. From the ootype ovarian lobes start. Ovary is distinctly bilobed, transversely placed at posterior margin of the segment, each lobe measures $0.397 (0.371-0.424) \text{ mm} \times 0.0848 (0.0424-0.127)$ mm in length and breadth. Vitellaria are follicular, arranged in two rows, on each lateral side from anterior to posterior margin of the proglottids, except genital pore, measures $0.0212(0.0106-0.0318) \text{ mm} \times 0.0159 (0.0106-0.0212)$ mm in length and breadth. Gravid segments are three to four times broader than long, measures $0.530 (0.424-0.636) \text{ mm} \times 1.828 (1.802- 1.855)$ mm in length and breadth.

Uterus is saccular, filled with eggs, measures 0.238(0.212-0.265) mm × 0.742(0.689-0.795) mm in length and breadth. Eggs are elongated, oval in shape, pointed at both ends, measures 0.091(0.084-0.098) mm × 0.039(0.028-0.050) mm in length and breadth. Uterine pore is rounded in shape, lies to words anterior region of the segments.

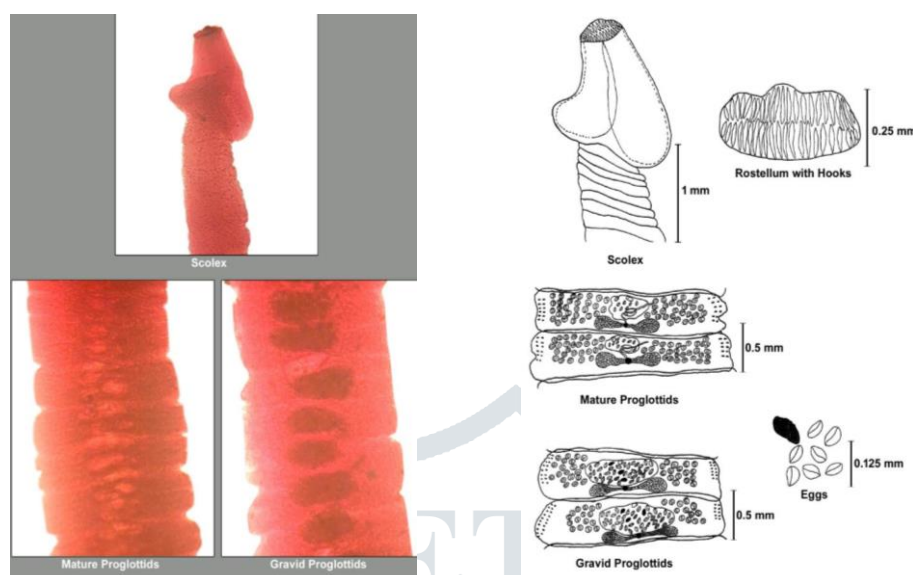


Fig.1: Microphotoplate and Camera Lucida Diagram of *Senga folliculariae* Sp. Nov.

DISCUSSION

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 new cestode comes closer to all known species of the genus *Senga* Dollfus, 1934 in general topography of organs, but differs from *Senga ophiocephalina* Teseng, 1933 in having scolex pear shaped, bothria shallow, neck absent, testes 50-55 in numbers and vitellaria lobate.

