Two Pseudophyllidean Tapeworms from Fresh Water Fish

*Mastacembelus armatus* of Maharashtra State (India)

with Revised Key to Species of Genus *Senga*

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Abstract: The present investigation deals with the taxonomic evaluation of two species of the tapeworm of the genera *Senga* (Cestoda:Pseudophyllidea) from freshwater fish *Mastacembelus armatus* of Maharashtra State provided new data on their morphology. The *Senga rostellare* Sp. Nov. and *Senga chandrashekhari* Sp. Nov. differs from each other by the shape of the body, scolex and morphology of internal organs.

Key words: Pseudophyllidean Tapeworm %Mastacembelus Armatus %Maharashtra State

INTRODUCTION


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**MATERIALS AND METHODS**

For the taxonomical study of tapworms, the fishes were collected from different places during the period of Oct. 2008 - Sept. 2010 of Maharashtra state. The hosts are easily identified by Day [39]. The viscera were brought to the laboratory immediately, repeatedly washed in cold saline, cut and observed under binocular microscope. The collected worms were washed in distilled water and fixed in hot 4 % formalin for specific identification. The flattened parasites were washed thoroughly under running tap water and subjected to Haematoxylin stain. All drawings were made with the aid of camera lucida [40]. All measurements are in millimeters, unless otherwise indicated. The identification is made with the help of “Systema Helminthum” by [41].

**Description**

*Senga Rostellarae* Sp. Nov: Description is based on fourteen specimens of this species, the complete strobilae measure 47 mm in length and 5.44 in width. All tapeworms are long, consisting of scolex, immature, mature and gravid proglottids. Scolex is pear shaped, medium in size elongated antero-posteriorly, broad posteriorly and narrow anteriorly. It measures 1.08mm (0.931-1.242) in length 0.57mm (0.535-0.605) in breadth. Scolex bears two lateral side bothria, large in size arising from anterior margin, anterior tip of the scolex extending posterioly and become wide and large. Right bothria measures 0.923mm in length and 0.149mm in width whereas left bothria measures 0.981mm in length and 0.271mm in width. Anterior end of scolex bears rostellum, it measures 0.156mm (0.145-0.167) in length and 0.175mm (0.166-0.184) in width which is armed with a semi circle of 41, strong, elongated hooks. The central hooks are larger in size gradually becoming short, it measures 0.051mm (0.061-0.042) in length and 0.004mm (0.003-0.006) in width. Neck is absent.

All segments, right from the base of the scolex up to the end of the strobila are much broader than long, including immature segments and partly mature segments. In immature segments there is no trace of any reproductive organ and in the partly mature segment besides the developing ovary, there is vitelline follicle. In more differentiated segment the vitelline follicles appear to be arranged in clusters at the lateral fields and the testes appear to occupy the medullary region around the ovarian lobes.

Mature segments are medium in size with almost straight lateral margin, almost quadrangular in shape, slightly broader than long, it measures 0.745mm (0.645 - 0.846) in length and 0.942mm (0.912 - 0.973) in width.

Testes are medium in size, rounded in shape, 234mm (217-242) in numbers, almost in single field, crowded together overlapping on each other; it measures 0.039mm (0.036-0.043) in length and 0.038mm (0.033-0.043) in width. Cirrus pouch situated just anterior to the isthmus, antero posteriorly elongated, almost oval in shape, medium in size, slightly obliquely situated, it measures 0.942mm (0.912-0.973) in length and 0.105mm (0.096-0.114) in width. The cirrus is short, thin, curved, present within cirrus pouch, it measures 0.082mm (0.078 - 0.096) in length and 0.008mm (0.007 - 0.009) in width and forms vas deferens. Vas deferens is short, thin, slightly transversely situated, measures 0.082mm (0.078 - 0.087) in length and 0.008mm in width. The vagina and cirrus pouch open in a common pore known as genital pore, medium in size, almost round in shape and opens ventrally, which is situated central anterior to the isthmus, it measures 0.008mm in length and 0.017mm in width.

