

**Two Pseudophyllidean Tapeworms from Fresh Water Fish
Mastacembelus armatus of Maharashtra State (India)
with Revised Key to Species of Genus *Senga***

J.S. Dhole, B.V. Sonune, Y.R. Reddy and R.J. Chavan

Department of Zoology, Dr. B. A. Marathwada University Aurangabad (M.S.) India

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

The genus *Senga* was established by Dollfus [1] with its type species *S. besnardi* from *Betta splendens*. The fighting fish in an aquarium at Vincennes, France. *S. ophioccephalina* [2] as *Anchistrocephalus ophioccephalina* from *Ophioccephalus argus* at Taimen, China and identified with a form previously recorded by Southwell [3] as *Anchistrocephalus polyptera* (*Anchistrocephalus*) [4] Syn. *Anchistrocephalus* [5] from *Ophioccephalus striatus* in Bengal, India. *S. pycnomera* [6] as *Bothriocephalus pycnomera* from *Ophioccephalus marulius* at Allahabad, India. *S. lucknowensis* [7] from *Mastacembelus armatus* in India. Fernando and Furtado [8] recorded three new species like *S. malayana* from *Channa striata*, *S. parva* and *S. filiformis* from *Channa micropeltes* at Malacca. Ramadevi [9] reported the plerocercoid of *Senga* sp. from *Panchax panchax*. Tadros [10] synonymised the genus *Senga* with the genus *Polyonchobothrium* and proposed new combinations for the species. Furtado and Chauhan [11] reported *S. pahangensis* from *Channa micropeltes* at Tesak Bera. Shinde [12] redescribed *S. besnardi* from *Ophioccephalus gachua* in India. Ramadevi and Hanumanthrao [13] reported another species of *S. visakhapatnamensis* India. Ramadevi [14] described the life cycle of *S. visakhapatnamensis* from *Ophioccephalus punctatus* in a lake at Kondakaria andhra Pradesh, India. But they do not agree with Tadros

statements. Wardle, Mcleod and Radinovsky [15] put *Senga* as a distinct genus in the family *Ptychobothridae*. Shinde and Deshmukh [16] reported *S. khami* from *Ophioccephalus marulius*, a fresh water fish from Kham river at Aurangabad. Jadhav and Shinde [17] reported *S. aurangabadensis* from *M. armatus*. Later on Shinde and Jadhav [18] *S. godavari* from *M. armatus*. A new addition made by Kadam, Jadhav and Shinde [19] as *S. paithaniensis* from host *M. armatus*. Majid and Shinde [20] added *S. raoi* and *S. jagannathae* from *Channa punctatus*. Jadhav [21] *S. gachuae* from the intestine of *Channa gachua*. Jadhav, Gavhane and Jadhav [22] these authors one more added new species i.e. *S. maharashtrii* from *M. armatus*. Monzer [23] added *S. chauhani* from *Channa punctatus*. Tat and Jadhav [24] added *S. mohekarae* from the intestine of the *M. armatus*. Wongswad and Jadhav [25] recorded *S. chaingmaiensis* from *Mastacembelus armatus*. Later on Hiware [26] added one species *S. armatusae* from *Mastacembelus armatus*. Patil and Jadhav [27] added *Senga tappi* from *M. armatus*. Jadhav [28] made the review article of the genus *Senga* from freshwater fishes from Maharashtra state. Pande, Mamta and Neetu [29] added two new species i.e. *S. ayodhensis* from *Amphinuus cuchia* and *S. baghui* from *Rita rita*. Bhure, Padwal and Jadhav [30] *S. jadhavae* from *Mastacembelus armatus*. Shrivastav and Singh [31] added *S. tictoi* from *Mastacembelus armatus*. Khadap [32] added *S. chandikarpurensis* *Mastacembelus armatus*. Kankale [33] *S. nathsagarensis* from *Mastacembelus armatus*.

Corresponding Author: J.S. Dhole, Department of Zoology, Dr. B. A. Marathwada University Aurangabad (M.S.) India.

Wankhede and Reddy [34] added *S. kaigaonensis* from *Mastacembelus armatus*. Mangale and Kalse [35] *S. panzaraensis* from *Mastacembelus armatus*. Later on added species *S. govindi* [36] from the intestine of *Mastacembelus armatus*. Later on Bhure [37] added one more species *S. madhavii* from the intestine of *Mastacembelus armatus*. Lastly Pardeshi [38] added *S. rupchandensis* from *Channa striatus*.

