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Taxonomic Study of Cestode Parasite *Senga Ashwiniae* Nov. Sp. from Freshwater Fish *Mastacembelus Armatus* at Niwali Dam, Taluka Jintur, District Parbhani, M.S. (India)

Ashish. S. Hasekar[1], Prof. Dr. B. G. Thakare[2]

[1]Research scholar, DSM College, Parbhani
[2]Professor and HOD zoology, DSM College, Jintur.

Abstract:
The present study describes a new species of the genus *Senga*, based on a lucida camera drawing named *Senga ashwiniae nov. sp*., discovered in *Mastacembalus armatus* at Niwali Dam, Taluka Jintur, District Parbhani, Maharashtra. This parasite differs from other known species of the genus *Senga* in several aspects, including the shape and size of the scolex, the number and arrangement of hooks and rostellum, the shape of the segments, the number of testes, the position of the cirrus pouch, and the arrangement of the vitellaria.

Keywords: Mastacemalus armatus, Senga ashwiniae, Niwali Dam, District Parbhani

Introduction:

Parasitology, covers many topics, and parasites, like other organisms, are good models for important biological studies. Helminthology is a continually growing field in parasitology. The importance of studying cestode is directly linked with the nutritional quality of hosts e.g. fish, chicken and another animal which is part of human food. Few people work in parasitology in very detail, pioneers in parasitology include Yamaguti, Woodland, Southwell, and Baylis. In India, notable researchers such as Singh, Johri, Bhalerao, Moghe, Thapar, Ramadevi, Shinde, Jadhav, Agrawal, Chopra, Hiware, Borde, Nanaware have worked on various aspects such as taxonomy, diversity, population dynamics, Biochemistry, Histopathology and the life cycle of helminth parasites from different vertebrate over the last several decades. Various genera of cestode parasites were found in the study are, including *Senga, Gangesia, Lytocestus, Silurotaenia and Circomonchobothrium*.

Review of literature:

The genus *Senga* was recognised by Dollfus in 1934, with its type species *S. besnardi* from *Betta splendens* (Dollfus, 1934). Tseng (1933) reported *Senga ophiocephalina* and Woodland (1924) described *S. pcynomera* from *Ophiocephalus marulius* at Allahabad, India. Johri (1956) recorded *Senga lucknowensis* from *Mastacembelus armatus* in Lucknow, India. Numerous subsequent researchers have described new *Senga* species as parasitic to freshwater fishes, indicating that the genus is highly diversified and abundant**.** Fernando and Furtado (1963) described *S. malayana* from *Channa striatus*, *S. Parva* and *S. filiformis* from