The *Senga folliculariae* Sp. Nov. differs from *S. besnardi* Dollfus, 1934 in having triangular scolex, rostellar hooks 50 in numbers, absence of neck, mature proglottid broader than long, testes oval to rounded, 160-175 in numbers, vagina arise posteriorly to cirrus pouch, ovary compact and granular Vitellaria. Present form differs from *S. pycnometra* Woodland, 1934 in having scolex elongated, rostellar hooks 60 in numbers, absence of neck, ovary discontinuous in two groups, granular vitellaria and reported from *Ophiocephalus marulius* at Allahabad, India. It differs from *S. lucknowensis* Johri, 1956 in having body 210-212 mm in size, pear shaped scolex, narrow anteriorly and broad posteriorly, bothria are paired, fleshy, 0.86-1.25 mm in size, rostellar hooks, 36-48 in numbers, absence of neck, immature segment 0.61 × 0.78 mm in size, mature proglottids broader than long, 0.39 × 1.27 mm in size, testes lies in medullary region, numerous, 40 × 43-46 mm in size, cirrus pouch muscular, coiled cirrus, ovary bilobed, each lobe measure 150-190 × 100-113 μ in size, uterus anterior to ovary, it winds anteriorly in irregular fashion making about 7-10 turns, 200-230 μ, vitelline follicles are situated in groups, in cortical parenchyma, eggs oval, thin shelled, without opercula, 46-60 × 24-28 μ and reported from freshwater fish *Mastacembelus armatus* (Lecep); Lucknow, India. The new form *Senga folliculariae* Sp. Nov. differs from *S. malayana* Fernando and Furtado, 1964 in having body measures 9.7-73.8 × 0.7-3.1 mm, scolex tubular, cylindrical or circular, 0.68-1.8 × 0.24-0.35 mm, apical disc 0.15 × 0.23-0.32 mm, rostellar hooks 60 in numbers, 0.006-0.009 mm in size, bothrium

049-0.91 × 0.2-0.225 mm in length and width, absence of neck, mature segments broader than long, proglottids 100-500 in numbers, testes 120-150 in numbers, 0.045 mm in diameter, bilobed ovary, vagina short tube, vitellaria lobate, 0.06 mm, arranged in two groups and reported from freshwater fishes. The present Cestodes differs from *S. parva* Fernando and Furtado, 1964 in having body 5.17 × 0.362-0.832 mm in size, pear shaped scolex, 0.46-0.53 mm, apical disc 0.1-0.12 × 0.12-0.3 mm, hooks 42-44 in numbers, 0.01-0.015 mm, bothrium 0.462-0.465 × 0.15 mm, neck absent, mature segment broader than long, 80-100 in numbers, 0.03-0.075 × 0.09-0.4 mm, testes 150-180 in numbers, globular ovary and granular vitellaria. It differs from *S. filiformis* Fernando and Furtado, 1964 in having body 15-16 × 0.192 mm in size, scolex 0.64-0.3 mm in size, apical disc 0.15 × 0.2 mm, rostellar hooks 55-57 in numbers, 0.005-0.015 mm in size, mature segments more than 70 in numbers, testes 350-370 in numbers, follicular vitellaria, 0.005 mm. The *S. folliculariae* Sp. Nov. differs from *S. pahangensis* Furtado et. al., 1971 in having triangular scolex, rostellar hooks 