

RESEARCH ARTICLE

Senga (Ptychobothridae) Bothriolata a parasite infestation of *Mastacembelus armatus*

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ABSTRACT

The present investigation deals with the systematic observation of Pseudophyllidean tapeworm *Senga bothriolata* *Sp.nov.* from freshwater *Mastacembelus armatus* (Lacepede, 2000). The worm come closer to all species of genus *Senga* in general topography of organs but differs due to the remarkable bothria as a part of scolex, the scolex with bothria and the position of bothria in a particular pattern, upper most portion of scolex terminate into a rostellum which in having a rostellar hook in circular manner. Rostellum with rostellar hooks. The mature proglottids are five times broader than long. The testes are small, circular in structure, 50-60 in number, spread all over in the proglottids. The cirrus pouch is rounded in shape, present in the middle position of the proglottid. The cirrus located in the cirrus pouch. The vas deferens is long. The vagina and cirrus pouch both open common in opening known as genital pore, which is small, oval in shape. The vagina is a thin tube, starting from the genital pore and forms receptaculum seminis, the receptaculum seminis is open into ootype, the ootype is rounded, small in size. The ovary is large, bilobed, dumbbell shaped. The vitellaria are follicular, present on each lateral side of proglottids.

Keywords: *Mastacembelus armatus*, *Senga*.

INTRODUCTION

The genus *Senga* was established by Dollfus (1934), with its type species *S. besnardi* from *Betta splendens* at Vincennes, France. *S. ophiocephalina* Tseng (1933), as *Anchistrocephalus ophiocephalina* from *Ophiocephalus argus* at Taimen, China and identified with a form previously recorded by Southwell (1913) as *Anchistrocephalus polyptera* (*Anchistrocephalus*) *Monticelli* (1890), *Syn. Anchistrocephalus*, Luhe (1999), from *Ophiocephalus striatus* in Bengal, India. *S. pycnomerus* Woodland (1924) as *Bothriocephalus pycnomerus* from *Ophiocephalus marulins* at Allahabad, India. *S. lucknowensis*. Johri (1956) from *Mastacembellus armatus* in India. Fernando and Furtado (1963) recorded *S. malayana* from *Channa striata*, *S. parva* and *S. filiformis* from *Channa micropeltes* at Malacca. Ramadevi and Hanumantrao (1966) reported the *plerocercoid*

of *Senga* sp. from *Panchax panchax*. Tadros (1968) synonymised the genus *Senga* with the genus *Polyonchobothrium* and proposed new combinations for the species, Furtado and Chauhan (1971) reported *S. pahangensis* from *Channa micropeltes* at Tesak Bera. Shinde (1972) redescribed *S. besnardi* from *Ophiocephalus gachua* in India and recently Ramadevi and Rao (1973) reported another species of *S. vishakapatnamensis* India.

Ramadevi (1976) described the life cycle of *S. vishakhapatnamensis* from *Ophiocephalus punctatus* in a lake at Kondakaria, Andhra Pradesh, India. But they do not agree with Tadros Statements. Wardle, McLeod and Radinovsky (1974) put *Senga* as a distinct genus in the family Ptychobothridae. Deshmukh, 1980 reported *S.khami* from *Ophicephalus marulius*, a fresh water fish from Kham river at Aurangabad. Jadhav and Shinde, 1980 reported *S. godavari* from *M. armatus* at Nanded, M.S. India. One more species *S. aurangabadensis* was added by Jadhav and Shinde, 1980 from *M. armatus* at Aurangabad M.S. India. A new addition made by Kadam et al., (1981) as *S. paithaniensis* from host *M. armatus*. Majid et al., (1984) added *S. raoi* and *S. jagannathae* from *Channa punctatus*. Two more new species erected by Jadhav et al., (1991) as *S. maharashtrii* and *S.gachuae* from the intestine of *M. armatus*.