Channa micropeltes at Malacca. Later, Furtado (1971) described *S. pahangenesis* from *Channa micropeltes*, and Ramadevi (1973) reported *S. vishakapattanmensis* from the intestine of *Ophiocephalus punctatus*. Ali and Khan (1976) reported *S. taunsaensis* from *Channa gachua* at Taunsa Barrage, Pakistan**.** Gupta and Sinha (1980) recorded *S. punctati* and *S. mastacembali* from *O. punctatus* and *M. armatus*, respectively. Shinde (1980) reported *S. khami* from *Ophiocephalus marulius* at Kham River, Aurangabad, India; Jadhav (1980) described *S. aurangabadensis*; and Shinde (1980) described *S. Godavari* and *S. paithanensis* from the intestine of *Mastacembelus armatus*. Majid and Shinde (1984) described *S. raoii* and *S. jagannathe* from freshwater fish *Channa punctatus* at Jagannathpur, Orissa. Gupta and Parmar (1985) recorded *S. indica* from *M. armatus* in Lucknow, India, and Gariola and Malhotra (1986) described *S. gangesii* from *Mystus vittatus* in the Ganga River at Allahabad. Duggal and Bedi (1989) described *S. pathankotensis*, and Jadhav (1991) reported *S. gachuae* from *Channa gachua* in Aurangabad, Maharashtra. Jadhav, Gavhane and Jadhav (1991) described *S. maharashtrii* from the intestine of *Mastacembelus armatus* in Daryapur; Monzer (1992) and Hasnain (1992) described *S. chauhani* from the intestine of *Channa punctatus* in Jamshedpur; Mathur et. al. (1994) described *S. jhansiensis* from *Mastacembelus armatus* in Jhansi, India. Tat (1997) described *S. mohekarae*, Wongswad (1998) described *S. chiangmaiensism* and Hiware (1999) described *S. armatusae* and *S. tappi* from *Mastacembelus armatus*. Polyakova and Kirin (2005) described *S. sharpiloi* in *Channa micropeltes* from Singapore. Pande et. al. (2006) added *S. ayodhensis* from *Amphinuous cuchia* and *S. baughui* from *Rita rita*. Bhure et. al (2007) described *S. jadhavae*, and Khadap (2007) described *S. chandkapurensis* from *Mastacembelus armatus*. Shrivastava et. al. (2007) described *S. tictoi* from the intestine of *Puntius ticto* in Jhansi, Uttar Pradesh, India. Kankale (2008) described *S. nathsagarensis*, Wankhede (2009) described *S. kaigaonensis* and Mangale (2009) described *S. panzaraensis*. Bhure et. al. (2010) described *S. madhavae* and Bhure (2011) described *S. satarensis* and *S. mangalbaiae* from the intestine of *Mastacembelus armatus* in Maharashtra. Pardeshi and Hiware (2011) recorded *S. rupchandensis* from *Channa striatus* in Jalna, Maharashtra. Dhole et. al. (2011) reported *S. rostellarae* and *S. chandrashekhari* from *Mastacembelus armatus* in Maharashtra. Jadhav et. al. (2012) added *S. govindii* from *Mastacembelus armatus* in Sina Kolegaon Dam, Osmanabad District, Maharashtra. Sawarkar (2012) described *S. maharashtrii* in *Mastacembelus armatus* from Chandrabhaga River in Daryapur, Maharashtra. Puinyabati et. al. (2013) reported *S. silcharensis* from the intestine of *Channa punctatus* in Chatla haor; Silchar, Assam. Nanware (2015) described *S. microrostellata*, and Fartade and Fartade (2014) described *S. nandedensis*. Fartade (2015) described *S. jadhavii* and *S. madhukarii*. Deshmukh (2015) described *S. rostellata* and Nanware (2016) described *S. triangullata* from *Mastacembelus armatus*. Khade (2017) described *S. bothrialata* and Lakhe (2017) described *S. mohkhedensis* from freshwater fish *Mastacembelus armatus*. Bele et. al. (2019) discovered *S. banshelkinsis* from *Mystus seenghala* at Banshelki Dam in Latur, Maharashtra. Kalse (2019) described *S. mastacembalae* from Velhane, Parola, Jalgaon, Maharashtra. Lakhe (2021) reported *S. killedharurensis* from Kille Dharur, Beed, Maharashtra. Pradhan (2021) described *S. wakadii* from *Mastacembelus armatus* at Wakadi Dam, Parbhani, Maharashtra. Barshe (2023) described *S. follicularae* from the intestine of *Mastacembelus armatus* in Ahmedpur, Maharashtra.

Material and Methods:

Cestodes were collected from the gut of freshwater fish *Mastacembelus armatus* at Niwali, Taluka Jintur, District Parbhani, Maharashtra State, India, from December to February 2022. The parasites were washed

in saline water. Some were flattened and preserved in 4% formalin, while others were preserved without flattening.

After the flattening procedure, parasites were released from the two slides and processed for permanent slide preparation. The flattened parasites were stained using Harris haematoxylin, dehydrated and cleared in xylene. Whole mount preparations were then made. Drawings were created with the aid of a camera lucida, and Photographs were taken using a digital camera.

Detailed studies of the parasites were conducted using the above methods to determine the taxonomic status of the cestode worms under study. Identification was performed using "Systema Helminthum- Vol-II".