Ovary is medium in size, distinctly bilobed, transversely situated in the posterior region 1/3rd of segment, ovarian lobes with irregular margin, big in size, antero posteriorly elongated, each lobe with 2- 3 blunt, round acini, it measures 0.253mm (0.236 - 0.271) in length and 0.069mm (0.061 - 0.078) in width. The isthmus is connecting the two ovarian lobes, slightly curved, uneven in width, transversely placed, near posterior margin; it measures 0.148mm (0.140 - 0.157) in length and 0.012mm (0.009 - 0.015) in width. Vagina arises from the genital pore thin tube, slightly curved, runs posteriorly crosses the isthmus and open in to ootype, measures 0.302mm (0.298 - 0.307) in length and 0.008mm in width. The ootype is medium in size, transversely elongated, situated just posterior to the isthmus, it measures 0.125mm in diameter. The vitellaria are follicular in one row, on each lateral side of the segment from anterior to posterior margin of the segment.
Gravid segment is slightly longer than broad, it measures 0.841 (0.824 - 0.859) in length and 0.749mm (0.719 - 0.780) in width. The uterus which is sac like, it measures 0.587mm (0.578 - 0.596) in length and 0.074mm (0.070 - 0.078) in width. The eggs are oval and operculated. It measures 0.052mm (0.049 - 0.056) in length and 0.016mm (0.015 - 0.018) in width.

Taxonomic Summary:

Genus : Senga [1]
Type Species : Senga rostellarae Sp. Nov.
Host : Mastacembelus armatus L.
Habitat : Intestine
Locality : Ahmednagar, Aurangabad, Latur, Kolhapur, Solapur
Accession Number : HRL/2008-10/1-5
Holotype : Deposited in the Helminthology pouch; it measures 0.096mm (0.087 - 0.105) in length and 0.038mm (0.035 - 0.043) in width. The cirrus pouch is small in size, cylindrical in shape, centrally placed antero - posteriorly elongated, opens anteriorly, situated either to the left or to the right of the midline of the segment, it measures 0.157mm (0.149 - 0.166) in length and 0.038mm (0.036 - 0.041) in width. The cirrus is thin, present within the cirrus pouch; it measures 0.096mm (0.087 - 0.105) in length and 0.008mm in length and 0.008mm in width and forms vas deferens. The vas deferens is thick, broad, slightly curved, long runs posteriorly. The vagina and cirrus pouch open in a common pore known as genital pore, large in size, oval in shape, it measures 0.012mm (0.008-0.017) in length and 0.039mm (0.035-0.043) in width.

Etymology : Named after having the specific type of rostellum.

**Senga Chandrashekhari Sp. Nov:** Description is based on seven specimens of this species; the entire tapeworm is long, consisting of scolex, immature, mature and gravid proglottids. Scolex is large in size broad at the posterior end, narrow at the anterior end; it measures 1.341mm (1.245 - 1.438) in length 0.68 4mm (0.561 - 0.807) in width. The scolex is having two fleshy bothria, almost cover the whole scolex, large in size arising from anterior margin, anterior tip of the scolex extending posteriory and become wide and large, it measures 1.048mm (0.912 - 1.184) in length 0.21mm (0.122 - 0.298) in width. Anterior end of scale is terminated with rostellum, it measures 0.289mm (0.280 - 0.298) in length and 0.245mm (0.236 - 0.254) in width which is elongated bears 78 lanceet shaped hooks, which are arranged in a semi circle, it measures 0.399mm (0.282 - 0.567) in length and 0.003mm (0.002 - 0.005) in width. Neck is short it measures 0.1mm (0.096 - 0.105) in length and 0.28mm (0.271 - 0.289) in breadth.

All the segments, right from the base of the scolex up to the end of the strobila are much broader than long, including immature segments and partly mature segments. In immature segments there is no trace of any reproductive organ and in the partly mature segment besides the developing ovary, vitelline follicle are observed which arranged in the lateral fields of the proglottids.