Monzer Hasnain (1992) added *S. chauhani* from *Channa punctatus*. Tat and Jadhav (1997) added new species to the genus as *S. mohekarae* from the Intestine of the *M. armatus*, at Parli, Dist. Beed, M.S. India. Patil and Jadhav added new species to this genus as *Senga tappi* from *M. armatus* in 2003. Pande et al., (2006) added two new species i.e. *S. ayodhensis* from *Amphinuous cuchia* and *S. baghui* 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. *Senga kaigaonensis*, (Wankhede and Reddy, 2009) was recorded from freshwater fish *Mastacembelus armatus* (L.) Kaigaon toka, Dist. Aurangabad (M.S.) India. *Senga madhavae* (Bhure et al., 2010); *Senga satarensis* and *Senga mangalbaiiae* (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. Puinyabati et al. (2013) reported *Senga silcharensis* from intestine of *Channa punctatus* (Bloch) from Chatla Haor, Silchar, Assam. Bhure et al. (2014) described *Senga microrostellata* from *Mastacembelus armatus* at Parabhani (M.S.) India. *Senga nandedensis* described by Fartade and Fartade (2014) from freshwater eel *Mastacembelus armatus* in Godavari river basin (M.S.) India. Deshmukh, V.S. (2015) reported *Senga rostellata* and *Senga tringulata* from freshwater fish *Mastacembelus armatus* in from Nanded (M.S.) India unpublished Ph.D Thesis S.R.T.M. University Nanded Maharashtra state in India. *Senga madhukari* reported by Fartade et al. (2015) from *Mastacembelus armatus* in Godavari basin (M.S.) India. More Recently Fartade and Fartade (2015) described *Senga mastacembelus* from *Mastacembelus armatus* from Godavari Basin (M.S.) India.

MATERIALS AND METHODS

Fourty five species collected from the intestine of fresh water fish *Mastacembelus armatus* from Warkhed, Tehsil Telhara, Dist. Akola (M.S.) India during the period of January 2013 to December 2014.

These Cestodes are preserved in hot 4% formalin and Six 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.

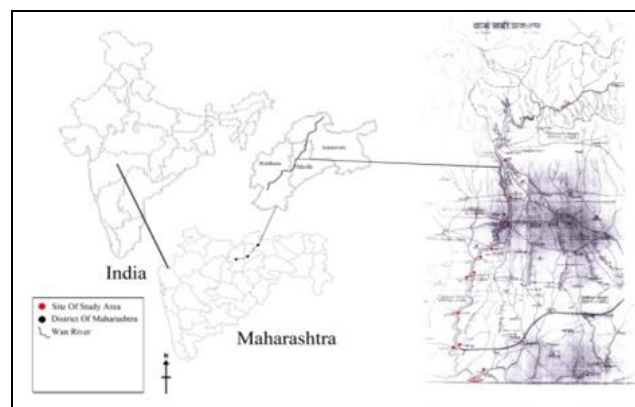


Fig. 1: Map location of survey spots on River Wan and Tributaries



Fig. 2: *Mastacembelus armatus* (Lacepede)

RESULTS AND DISCUSSION:

Description

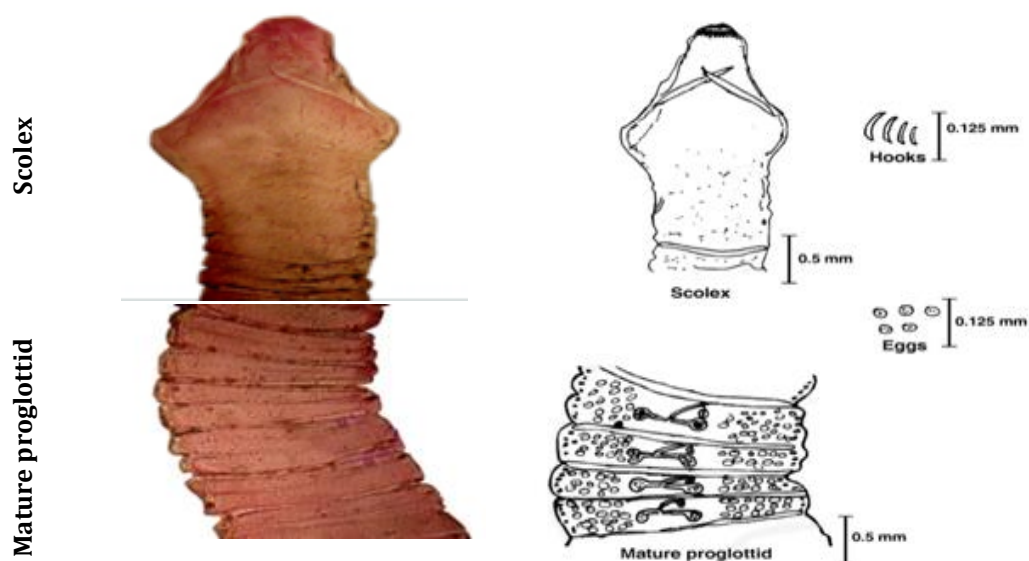
(Based on Six Specimen)

45 Piscean Cestode parasites were collected from the 28 infected intestines out of 59 examined freshwater fish host *Mastacembelus armatus* (Lacepede, 1800) Warkhed, Tehsil Telhara, Dist. Akola (M.S.) India during the period of January 2013 to December 2014. These cestodes are preserved in hot 4% formalin and Six 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.

All the cestodes are long having scolex, immature, mature and gravid proglottids. The scolex having bothria, rostellum with rostellar hooks, narrow anteriorly and broad posteriorly and measures 1.030 (0.970-1.090) in length and 0.360(0.213-0.517) in breadth.

scolex with bothria and the position of bothria in a particular pattern, the upper most portion of scolex terminate into a rostellum which having a rostellar hook in circular manner. Rostellum measure 0.455(0.290-0.621) in length and 0.120(0.090-0.150) in width. Rostellum is armed with 23-25 hooks which measures 0.084 (0.073-0.095) in length and 0.007 (0.006-0.008) in breadth.

The mature proglottids are five times broader than long and measures 0.394 (0.279-0.510) in length and 2.775 (2.450-3.100) in width. The testes are small, circular in structure, 50-60in number, spread all over in the proglottids and measures 0.036 (0.026-0.046) in length and 0.057 (0.051-0.064) in width. The cirrus pouch is rounded in shape, present in the middle position of the proglottid and measures 0.167 (0.155-0.179) in length and 0.076 (0.066-0.086) in width. The cirrus is small, located in the cirrus pouch and measures 0.179 (0.175-0.183) in length and 0.013 (0.009-0.018) in width. The vas deferens is long and measures 0.214 (0.195-0.233) in length and 0.012 (0.008-0.016) in width. The vagina and cirrus pouch both open in common opening known as genital pore,



Photoplate : *Senga bothriolata* sp.nov.

Camera lucida drawing of *Senga bothriolata* sp.nov.

which is small, oval and measures 0.049 (0.042-0.057) in length and 0.033 (0.029-0.038) in breadth. The vagina is a thin tube, starting from the genital pore and forms receptaculum seminis and measures 0.388 (0.324-0.453) in length and 0.015 (0.010-0.020) in width. The receptaculum seminis is open into ootype and measures 0.179 (0.175 - 0.184) in length and 0.031 (0.027 - 0.036) in width. The ootype is rounded, small in size and measures 0.039 in diameter. The ovary is large, clearly bilobed, dumbbell shaped and measures 0.475 (0.451-0.499) in length and 0.240 (0.225-0.256) in width. The vitellaria are follicular, present on each lateral side of proglottids.

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. *S. ophiocephalina* Tseng, 1933, syn. *Anchistrocephalus o. T.*, *A. polyptera* Southwell, 1913 nec *A. polypteri* (Leydig) of Monticelli, 1890, occurs in *Ophiocephalus argus*; Tsinan and Pieping, China.