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 Rostellariae* 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 posteriorly 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 measure 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	: <i>Senga rostellariae</i> Sp. Nov.
Host	: <i>Mastacembelus armatus</i> L.
Habitat	: Intestine
Locality	: Ahmednagar, Aurangabad, Latur, Kolhapur, Solapur
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
Date of collection	: Oct. 2008 - Sept. 2010.
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 0.684mm (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 posteriorly 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 lancet 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 0.038mm (0.036 - 0.041) 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 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.

Ovary is medium in size, bilobed, transversely placed at posterior region of segment; it measures 0.135mm (0.122 - 0.149) in length and 0.157mm (0.149 - 0.166) in width. The ovarian lobes are connected by long, thick isthmus, transversely placed, it measures 0.240mm (0.236 - 0.245) in length and 0.012mm (0.008 - 0.017) in width. The vagina is long, broad tube, arises from genital pore, runs posteriorly, obliquely reaches and open in to ootype, it measures 0.442mm (0.429 - 0.456) in length and 0.135mm (0.122 - 0.149) in width. The ootype is small in size, slightly elliptical in shape, post ovarian, near the posterior margin of the segment it measures 0.030mm (0.026 - 0.035) in length and 0.065mm (0.061 - 0.070) in width. The vitellaria are follicular arranged in 1 - 2 rows, on each lateral side from anterior to posterior margin of proglottids.

Gravid segment is broader than longer, it measure 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	: <i>Senga</i> [1]
Type Species	: <i>Senga chandrashekhari</i> Sp. Nov.
Host	: <i>Mastacembelus armatus</i> 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
Date of collection	: Oct. 2008 - Sept. 2010.
Etymology	: Named in Honour of Prof. Chandrashekhari J. Hiware

DISCUSSION

***Senga Rostellariae* 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. ophiocephalina* [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. pcynera* [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 lobulate) 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. visakhapatnamensis* [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. khami* [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 elongated Vs 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. chauhani* [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. mohekarai*, [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. chaingmaensis* [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. baughi* [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. tictoi* [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 the species *S. nathsagarensis* [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. kaigaonensis* [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 (follicular 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 (follicular 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 (follicular 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 Chandrashekhari* 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 (follicular 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 (follicular 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 (follicular 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 (follicular 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 (follicular 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 (follicular Vs lobate). The present tapeworm differs from *S. pahangensis* [11] in having scolex (oval Vs triangular), hooks (78 Vs 52) and vitellaria (follicular Vs lobulated). The present tapeworm differs from *S. visakhapatanamensis* [13] in having scolex (oval Vs circular), neck (present Vs absent), testes (112 Vs 50-55) in number and vitellaria (follicular Vs lobulated). The present tapeworm differs from *S. khami* [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. chauhani* [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. chaingmaensis* [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. baughi* [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 pear 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. kaigaonensis* [34], having scolex (oval Vs triangular), testes (112 Vs 285 -295) in number and mature proglottids (slightly broader than long Vs three times broader than long). The present tapeworm differs from *S. panzaraensis* [35], having scolex (oval Vs triangular), hooks (78 Vs 58), testes (112Vs 40 - 50), vitellaria (follicular Vs granular). The present tapeworm differs from *S. govindi* [36] 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 *Sengarupchandensis* [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. rostellarae* 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.