The mature segment is broader than long, slightly squarish it measures 0.622mm (0.596 - 0.649) in length and 1.469mm (1.421 - 1.517) in width. Testes are medium in size, round in shape, 98 - 117 (112) in number, evenly distributed in two lateral fields; it measures 0.056mm (0.054 - 0.059) in length and 0.041) in width. The cirrus pouch is small in size, posteriorly opens anteriorly, situated either to the left or to the right of the midline of the segment, it measures 0.846mm (0.807-0.885) in length and 0.941mm (1.421-1.462) in width. The uterus which is sac like, filled with numerous eggs, it measures 0.653mm (0.631 - 0.675) in length and 0.824mm (0.824 - 0.833) in width. The eggs are oval and operculated it measures 0.035mm (0.021-0.043) in length and 0.016mm (0.015 - 0.018) in width.
Taxonomic Summary:

**Genus** : *Senga* [1]
**Type Species** : *Senga chandrashekhari* Sp. Nov.
**Host** : *Mastacembelus armatus* L.
**Habitat** : Intestine
**Locality** : Osmanabad, Latur, Jalgaon, Buldhana, Parbhani, Beed, (M.S.)
**Accession Number** : HRL/2008-10/1-5
**Holotype** : Deposited in the Helminthology Research Lab.
**Paratype** : Department of Zoology, Dr. B.A.M.U. Aurangabad, (M.S.) India
**Etymology** : Named in Honour of Prof. Chandrashekhar J. Hiware

**DISCUSSION**

*Senga Rostellarae* Sp. Nov: The genus *Senga* was established by Dollfus in 1934 with the type species *Senga besnardi* from *Betta splendens*. The present worm comes closer to all the known species of the genus *Senga* [1] in general topography of organs differs due to some characters from following species.