S. pycnomera (Woodland, 1924), syn. *Bothriocephalus p.W.*, is reported from *Ophiocephalus marulius* at Allahabad, India. Johri, 1956 described *S. lucknowensis* from the spiny eel, *Mastacembelus armatus* Lacep. from Lucknow, India. Subsequently following species of the genus *Senga* were described and furnished information on the diagnostic features of the species by various workers.

The present worm differs from *S. besnardi* in the shape of scolex which is triangular, no. of hooks 50, neck absent, mature segment wider than long. Total number of testes 160-175.

The present cestode differs from *S. ophiocephalina* which shows pear shaped scolex, no. of hooks 47-50 and no. of testes 50-55.

The present tapeworm differs from *S. pycnomeris* in the shape of scolex, elongated scolex bear 68 no. of hooks, mature segments are in distinct.

The present worm differs from *S. lucknowensis* which have pear shaped scolex with 36-48 large hooks.

The present cestode differs from *S. malayana* which shows circular scolex with 60 hooks.

The tapeworm differs from *S. parva* in having pear shaped scolex with 38-40 hooks.

The present cestode differs from *S. pahangensis* in the shape of triangular scolex, no. of hooks 52 neck is short, segmentation clear, proglottids broader than long, testes laterally situated in the proglottids.

The worm differs from *S. vishakapatanamensis* which shows circular scolex, no. of hooks 46-52, two large rudimentary hooks. Neck absent, testes 50-55 in number.

The present worm differs from *S. khami* which have rectangular; pear to oval scolex, shallow bothria, no. of hooks 55-57, short neck, mature segment broader than long, testes rounded 155 in number and arranged in two fields; cirrus pouch is elongated.

The cestode differs from *S. aurangabadensis* which bear oval scolex, two bothria, 50-52 large hooks in two half rows, overlapping on each other, neck absent, mature segment longer than broader. Testes 240-260 in number cirrus pouch is medullary.

The present tapeworm differs from *S. godavarii* which have pear shaped scolex which is broader in center and tapering at anterior and posterior end, bothria present, hooks 40-42 in number arranged in two half rows, which overlap on each other. Neck absent, mature segment broader than long and testes are rounded which are arranged in fields and 220-230 in number, cirrus pouch is oval, situated in anterior half of the segment.

This cestode differs from *S. paithanensis* which shows prominent large triangular scolex with two bothria that extends up to posterior end. no. of hooks are 54 and arranged in two half rows which overlap on each other. Neck is present. Mature segment broader than long. Testes are rounded, oval, 130-135 in number arranged in two lateral groups. Cirrus pouch oval and curved anteriorly to the isthmus of the ovary in the centre of the segment.

The present form differs from *S. raoi* in having pear shaped scolex, hooks 46 in numbers, absence of neck and testes 65-170 in numbers.

The present of cestode differs from *S.jagannathae* in having pear shaped scolex, hooks 44 in numbers and testes 240 - 250 in numbers.

The present parasites differs from *S. gachuae* in having pear shaped scolex, hooks 22-25 in numbers and testes 60-70 in numbers.

The present cestode differs from *S. maharashtrii* which shows muscular scolex; broader anteriorly and narrow posteriorly. Bothria oval and two in number that extends up to the posterior end of the scolex. Hooks 45-46 in number; large and arranged in two half crowns. Neck absent mature segment broader than longer, testes oval 80-90 in no. cirrus pouch small oval in the posterior half of the segment in the medullary region and anterior to the ovary.

The present worm differs from *S.chauhani* in having scolex oval, hooks 40-44 in numbers and testes 200-210 in numbers.

The present cestode differs from *S. mohekarae*, which shows pear shaped scolex, two bothria, extend up to the posterior end, hooks 151 in number. Neck is short and broad, mature segment broader than long, testes 300-310 in number. Cirrus pouch oval and situated in the anterior half of the segment and ovary bilobed, posterior to middle of the segment.