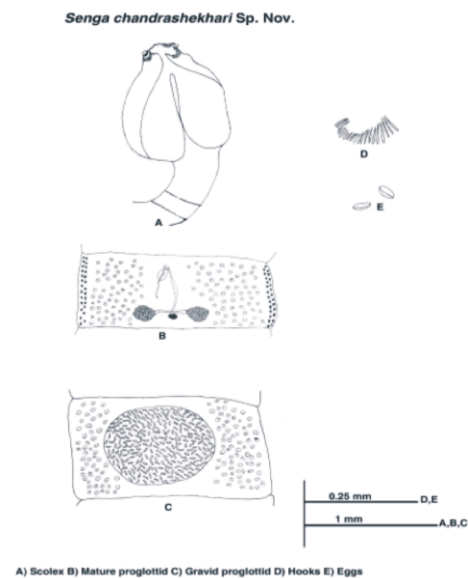
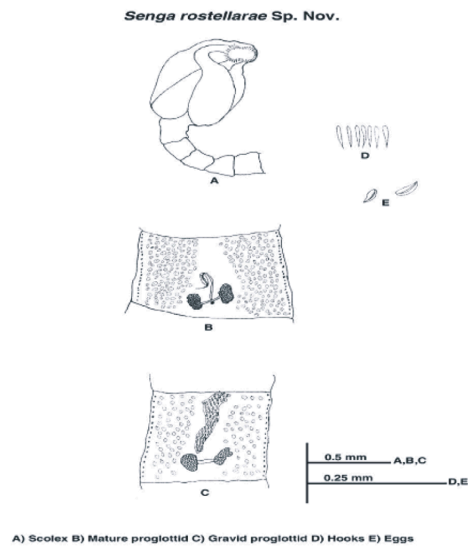
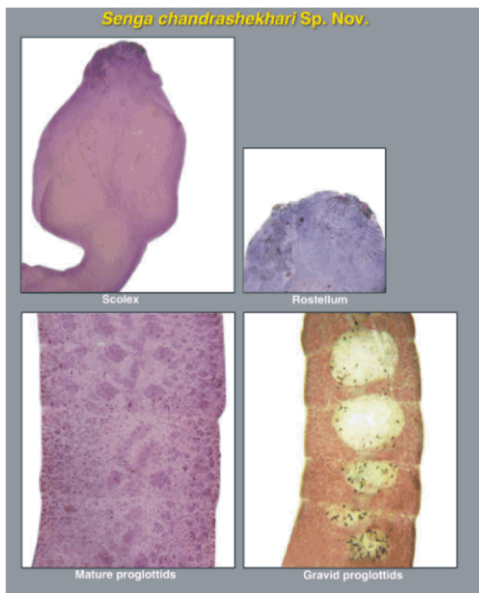
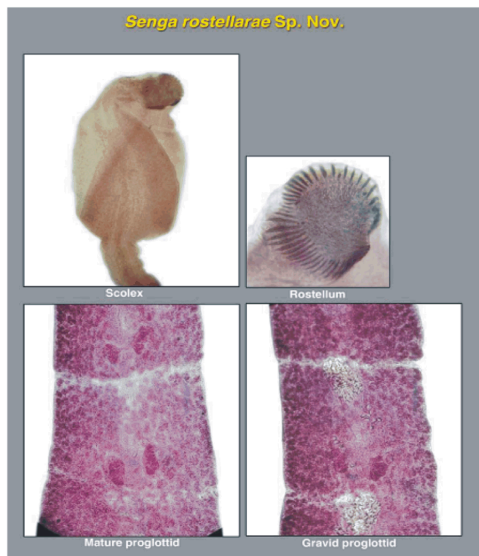
Some additional and differentiating characters are given in the comparative chart at the end. In above aforesaid discussion on the present parasite deserves status of a new species and named *Senga chandrashekhari* Sp. Nov. propose in honour of Prof. C. J. Hiware an eminent Helminthologist.

Chart showing an account of new species of the genus *Senga*, Dollfus, 1934.

Specie Y	<i>S. rostellarae</i> Sp. Nov.	<i>S. chandrashekhari</i> Sp. Nov.
Characters \		
Country	India	India
Host	<i>Mastacembelus armatus</i>	<i>Mastacembelus armatus</i>
Scolex	Pear shaped	Oval shape
Bothria	Two, lateral side	Two fleshy bothria
Hooks	41 in number,	78 lancet shaped
Neck	Absent	Present
Mature		
Proglottids	Quadrangular	Broader than long, slightly squarish

A Key to the Species of the Genus *Senga* Dollfus, 1934:

Mature segment quadrangular *S. rostellarae* Sp. Nov. Testes 100 - 115 *S. chandrashekhari* Sp. Nov.