The present tapeworm differs from *S. besnardi* [1] in the shape of scolex (pear shaped Vs triangular), hooks (41 Vs 50) in numbers, testes (234 Vs 160-175) in numbers and ovary (distinctly bilobed Vs compact). The present tapeworm differs from *S. ophiocophalina* [2] in number of hooks (41 Vs 47-50) and testes (234 Vs 50-55) and in numbers and shape of vitellaria (follicular Vs lobate). The present tapeworm differs from *S. peynomera* [6] the shape of scolex (pear shaped Vs elongated), number of hooks (41 Vs 68) and testes (234 Vs 120 - 150) in numbers and shape of vitellaria (follicular Vs granular). The present tapeworm differs from *S. lucknowensis* [7] in number of testes (234 Vs 100 - 150), in shape of mature segment (quadrangular Vs broader than long) and vitellaria (follicular Vs lobate) and discontinuous in two groups. The present tapeworm differs from *S. malayana* [8] in scolex shape (pear shaped Vs circular), hooks (41 Vs 60) testes (234 Vs 120 - 150) in number, vitellaria (follicular Vs lobate) discontinuous in two groups and mature segment (quadrangular Vs acraspedote). The present tapeworm differs from *S. parva* [8] in hooks (41 Vs 38-40), testes (234 Vs 150 - 180) in numbers, (quadrangular Vs rectangular) and vitellaria (follicular Vs granular). The present tapeworm differs from *S. filiformis* [8] having scolex (pear shaped Vs rectangular), hooks (41 Vs 51 - 52), testes (234 Vs 17-21) in number, mature proglottids (quadrangular Vs rectangular) and vitellaria (follicular VS lobate). The present tapeworm differs from *S. pahangensis* [11] in having scolex (pear shaped Vs triangular), hooks (41 Vs 52) and vitellaria (follicular Vs lobulated). The present tapeworm differs from *S. visakhapatanamensis* [13] in having scolex (pear shaped Vs circular), testes (234 Vs 50-55) in number and vitellaria (follicular Vs lobulated). The present tapeworm differs from *S. khani* [16] having scolex (pear shaped Vs rectangular), hooks (41 Vs 55-57) and testes (234 Vs 155) in numbers. The present tapeworm differs from *S. aurangabadensis* [17] in having scolex (pear shaped Vs Oval), hooks (41 Vs 50-52), testes (234 Vs 240-260) in number and mature segment (quadrangular Vs longer than broad). The present tapeworm differs from *S. godavari* [18] in having mature segment (quadrangular Vs broader than long) and cirrus pouch (antero-posteriorly elongatedVs oval). The present tapeworm differs from *S. paithanensis* [19] which is scolex (pear shaped Vs triangular), hooks (41 Vs 54) and testes (234 Vs 240-260), neck (absent Vs present) and mature segment (quadrangular Vs broader than long). The present tapeworm differs from *S. raoi* [20] in having neck (absent Vs present), testes (234 Vs 65-170) in numbers and mature segment (quadrangular Vs broader than long). The present tapeworm differs from *S. jagannathae* [20] in having neck (absent Vs present), mature segment (quadrangular Vs broader than long) and ovary (distinctly bilobed Vs compact). The present tapeworm differs from *S. gachuae* [21] in having hooks (41 Vs 22-25) neck (absent Vs present), testes (234 Vs 60-70) in numbers and mature segment (quadrangular Vs broader than long). The present tapeworm differs from *S. maharashtrii* [22] which scolex (pear shaped Vs oval), testes (234 Vs 80-90) in numbers and mature segment (quadrangular Vs broader than long). The present tapeworm differs from *S. chaunani* [23] in having scolex (pear shaped Vs oval), testes (234 Vs 200-210) in numbers and vitellaria (follicular Vs lobate). The present tapeworm differs from *S. mohekarae*, [24] which shows scolex (pear shaped Vs medium oval), hooks (41 Vs 151), testes (234 Vs 300 - 310), neck (present Vs absent) and mature segment (quadrangular Vs three times broader than long). The present tapeworm differs from *S. chaingmaiensis* [25] in having scolex (pear shaped Vs triangular) hooks (41 Vs 28) in number, neck (absent Vs present) mature proglottids (quadrangular Vs broader than long) and vitellaria (follicular Vs granular). The present tapeworm differs from *S. armatusae* [26] in having scolex (pear shaped Vs triangular), mature segment four times...
(quadrangular Vs broader than long). The present tapeworm differs from *S. tappi* [27] which is having scolex (pear shaped Vs triangular), neck (absent Vs present), testes (234 Vs 285-295) in numbers and mature segment (quadrangular Vs three times broader than long). The present tapeworm differs from *S. ayodhensis* [29] in having scolex (pear shaped Vs conical), hooks (41 Vs 29) in numbers and mature segment (quadrangular Vs broader than long). The present tapeworm differs from *S. baughii* [29] in having hooks (41 Vs 28) in numbers, neck (absent Vs present), testes (234 Vs 40-50) in numbers and mature segment (quadrangular Vs broader than long). The present tapeworm differs from the species *S. jadhavae* [30] having scolex (pear shaped Vs triangular), hooks (41 Vs 50-54) in number, testes (234 Vs 120-150) in number and mature proglottids (quadrangular Vs three times broader than long). The present tapeworm differs from *S. ticotii* [31] scolex (pear shaped Vs oval), rostellar hooks (41 Vs 24-28) in number, mature proglottids (quadrangular Vs broader than long) and testes (234 Vs 60-120). The present tapeworm differs from *S. Chandikarpurensis* [32] having scolex (pear shaped Vs barrel shaped), hooks (41 Vs 28 - 30), testes (234 Vs 170 - 180) and mature proglottids (quadrangular Vs broader than long). The present tapeworm differs from *S. Kaigaonensis* [33] having neck (absent Vs present) hooks (41 Vs 30-32) in number and mature proglottids (quadrangular Vs longer than broader). The present tapeworm differs from *S. kadiakarpurensis* [34] having scolex (pear shaped Vs triangular shaped), testes (234 Vs 285-295) in number and mature proglottids (quadrangular Vs three times broader than long). The present tapeworm differs from *S. Panzaraensis* [35], having scolex (pear shaped Vs triangular), hooks (41 Vs 58), neck (absent Vs present), testes (234 Vs 40 - 50), vitellaria (folicular Vs granular). The present tapeworm differs from *S. Govindi* [36] having scolex (pear shaped Vs barrel shaped), mature proglottids (quadrangular Vs broader than long), testes (234 Vs 318 - 320) in number and vitellaria (folicular Vs granular thin strips). The present tapeworm differs from *S. Madhavae* [37] having scolex (pear shaped Vs triangular), mature proglottids (quadrangular Vs 5 - 6 times broader than long) and vitellaria (folicular Vs granular). The present tapeworm differs from *Senga rupchandensis* [38] having scolex (pear shaped Vs tubular), testes (234 Vs 350-370) in number.