The present Cestodes differs from *S. tappi* which have triangular scolex, bothria two in number and extended from anterior to posterior end of the scolex. Hooks 42-44 in number, neck is very short and squarish. Mature segment three times broader than long, testes small rounded in shape distributed in 2 fields on either side of cirrus pouch oval; pre-ovarian in anterior half of the segment and ovary bilobed elongated post equatorial, medially situated.

The present parasites differs from *S.ayodhensis* in having conical scolex, absence of neck, hooks 29 in numbers.

The present cestode differs from *S.baughi* in having pear shaped scolex, hooks 28 in numbers.

The present worm differs from *S.jadhavae* Bhure et al., 2007 in having scolex triangular, rostellum rounded, rostellar hooks 50-54 in numbers, neck short, testes

small, rounded, ovary bilobed, vagina coiled tube, vitellaria follicular, arranged in 4-5 rows, uterus Saccular and recovered from *Mastacembelus armatus* Aurangabad (M.S.), India .

It differs from *S. chandkapurensis* Kahadap et al.,2007 in having scolex barrel shaped, rostellum armed, rostellar hooks 28-30 in numbers, circularly arranged, neck short, mature proglottid broader than long, testes small, rounded, 170-180 in numbers, anterior to cirrus pouch, Vitellaria granular and reported from intestine of freshwater fish *Mastacembelus armatus* at Chandikapur Dist Bidar, Karnataka, India.

The present form differ from *S. kaigaonensis*, Wankhede and Reddy, 2009 in having scolex triangular, anterior end pointed, rounded and posterior end broad, testes 285-295 in number, cirrus pouch pre-ovarian, obliquely placed and reported form fresh water fish *Mastacembelus armatus* (L.) Kaigaon toka, Dist. Aurangabad (M.S) India.

The present cestode species differs from 25. *Senga madhavae* Bhure et al., 2010 in having Scolex triangular, Rosetellum armed with 40-44 hooks, neck absent, mature proglottids 5-6 times broader than long, Vagina thin tube, Vitellaria granular, uterus Saccular and collected from *Mastacembelus armatus* (Lacepede,1800); Pune (M.S.), India.

The present form differ from *Senga mangalbaiiae* Bhure and Nanware, 2011 in possessing Scolex conical, tapering at the apex and broad at the base, distinctly marked off from the strobilia, uterus Saccular, vitellaria granular, arranged in 2-3 rows and collected from *Mastacembelus armatus* (Lacepede,1800); Osmanabad (M.S.), India.

The reported cestode species differs from *Senga rupchandensis* Pardeshi and Hiware, 2011 in having body long, scolex flat, tubular, cylindrical, scolex bears two bothria, rostellum flat, having two rows of semicircular hooks, 42-55 in number, neck absent, vitellaria follicular, eggs oval, non-operculate and recovered from *Channa striatus* (Bloch, 1793) at Jalna District (M.S.), India.

It differs from *Senga rostellarae* Dhole et al., 2011 in having body long, Scolex pear shaped, medium, elongated, bothria two, large, cirrus pouch elongated,oval, vitellaria follicular, arranged in one

row and collected from intestine of *Mastacembelus armatus* L.; M.S. India.

The present cestode parasite *Senga chandrashekhari* Dhole *et al.*, 2011 in having scolex large, broad at the posterior end, narrow at the anterior end, neck short, testes medium, rounded, 98-117 in numbers, evenly distributed, in two lateral fields, vagina long, broad tube, eggs oval, operculate, and reported from intestine of *Mastacembelus armatus* L.; M.S. India.

It differ from *Senga silcharensis* Puinyabati, Shomorendra and Kar Devashish, 2013 in having Scolex pear shaped, bluntly rounded apically, Anterior region of scolex having rostellum with 44 hooks in two semi-circles, ovary post-equatorial, bilobed, collected from the intestine of *Channa punctatus* (Bloch) from Chatla Haor, Silchar, Assam.