52 in numbers, mature segments broader than long, testicular lobes lies laterally in the medulla, ovary bilobed, vitellaria lobulate and reported from *Channa micropeltes*. The present tapeworms differs from *S. visakhapattanmensis* Ramadevi et. al., 1973, in having scolex circular, rostellar hooks 46-52 in numbers, absence of neck, testes 50-55 in numbers collected from *Ophiocephalus punctatus* at Visakhapatnam. The present form differs from *S. taunsaensis* Ali and Khan, 1976 due to body 39.150-41.760 × 1.218-1.228 mm in size, rectangular scolex, 0.855-0.955 × 1.152-1.252 mm, bothria two, shallow, 0.099-0.108 mm, apical disc 0.177-0.197 × 0.038-0.051 mm, Rostellar hooks 44-46 in numbers, long rostellar hooks 42-44 in numbers, 0.050-0.082 × 0.010-0.015 mm, while rudimentary hooks 04 in numbers, 0.023-0.041 × 0.008-0.010 mm in size, Mature segments broader than long, testes numerous, 0.033-0.038 mm in size, ovary bilobed, post equatorial, 0.155-0.159 × 0.090-0.094 mm in size, coiled uterus, opens at cirrovaginal apperture, eggs numerous, small in size, oval in shape, 0.043-0.051 × 0.020-0.028 mm and reported from *Channa gachua*, Pakistan. The present cestode *S. folliculariae* Sp. Nov. differs from *S. punctati* Gupta and Sinha, 1980 in having body 150-180 × 1.20-1.49 mm, scolex 0.76-0.78 mm, bothria 0.55-0.58 mm, 28 to 30 hooks, hooks small, neck absent, mature proglottids longer than broad, 1.42-1.46 × 0.062-0.064 mm, interrupted vitellaria, bilobed ovary, 0.17-0.19 × 0.050-0.055 mm, gravid segment 1.21-1.31 × 0.56-0.60 mm in size and collected from intestine of *Ophicephalus punctatus*. *S. folliculariae* Sp. Nov. differs from *S. mastacembali* Gupta and Sinha, 1980 due to worm 180-200 × 1.2-1.38 mm in size, scolex 0.92-0.99 mm in size, bothria 0.79-0.80 mm in size, rostellar hooks 30-36 in numbers, 0.03-0.05 mm in size, mature segments broader than long, 0.235-0.23 × 0.85-0.89 mm in size, subequal ovary, 0.06-0.07 × 0.05-0.55 mm, gravid segments 0.293-0.310 × 0.890-0.895 mm and reported from the intestine of *Mastacembelus armatus*. The new Cestode *S. folliculariae* Sp. Nov. differs from *S. khami* Shinde et. al., 1980 due to body 126.0 × 1.94 mm in size, scolex rectangular, 1.13-1.21 × 0.37-0.39 mm, bothria 0.65 × 0.22 mm, hooks 55-57 in numbers, mature segments broader than long, 1.36 × 1.94 mm in size, testes 155 in numbers, ovary bilobed, post equatorial, 0.73 × 0.35-0.39 mm, vitellaria follicular. It differs from *S. aurangabadensis* Jadhav et. al., 1980 in having scolex oval, rostellar hooks 50-52 in numbers, mature segments two times broader than long, testes 240-260 in number, ovary bilobed, post equatorial, follicular vitellaria. It differs from *S. godavarii* Shinde et. al., 1980 in having hold fast organ pear shaped, testes scattered in two groups, rounded in shape, 220-230 in numbers, cirrus