Some additional and differentiating characters are given in the comparative chart at the end. In above aforesaid discussion on the present parasite deserves status of a new species and named *Senga rostellarae* Sp. Nov. having specific type of rostellum.

**Senga Chandrashekhar* Sp. Nov:** The present tapeworm differs from *S. besnardi* [1] in the shape of scolex (oval Vs triangular), hooks (78 Vs 50) in numbers, testes (112 Vs 160-175) in numbers and ovary (medium bilobed Vs compact). The present tapeworm differs from *S. ophiocephalina* [2] in having scolex (oval Vs pear shaped) hooks (78 Vs 47-50), testes (112 Vs 50-55) in numbers and vitellaria (folicular Vs lobate). The present tapeworm differs from *S. pcynomera* [6] in having scolex (pear shaped Vs elongated), hooks (78 Vs 68), testes (112 Vs 120-150) in numbers and vitellaria (folicular Vs granular). The present tapeworm differs from *S. lucknowensis* [7] in having scolex (oval Vs pear shaped), hooks (78 Vs 36 - 48), testes (112 Vs 100 - 150) in numbers, vitellaria (folicular Vs lobulate) and discontinuous in two groups.

The present tapeworm differs from *S. malayana* [8] in having scolex (oval Vs circular), hooks (78 Vs 60) testes (112 Vs 120 - 150) in number, vitellaria (folicular Vs lobate) and mature segment (broader than long Vs acraspedote). The present tapeworm differs from *S. parva* [8] in having scolex (oval Vs pear shaped), hooks (78 Vs 38-40), testes (112 Vs 150 - 180) in numbers, (broader than long Vs rectangular) and vitellaria (folicular Vs granular). The present tapeworm differs from *S. filiformis* [8] having scolex (oval Vs rectangular), neck (present Vs absent), hooks (78 Vs 51 - 52), testes (112 Vs 17 - 21) in number, mature proglottids (broader than long Vs rectangular) and vitellaria (folicular Vs lobate). The present tapeworm differs from *S. Pahangensis* [11] in having scolex (oval Vs triangular), hooks (78 Vs 52) and vitellaria (folicular Vs lobulated). The present tapeworm differs from *S. visakhapatanensis* [13] in having scolex (oval Vs circular), neck (present Vs absent), testes (112 Vs 50-55) in number and vitellaria (folicular Vs lobulated). The present tapeworm differs from *S. Khani* [16] having scolex (pear shaped Vs rectangular), hooks (41 Vs 55-57) and testes (234 Vs 155) in numbers and arranged in two fields. The present tapeworm differs from *S. Aurangabadensis* [17] in having scolex (oval Vs Oval), neck (present Vs absent), hooks (78 Vs 50-52) and testes (112 Vs 240-260) in number. The present tapeworm differs from *S. Godavari* [18] in having scolex (oval Vs pear shaped), neck (present Vs absent), hooks (78 Vs 40 - 42) and testes (112 Vs 220 - 230) in number. The present tapeworm differs from *S. Paithanensis* [19] in which scolex (oval Vs triangular), hooks (78 Vs 54) and testes (112 Vs 240-260). The present tapeworm differs from *S. Raoi* [20] in having scolex (oval Vs pear shaped), neck (present Vs absent), hooks (78 Vs 46) and testes (112 Vs 65-170) in numbers. The present tapeworm differs from *S. Jagannathae* [20] in having scolex (oval Vs pear shaped), hooks (78 Vs 44), testes