REFERENCES

1. Dollfus, R.P.H., 1934. Sur un cestode Pseudophyllidae parasite de poisson ornement. Bull. Sac. Zool. France 69: 476-490.
2. Sengs, T., 1933. Study on some cestodes from fishes. J. Science, National University, Shanatuma, T Singtao, China, 2: 1-21.
3. Southwell, T., 1913. "On some Indian Cestoda, Part I". Ibid. pp: 279-300.
4. Monticelli, F.S., 1890. Note elmintologica. Bulletin Society Naturali. Napoli, 4: 189-208.
5. Luhe, M., 1899. Zur Kenntnis einiger Distomen. Zool. Anz., 22: 524-529.
6. Woodland, W.N.F., 1924. On a new *Bothriocephalus* and a new genus of Proteocephalidae from Indian fresh water fishes. Parasit. 16: 441-451.
7. Johri, G.N., 1956. A new cestode *Senga lucknowensis* from *Mastecembelus armatus* Lacepede. Current science Bangalore, 25(6): 193-195.
8. Fernando, C.H. and J.I. Furtado, 1963. Helminth parasites of some Malayan fresh water fishes. Bulletin of the National Museum, state of Singapore, 32: 45-71.
9. Ramadevi, P. and K. Hanumanth Rao, 1966. Pleuroceroid of *Senga* sp. (pseudophyllidea, ptychobothriidae) from the freshwater fish Panchax (Ham and Buch) current. Sci., 35(24): 626-627.

10. Tadros, G., 1968. A redescription of *Polyonchobothrium clarias* (Woodland, 1925) Meggitt, 1930 (Bothriocephalidae: Cestoda) with a brief review of the genus *Polyonchobothrium* Diesing, 1854 and the identity of the genera *Tetracampos* Wedl, 1861, *Senga* Dollfus, 1935 and *Oncobothriocephalus* Yamaguti, 1959. J. Veterinary Science of the United Arab Republic 5: 53-84.
11. Furtado, J.I. and L. Chauhan, 1971. Two new helminth species from the fish *C. micropeltes* Cuvier (Ophiocephalidae) of Malaysia. Folia Parasitologica. 18: 365.
12. Shinde, G.B., 1972. Studies on India cestoda Redescription of *Senga besnardi* Dollfus, 1923 Marathwada, Univivwersity J. Sci., 11(4): 39-40
13. Ramadevi, P. and K. Hanumanth Rao, 1973. On *Senga Vishakhapatnamensis* n.sp (cestode: pseudophyllidea) from the intestine of the freshwater fish *Ophiocephalus punctatus*. Bloch. Rivista di Parassitologia, 34: 281-286
14. Ramadevi, P., 1976. The life cycle of *Senga Vishakhapatnamensis* (Ramadevi and Hanumanthrao, 1973. (Cestode: Pseudophyllidea) Rivista di Parassitologia, 37: 79-90.
15. Wardle, R.A., J.A. Mcleod and S. Radinovsky, 1974. Advances in the zoology of Tapeworm, 1950 - 1970. University of Minnesota Press, Minneapolis, pp: 1-274.
16. Shinde, G.B. and R.A. Deshmukh, 1980. On a new cestode *Senga khami* n.sp (Cestoda: Ptychobothriidae) from a freshwater fish. Indian J. Zool., 8(1): 28-32.
17. Jadhav, B.V. and G.B. Shinde, 1980. On a new cestode *Senga aurangabadensis* n.sp from the fish *Mastecembelus armatus*. Bioresearch, 43(2): 25-27.
18. Shinde, G.B. and B.V. Jadhav, 1980. A new tapeworm *Senga godavarii* n.sp from *Mastacembellus armatus* at Aurangabad, India Biology Jou., II(4): 46-48.
19. Kadam, S.S., B.V. Jadhav and G.B. Shinde, 1981. On a new cestoda *Senga paithanesis* n.sp (cestoda Ptychobothriidae) from *Mastecembelus armatus*, Bioresearch, 5(1): 95-96.
20. Majid, M.A. and G.B. Shinde, 1934. Two new species of the genus *Senga* Dollfus, 1934 (Cestode Pseudophyllidea) from freshwater fishes at Jaganath puri, Orisa. India J. Parasitol., 1: 169-172.
21. Jadhav, B.V., 1991. A new tapeworm *Senga gachuae* n.sp from the fish *Channa gachua* at Aurangabad. Rivista di Parassitologia, 3(1): 39-41.
22. Jadhav, B.V., A.V. Gavhane and A.P. Jadhav, 1991. On a new Pseudophyllidae cestode from *Mastacembelus armatus* at Daryapur (M.S) India. Rivista di Parassitologia, 7: 19-22.
23. Monzer, Hasnain, 1992. On a new cestode *Senga chauhani* n.sp. from fish host *Channa punctatus* from Jamshedpur. National J. Helminthol., XXXIV No. 1: 123-127.
24. Tat, M.B. and B.V. Jadhav, 1997. *Senga mohekare* n.sp. (Cestoda: Ptychobothriidae) from *Mastacembelus armatus* at Pune (M.S.). Rivista di Parassitologia Xvii (Lviii), 2: 203-296.
25. Wongswad, C.M. and B.V. Jadhav, 1998. A new ptychobothridean tapeworm from *Mesastrem chainaimai* Thiland, Rivista di Parasitologia, 15(3): 291-294.
26. Hiware, C.J., 1999. On a new tapeworm *Senga armatusae* from freshwater fish, *Mastacembelus armatus* at Pune (M.S). Rivista di Para , XVI (LX): N-19-12.
27. Patil, D.N. and B.V. Jadhav, 2003. On a new species of the *Senga* Dollfus, 1934 Cestoda Ptychobothriidae Luhe, 1902 as *S. tappi* n.sp. from the Shripur Dist. Dhule (M.S.) India. J. Comparative Physiol., 1: 68-72.
28. Jadhav, B.V., 2005. Record of a cestode *Senga* Dollfus, 1934 (Cestoda: pseudophyllidae) from fresh water fishes in Maharashtra. Indian J. Helminth (N.S.) 23: 39-47.
29. Pande, P.N., T. Mamta and M. Neetu, 2006. On two new species of genus *Senga* Dollfus, 1934 (Family: Ptychobothriidae) Luhe, 1902 from the intestine of freshwater fishes. Indian J. Helminthol., pp: 24.
30. Bhure, D.B., N.D. Padwal and B.V. Jadhav, 2007. A new tapeworm *Senga jadhavae* n.sp (cestode-pseudophyllidea) from *Mastecembelus armatus* at Aurangabad. Proceeding. zoological Society of India. 6(2): 45-52.
31. Shrivastav, A.K., R.K. Khare, V.K. Sahu and A.R. Singh, 2007. A new species of genus *Senga* Dollfus (1934) from *Puntius ticto* at Jhansi (U.P.) National Jou. Life Sci., 4(3): 129-132.
32. Khadap, R.M., B.V. Jadhav and N.V. Suryawanshi, 2007. A new species of genus *Senga* (Dollfus, 1934) (Cestoda: Ptychobothriidae) from fresh water teleost *Mastacembellus Armatus*.
33. Kankale, N.M., 2008. A new species of the genus *Senga nathsagarensis* from freshwater fish, *Mastacembelus armatus*. National J. Life Sci., 5(3): 81-84.