pouch lies in anterior half of the segments, vagina arise anteriorly to cirrus pouch, follicular vitellaria arranged in three to four rows. *S. folliculariae* Sp. Nov. differs from *S. paithanensis* Kadam et. al., 1981 due to triangular scolex, rostellar hooks 54 in numbers, testes rounded to oval in shape, 130-135 in numbers, lies in two lateral fields, vagina thin, tubular and follicular vitellaria arranged in 2-3 rows. The new Cestode *Senga folliculariae* Sp. Nov. differs from *S. jagannathae* Majid et. al., 1984 due to pear shaped scolex, bothria spoon shaped, two in numbers, rostellar hooks 44 in numbers, testes small in size, rounded in shape and 240-250 in numbers, cirrus pouch oval in shape, ovary compact, spatulate, vagina arises anteriorly to cirrus pouch, granular vitellaria and collected from *Channa punctatus*. It differs from *S. indica* Gupta and Parmar, 1985 in due to size of worms 176×1.32 mm, scolex measure 0.78×0.62 mm in size, bothria 0.62 mm, hooks 36 in numbers, mature segments longer than broad, 1.86×0.44 mm in size, ovary 0.18×0.16 mm in size, gravid segments longer than broad, 1.58×0.26 mm in size. The *S. folliculariae* Sp. Nov. differs from *S. gangesii* Gairola, D. and Malhotra, S.K., 1986 in having body 200 mm in size, hooks 72-75 in numbers, arranged in two semicircle. *The Cestode Senga folliculariae Sp. Nov. differs from S. pathankotensis* Duggal and Bedi, 1989 due to 52 rostellar hooks, ovary bilobed, vitellaria follicular, larger than testes and collected from freshwater fish at Punjab, India.