The *S.microtrigularis Sp.nov.* is differ from *Senga 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 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, bothria two, spatulate, neck absent, testes oval, small, 150-200 in numbers cirrus pouch oval, medium ovary small, bilobed, dumbbell shaped vitellaria follicular, arranged in two lateral margin of the segment and reported from *Mastacembelus armatus* in Godavari basin (M.S.) India.

The present form differs from *Senga rostellata* Deshmukh V.S, 2015. The scolex having pair of bothria, which is sessile, extends from the anterior end to posterior end of the scolex. The anterior end of the

scolex terminates in a rostellum, which is oval to rounded in shape. The rosetellum is armed with 20-22 hooks, neck is long, mature proglottids are about three times broader than long, testes are small, oval in shape, pre-ovarian 25-30 in number, scattered in two groups. The cirrus pouch is cylindrical in shape, pre-ovarian in position, situated in the centre of the segment, cirrus is thin, present within the cirrus pouch, vas deferens is short, thin, straight tube, The vagina and cirrus pouch open a common pore known as genital pore, which is small in size, oval in shape, vagina is a thin tube, slightly curved. The receptaculum seminis is straight tube open into ootype. Ootype is oval, medium in size, ovary is distinctly bilobed, The vitellaria are follicular, on each lateral side from anterior to posterior margin of the proglottids and reported from freshwater fish *Mastacembelus armatus* (Lacepede, 1800); Nanded (M.S.) India.

The *S.microtrigularis Sp.nov.* differs from *Senga tringulata* Deshmukh V.S, 2015. scolex having pair of bothria, which are sessile, extends from the anterior end to posterior end of the scolex. Scolex bears rostellum with hooks which are arranged in circle unequal length, neck is absent. The mature proglottids are about 4-5 times broader than long, The testes are medium, oval in shape, 55-60 in number, scattered throughout the proglottids, The cirrus is thin, curved tube, present within the cirrus pouch, vas deferens is short, vagina is a thin tube, ootype is oval, medium in size ,ovary is large, distinctly bilobed, dumbbell shaped , vitellaria are follicular. Eggs are elongated, tapering at both ends and collected freshwater fish host *Mastacembelus armatus* (Lacepede, 1800) at Hadgaon Dist. Nanded (M.S.).

The present form differs from *Senga mastacembelusae* having scolex triangular, hooks 20-22. Mature segment rectangular, genital pore rounded, which are reported from *Mastacembelus armatus* in India

It differs from *Senga madhukarii* Fartade, A. (2015) in scolex is large and well developed, cylindrical in shape, scolex bear rostellum armed with hook 45 in numbers. The bears two bothria spatulated overlapping each other, long extend upto posterior end of scolex, neck is absent, the testes are oval in shape, medium in size 130 in numbers spread in the segment at each side of the ovary. The cirrus pouch is oval medium in size, anterior to ovary, situated in the middle of the segment. Ovary is bilobed each lobe is different with

long isthmus. Vitellaria are follicular arranged in two to three rows at each lateral margin of the segment and reported from *Mastacembelus armatus* (Lacepede, 1800); Godavari basin Maharashtra India.

Senga bothriolata Sp.nov. differs from earlier described *Senga microtrigularis* Sp.nov. (2016) In having The scolex is small and triangular, acute at anterior side and broad at posterior side, scolex having rostellum and bears pair of bothria, starting from the anterior end and terminate into posterior end of the scolex, The neck is long and broad, The testes are minute, rounded in shape, 50-55 in number, scattered in two groups . The cirrus pouch is cylindrical in shape, present in the middle position of the proglottid. Ovary is bilobed , Genital pore is minute in size, vagina is a thin tube, vitellaria are granular, on each lateral side margin of the proglottids and reported from *Mastacembelus armatus* (Lacepede, 1800); Wan river at Takali, Tehsil Sangrampur, Dist Buldhana (M.S.) India.

The above noted characters are valid enough to erect a new species hence the name *Senga bothriolata* Sp.nov. is proposed after the remarkable bothria as a part of scolex

Conflicts of interest: The authors stated that no conflicts of interest.

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