(112 Vs 240-250) ovary (bilobed Vs compact). The present tapeworm differs from S. gachuae [21] in having scolex (oval Vs pear shaped), hooks (78 Vs 22-25) and testes (112 Vs 60-70) in numbers. The present tapeworm differs from S. maharashtrii [22] which neck is (present Vs absent), bothria (fleshy Vs oval), hooks (78 Vs 45 - 47) and testes (112 Vs 80-90) in numbers. The present tapeworm differs from S. chaunhani [23] in having hooks (78 Vs 40 - 44), testes (112Vs 200-210) in numbers and vitellaria (follicular Vs lobate). The present tapeworm differs from S. mohekarae, [24] which shows hooks (78 Vs 151), testes (112 Vs 300 - 310) in number and mature segment (slightly broader than long Vs three times broader than long). The present tapeworm differs from S. chandikarpurensis [32] having scolex (oval Vs pear shaped), hooks (78 Vs 22-25), mature proglottids (slightly broader than long Vs longer than broader) and testes (112 Vs 200 - 250). The present tapeworm differs from S. chandrashekhari Sp. Nov. having scolex (oval Vs triangular), neck (present Vs absent), hooks (78 Vs 285 -295) in number and mature proglottids (slightly broader than long Vs three times broader than long). The present tapeworm differs from S. arohina [25] in having scolex (oval Vs triangular) hooks (78 Vs 28) in number and vitellaria (follicular Vs granular). The present tapeworm differs from S. armatusae [26] in having scolex (oval Vs triangular), neck (present Vs absent), hooks (78 Vs 32 - 40) and testes (112 Vs 230 - 240) in number. The present tapeworm differs from S. tappi [27] which is having scolex (oval Vs triangular), hooks (78-42-44), testes (112 Vs 285-295) in numbers and mature segment (slightly broader than long Vs three times broader than long). The present tapeworm differs from S. ayodhensis [29] in having scolex (oval Vs conical), neck (present Vs absent) and hooks (78 Vs 29). The present tapeworm differs from S. baughhi [29] in having scolex (oval Vs pear shaped), hooks (78 Vs 28) in numbers, testes (112 Vs 40-50) in numbers and ovary (bilobed Vs oval). The present tapeworm differs from the species S. jadhavae [30] having scolex (oval Vs triangular), hooks (78 Vs 50-54) in number, testes (112 Vs 120-150) in number and mature proglottids (broader than long Vs three times broader than long). The present tapeworm differs from S. tictoi [31] scolex neck (present Vs absent), hooks (78 Vs 24 - 28) in number and testes (112 Vs 60 - 120) in number. The present tapeworm differs from S. chandikarpurensis [32] having scolex (oval Vs barrel shaped), hooks (78 Vs 28 - 30) and testes (112 Vs 170- 180) in number. The present tapeworm differs from the species S. nathsagarensis [33] having scolex (oval Vs barrel shaped), hooks (78 Vs 30 -32), mature proglottids (slightly broader than long Vs longer than broader) and testes (112 Vs 200 - 250). The present tapeworm differs from S. madhavae having scolex (oval Vs barrel shaped), hooks (78 Vs 50 - 53) testes (112 Vs 318 - 320) in number and vitellaria (follicular Vs granular thin strips). The present tapeworm differs from S. madhavae [37] having scolex (oval Vs triangular), mature proglottids (slightly broader than long Vs 5 - 6 times broader than long) and vitellaria (follicular Vs granular). The present tapeworm differs from Senga rupchandensis [38] having scolex (Oval Vs tubular), hooks (78 Vs 41 -52) in number, testes (112 Vs 350-370) in number. The present tapeworm differs from S. rostellarense Sp. Nov. having scolex (oval Vs pear shaped), neck (present Vs absent), hooks (78 Vs41) in number, mature proglottids (broader than long Vs quadrangular) and testes (112 Vs 234) in number.

Some additional and differentiating characters are given in the comparative chart at the end. In above aforesaid discussion on the present parasite deserves status of a new species and named Senga chandrashekhari Sp. Nov. propose in honour of Prof. C. J. Hiware an eminent Helminthologist.
REFERENCES