The present form differs from *S. gachauae* Jadhav et. al., 1991 posseing scolex pear shaped, rostellar hooks 22-25 in numbers, testes oval in shape, scattered in two groups, 60-70 in numbers and reported from *Channa gachua* at Solapur, M.S. India; It differs from *S. maharashtrii* Jadhav et.al., 1991 in having scolex oval, rostellar hooks 45-47 in numbers, absence of neck, testes oval in shape, scattered in two fields, 80-90 in numbers. The *S. folliculariae* Sp. Nov. differs from *S. chauhani* M. Hasnain, 1992 in having holdfast organ oval in shape, large in size, hooks 40-44 in numbers, mature segments broader than long, testes oval in shape, 200-210 in numbers, ovary bilobed, vittelaria follicular, arranged in 4-5 rows and reported from *Channa punctatus* at Jamshedpur. It differs from *S. jhansiensis* Mathur et.al., 1994 in having worm $110-125 \times 0.98-1.23$ mm in size, scolex measure $0.98-1.4 \times 0.23-0.61$ mm, bothria $1.11-1.23 \times 0.001-0.32$ mm, hooks 28-32 in numbers, neck present, mature segments broader than long, $0.26-0.49 \times 0.78-1.23$ mm in size, ovary $0.013-0.021 \times 0.196-0.390$ mm in size and gravid segments broader than long, $0.39-0.58 \times 0.78-1.23$ mm in size. The Cestode *S. folliculariae* Sp. Nov. differs from *S. Chiangmaiensis* Wongsawadet.al., 1998 due to pear-shaped scolex, $0.75-1.54 \times 0.50-1.20$ mm in size, bothria four in numbers occupy major portion of scolex, rostellum lies at the anterior end of the scolex, it consists of 28 rostellar hooks, ovary butterfly-shaped, situated in the posterior third of the proglottid, testes oval in shape, scattered in two fields in the central medulla of segment, 0.03-0.05 mm in diameter, eggs oval to rounded, 0.04-0.05 mm in size and reported from Maesa Stream, Chiang Mai, Thailand. The new cestode differs from *S. armatusae* Hiware, 1999 possessing triangular scolex, rostellar hooks 32-40 in numbers, mature segments four times broader than long, testes small in size, rounded in shape, 230-240 in numbers, vagina arise anteriorly to cirrus pouch, ovary bilobed and post equatorial. It differs from *Senga tappi* Patil et. al., 2003 due to triangular shaped scolex, rostellar hooks 42-44 in numbers, testes oval to rounded, scattered in two fields, 285-295 in numbers, vagina runs anteriorly to cirrus pouch. The present parasites differs from *Senga sharpiloi* Polyakova and Kirin, 2005 possessing medium sized, fusiform body, pyramidal, pear-shaped scolex, apical disc armed, lies at