34. 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.
35. Mangale, A.J. and A.T. Kalse, 2009. On a new cestode *Senga panzarensis* from *Mastacembelus armatus* at Dhule, India. Uttar Pradesh J. Zool., 29(1): 105-108.
36. Minaj, N. Attar and S.V. Kharade, 2010. A new cestode *Senga govindi* n.sp. from *Mastacembelus armatus* Khodash, Tq karad, Dist. Satara (M.S.) India, Life science Bulletin, 7(1): 134- 136.
37. Bhure, D.B., S.S. Nanaware, D.M. Pathan and R.M. Dhondge, 2010. Morpho-taxonomic observation of new pseudophyllidean tapeworm *Senga* Dollfus 1934 from *Mastacembelus armatus*. Asian J. Animal Sci., 5(2): 147-52.
38. Pardeshi P.R. and C.J. Hiware, 2011. A new Pseudophyllidean *Senga rupchandensis* n.sp. from *Channa striatus* (Bloch, 1793) at Jalna District (M.S.), India, Rec Res Sci Tech., 3: 17-22.
39. Day, F., 1958. The fishes of India. I-II William Dawson & Son Ltd. London.
40. Weesner, F.M., 1965. General Zoological Techniques. The William & Wilkins Company.
41. Yamaguti, S., 1959. The cestode of vertebrates. In: Systema helminthum. Vol II. New York: Interscience: pp: 860.