anterior end of scolex, bothria shallow, oval in shape, rostellar hooks large, 44-50 in numbers, distributed in two semicircle rings, rectangular mature proglottids, testes lies in medullary region of segment, rounded in shape, cirrus pouch small, ovary bilobed, each lobe concted by isthmus, genital pore lies at center dorsal proglottid in its median field ahead ovary, vagina tubular, uterine pore involutive, lies at anterior margin of proglottid, eggs oval in shape, small in size and collected from intestine of *Channa micropeltes* at Singapore. *Senga folliculariae* Sp. Nov. differs from *Senga jadhavae* Bhure et al., 2007 due to triangular shaped scolex, $1.332-1.458 \times 0.258-0.918$ mm in size, rounded rostellum, $0.043-0.061 \times 0.231-0.241$ mm in size, armed with 50-54 hooks, mature segments $0.425-0.480 \times 1.495-1.625$ mm in size, testes small in size, rounded in shape, 310-320 in numbers, $0.020-0.025$ mm, cirrus pouch $0.170-0.180 \times 0.070-0.080$ mm in size, vagina tubular, coiled, $0.245-0.255 \times 0.010$ mm in size, ovary bilobed, $0.095-0.245 \times 0.410-0.425$ mm in size, follicular vitellaria arranged in 4-5 rows. The *Senga folliculariae* Sp. Nov. differs from *Senga tictoii* Shrivastava, 2007 in possessing oval shaped holdfast organ, rostellum bilobed, $0.045-0.061 \times 0.151-0.186$ mm, rostellar hooks 24-28 in numbers, $0.042-0.054$ mm, bothria elongated, deep, $0.452-0.487 \times 0.066-0.077$ mm, proglottids craspedote, $0.251-0.312 \times 0.552-0.672$ mm, testes oval to round, 60-120 in numbers, $0.020-0.026 \times 0.027-0.038$ mm, cirrus sac measure $0.036-0.037 \times 0.037-0.041$ mm in length and width, bilobed ovary measure $0.063-0.103 \times 0.212-0.345$ mm, vagina $0.006-0.007$ mm, receptaculum seminis absent, vitelline follicles corticle, $0.012-0.015 \times 0.018-0.026$ mm, arranged in two lateral bands, uterus median, $0.075-0.244 \times 0.076-0.277$ mm, eggs oval, operculated, $0.020-0.023 \times 0.030-0.033$ mm. The present cestode differs from *Senga nathsagensis* Kankale, due to cone shaped, long, elongated scolex, 0.3494×0.2909 mm in length and width, rostellum lies at anterior end of scolex, round to oval in shape, armed with 30-32 rostellar hooks, mature segments wide as compared to long, 0.213×0.309 mm in size, testes scattered central medulla of segment, 200-250 in numbers, , cirrus sac oval in shape, pre ovarian in position, 0.1697×0.2038 mm in size, cirrus short, curved, 0.1698 mm in size, vagina measures 0.2547 mm, forms seminal receptaculum, which is long, 0.1577 mm in size, ovary bilobed, dumbbell shaped, ootype small, 0.5825 mm, gravid proglottids broader than long, 0.5193×0.9218 mm, uterus sacular, lies at middle region of segment, 0.2111×0.1620 mm, eggs 25-27 in numbers, uterine pore oval, vitellaria follicular and arranged in 2-3 rows. *Senga folliculariae* Sp. Nov. differs from *Senga kaigaonensis*, Wankhede and Reddy, 2009 in possessing triangular shaped holdfast organ, rostellum armed with 36 rostellar hooks, proglottids wider, testes scattered throughout proglottids, 285-295 in number, oval to rounded in shape. The new form differs from *Senga panzaraensis*, Mangale and Kalse, 2009 due to triangular scolex, $0.545 \times 0.116-0.406$ mm in size, bothria two, $0.428 \times 0.161-0.299$ mm, rostellum lies at anterior tip of scolex, oval in shape, 0.054×0.071 mm, armed with 58 rostellar hooks, neck 0.089×0.169 mm in size, mature proglottids wider, $0.179-0.210 \times 1.089$ mm in size, testes small in size, rounded in shape, 40-45 in numbers, 0.017 mm, cirrus sac oval in shape, medium, transversely located, 0.076×0.0402 mm, genital pore small, oval, 0.014×0.031 mm, ovary large, bilobed, $0.084-0.121 \times 0.540$ mm, vagina thin tube, slightly curved, 0.049×0.05 mm, ootype rounded, 0.014 mm. The present tapeworms differs from *Senga madhavae* Bhure et al., 2010 due to triangular hold fast organ, 0.910×0.519 mm in size, rostellum terminate at anterior region of scolex, rounded, 0.101×0.247 mm in size, hooks 40-44 in numbers, mature segments wider, 0.271×2.199 mm in size, small sized testes oval in shape, 200-220 in number,

0.021 × 0.031 mm, Cirrus sac pre-ovarian, lies in middle of segment, 0.058 × 0.024 mm in size, Vagina tubular, 0.094 × 0.009 mm, forms receptaculum seminis, which is straight tube, 0.029 × 0.009 mm in size, dumbbell shaped ovary measures 0.992 × 0.116 mm, granular vitellaria and uterus 0.065 × 0.538 mm. The Cestode varied from *Senga satarensis* Bhure et al., 2011 due to pear shaped hold fast organ, 0.635 × 0.410 mm in size, bothria two, 0.684 × 0.067 mm in size, rostellum located at anterior end of scolex, which is oval to rounded in shape, 0.030 × 0.070 mm in size, rostellar hooks 28-30 in numbers, 0.083 × 0.009 mm long hook, while 0.071 × 0.009 mm short hook, mature segments 6-7 times wider, 0.337 × 1.618 mm in size, testes scattered medulary part of segment, 175-200 in number, oval in shape, 0.024 × 0.019 mm in size, cirrus sac elongated, 0.065 × 0.021 mm in size, Vagina arise from genital pore, tubular, curved, 0.065 × 0.009 mm in size, forms receptaculum seminis, seminal receptaculum 0.021 × 0.014 mm in size, Ovary bilobed, each lobe 0.497 × 0.055 mm in size, granular vitellaria, uterus 0.145 × 0.342 mm in size, sac like and eggs oval, 0.040 × 0.015 mm. The new form *Senga folliculariae* Sp. Nov. differs from *Senga mangalbaiiae* Bhure et al., 2011 in having conical hold fast organ, 2.038 × 0.878 mm in size, paired, fleshy bothria measures 1.662 × 0.349 mm, rostellum located at anterior part of scolex, rounded in shape, 0.116 × 0.266 mm, rostellar hooks 38-42 in numbers, mature segments 2-3 times wider, 0.449 × 1.084 mm, testes located through out proglottid, pre-ovarian in position, oval in shape, 70-80 in numbers, 0.024 × 0.019 mm, cirrus sac elongated, 0.080 × 0.041 mm, cirrus short, 0.084 × 0.009 mm, genital aterium small, 0.019 × 0.012 mm, Vagina thin tubular 0.050 × 0.007 mm, seminal receptacle 0.031 × 0.012 mm, Ootype oval, compact, 0.029 mm, Ovary bilobed, lobe nut shaped, 0.439 × 0.077 mm, uterus sac like, 0.196 × 0.415 mm, eggs non-operculated, oval in shape, 0.034 × 0.016 mm, granular vitellaria arranged in 2-3 rows. The *Senga folliculariae* Sp. Nov. varied from *Senga rupchandensis*, Pardeshi et. al., 2011 in due to flattended, tubular and cylindrical scolex, 0.7159 mm long and 0.2386 mm wide, bothria paired, right bothria 0.4886 × 0.1931 mm in size, left bothria 0.4545 × 0.1477 mm in size, scolex bears rostellum at its anterior end, rostellar hooks, arranged in two semicircle rows, 42-55 in numbers, mature segment wider, 1.2523 × 0.4514 mm in size, testes oval to rounded in shape, 350-370 in number, 0.0922 mm in size, cirrus pouch sac like, oval, 0.05339 × 0.03883 mm, vagina elongated, tubular, 1.0873 × 0.08737 mm, ovary bilobed, right ovarian lobe 0.2184 × 0.07766 mm, left ovarian lobe 0.1601 × 0.1213 mm, vitellaria follicular, eggs oval, non-operculate, 0.01925 × 0.01069 mm. The new form differs from *Senga rostellare*, Dhole et. al., 2011 due to long body, pear shaped hold fast organ, 1.08 × 0.57 mm in size, bothria two, large, right bothria 0.923 × 0.149 mm, left bothria 0.981 × 0.271 mm, rostellum 0.156 × 0.175 mm, armed with a semi circle 41 hooks, hooks 0.051 × 0.004 mm, mature segments medium, quadrangular, 0.745 × 0.942 mm, testes oval to rounded in shape, 217-242 in numbers, 0.039 × 0.038 mm in size, cirrus pouch elongated, oval, 0.942 × 0.105 mm, cirrus short, thin, curved, 0.082 × 0.008 mm, ovary bilobed, each lobe is joined by narrow isthumus, 0.253 × 0.069 mm in size, Vagina 0.302 × 0.008 mm in size, gravid proglottid 0.841 × 0.749 mm in size, uterus sac like, 0.587 × 0.074 mm, eggs oval, operculate, and measures 0.052 × 0.016 mm. *Senga folliculariae* Sp. Nov. varied from *S. chandrashekhari* Dhole et. al., 2011 in due to scolex 1.341 × 0.684 mm in size, bothria two, fleshy, 1.048 × 0.21 mm, rostellum 0.289 × 0.245 mm, hooks 78 in numbers, arranged in a semi circle, 0.399 × 0.003 mm, neck short, 0.1 × 0.28 mm, mature proglottid broader than long, slightly squarish, 0.622 × 1.469 mm, number of testes 98-117, cirrus pouch small, cylindrical, 0.157 × 0.038 mm, ovary

medium, bilobed, transversely placed, 0.135×0.157 mm in size, vagina long, broad tube, 0.442×0.135 mm in size, uterus sac like, 0.653×0.824 mm in size, eggs oval, operculate, and measures 0.035×0.016 mm in size. The *Senga folliculariae* Sp. Nov. varied from *S. govindii*, Jadhav et. al., 2012 in having triangular hold fast organ, 8.54×2.46 mm in size, rostellum, encircled with 45-50 hooks, 6.12×1.28 mm, bothria two, sac like, 2.01×0.72 mm, neck present, 1.52×1.44 mm, mature proglottids rectangular, three times broader than long, 1.77×3.01 mm, testes medium, oval, 100-130 in numbers, 0.05×0.12 mm, cirrus sac oval, 0.22×0.28 mm, cirrus thin tube, 0.19×0.03 mm, ovary bilobed, large, situated middle of the segment, 0.57×0.61 mm, vagina thin tubular, runs posterior to cirrus pouch, 1.75×0.03 mm in size, genital atrium small, rounded in shape, 0.09×0.07 mm in size, gravid proglottids wider, 1.94×5.49 mm in size, uterus sac like, 0.98×1.33 mm in size, eggs 2.25×7.58 mm in size. The new form differs from *Senga silcharensis* Puinyabati, et.al., 2013 in possessing pear shaped hold fast organ, 0.50×0.27 mm, rostellar hooks 0.06×0.005 mm in size, mature and gravid segments broader than long, mature segments $0.12-0.15 \times 0.27-1.10$ mm, gravid segments 0.11×1.21 mm, testes small, rounded, 0.035×0.03 mm, 60 in number, ovary post-equatorial, bilobed, right ovarian lobe $0.07-0.08 \times 0.11-0.12$ mm, left ovarian lobe $0.07-0.10 \times 0.12-0.13$ mm, vitelline follicles 0.02×0.02 mm, eggs $0.025-0.05 \times 0.02$ mm. The new parasites varied from *Senga microrostellata* Bhure et.al., 2014 due to triangular hold fast organ, 1.218×0.686 mm in size, bothria two, sessile, 1.072×0.266 mm, rostellum oval, 0.109×0.206 mm, armed with 18-20 hooks, arranged in a circle, long hooks 0.097×0.009 mm, while short hooks 0.085×0.007 mm, mature proglottids 8-9 times broader than long, 0.211×3.407 mm, Cirrus pouch small, elongated, transversely placed, 0.060×0.029 mm, cirrus 0.038×0.012 mm in size, vas deferens 0.016×0.009 mm, genital atrium 0.016×0.012 mm, vagina measure 0.055×0.012 mm, receptaculum seminis thin, short tube, 0.021×0.012 mm, ootype compact, 0.019 mm in size, Ovary lobed, each lobe join with narrow isthmus, 0.538×0.041 mm, Uterus sac like, 0.050×0.40 mm, eggs 0.044×0.019 mm in size, vitellaria arranged in a line. The present tapeworms varied from *Senga nandedensis* Fartade et.al., 2014 in due to hold fast organ 5.57×3.24 mm, rostellar hooks 60-62 in numbers, 0.083×0.009 mm, bothria paired, 6.38×2.07 mm, mature proglottid wider, 0.89×8.86 mm, testes 150-200 in numbers, 0.20×0.11 mm in size, cirrus pouch oval, medium, 0.13×0.133 mm, cirrus thin tube, 0.09×0.05 mm, ovary measures 2.07×0.038 mm, each lobe connected with narrow isthmus, vagina start from genital pore, 0.61×0.17 mm, genital pore small, rounded, and measure 0.038 mm. *S. folliculariae* Sp. Nov. differs from earlier described *Senga rostellata* Deshmukh et.al., 2016 due to scolex triangular, narrow anteriorly and broad posteriorly, 1.180×0.494 mm, bothria two, 0.983×0.235 mm, rostellum 0.084×0.264 mm, rostellar hooks 20-22 in numbers, 0.088×0.009 mm, neck long, 0.365×0.348 mm, mature segment wide, 0.325×1.236 mm, testes small, oval, pre-ovarian 25-30 in number, 0.056 mm in size, cirrus sac 0.123×0.078 mm, cirrus 0.109×0.016 mm, vas deferens short, thin, straight tube, 0.061×0.028 mm, genital pore small, oval, 0.039×0.028 mm, vagina thin tube, slightly curved, 0.089×0.016 mm, receptaculum seminis straight tube, 0.039×0.028 mm, ootype oval, medium, 0.044 mm, each lobe of ovary measure 0.264×0.067 mm, uterus saccular, filled with 30-35 eggs, 0.280×0.702 mm, Eggs elongated, tapering at both ends, 0.045×0.025 mm, uterine pore rounded, lies at anterior region of proglottids. Present form differs from *S. triangullata* Nanware et.a., 2016 in having scolex 2.388×0.494 mm, rostellum 0.258×0.550 mm, rostellar hooks 28-30 in numbers, mature segments 0.429×2.725 mm, testes $0.045 \times$

0.067 mm, cirrus pouch 0.264×0.107 mm, vagina starts from gonopore, 0.298×0.017 mm, ovary 0.534×0.197 mm, gravid segments broad, measures 0.559×3.162 mm.

Therefore, considering all the above differences, it is proposed to assign to the present form the rank of a new species and named as *Senga folliculariae* Sp. Nov. on account of follicular vitellaria.

Taxonomic Summary

- Genus** : *Senga* Dollfus, 1934
- Species** : *Senga folliculariae* Sp. Nov.
- Host** : *Mastacembelus armatus* (Lecepede, 1800)
- Habitat** : Intestine
- Locality** : Ahmedpur, Latur, Maharashtra State, India.
- Prevalence** : One Hundred Eighty-Four mature cestodes collected from One Hundred Twenty Two infected host out of Two Hundred Forty examined.
- Period of collection**: February, 2012 to January, 2014.
- No. of Specimen** : 184 (One Hundred Eighty-Four)
- Accession number**: PGDZ/YMN/1-08/ February, 2012 to January, 2014
- Deposition** : Department of Zoology (UG & PG), Yeshwant Mahavidyalaya, Nanded.
- Etymology** : The present species is named on account of Follicular vitellaria.

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