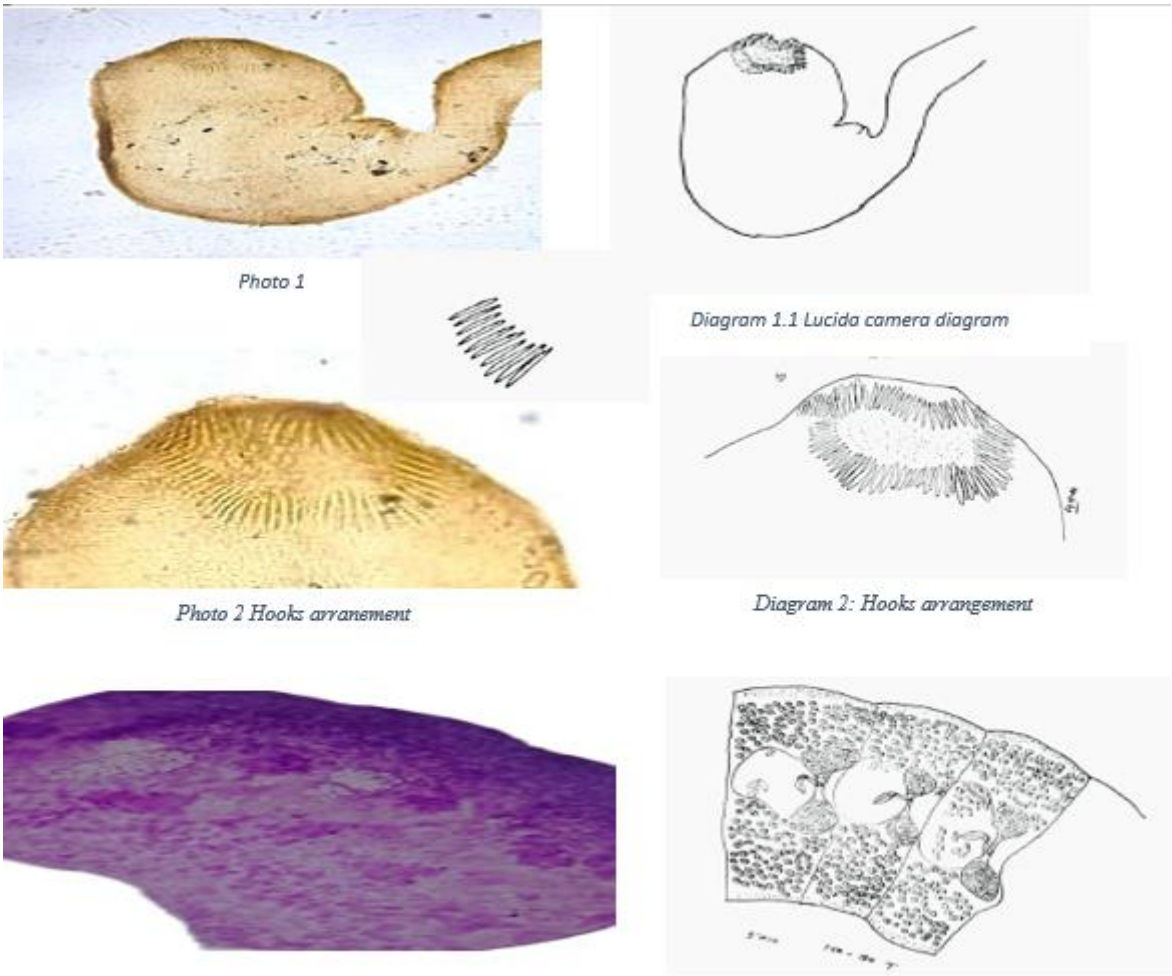

Photo 3 Mature segment of parasite and diagram of Lucida camera

Description:

The body of cestode parasites is divided into different body parts, including the Scolex, immature segments and mature segments. The Scolex of the cestode parasites is cylindrical, measuring approximately 4.02 mm in length and 1.862 mm in width. The scolex serves as an attachment organ, facilitating adherence to the host's intestinal mucosa. This morphological feature is critical for the parasite's ability to establish and maintain infection within the host.

The anterior part of the scolex contains a rostellum with 64 rostellar hooks. The hooks are arranged in a

quadrangular form and measure 0.0585 mm in length and 0.0075 mm in width. The scolex bears two bothria, which originate from the base of the rostellum and extend to the posterior end of the scolex, measuring 4.731 mm in length and 0.456mm in width. The neck is reduced.

The mature segment is rectangular in shape, 3-4 times broader than long, measuring 1.577mm in length and 5.244 mm in width. The testes are oval small to medium in size, numbering 100-150, and are spread throughout the segment on both sides of the ovary. The testes measure 0.1615 mm in length and 0.1045 mm in width.

The cirrus pouch is small and oval, located on the anterior side of the ovary, measuring 0.342 mm in length and 0.171 mm in width. The cirrus is a thin tube within the cirrus pouch, measuring 0.323 mm in length and 0.038 mm in width. The ovary is centrally positioned in the posterior region of the segment, with each ovarian lobe divided by an isthmus. The ovary measures 0.494 mm in length and 0.703 mm in width.

The vagina is a thin, coiled tube originating from the genital pore, posterior to the cirrus pouch, measuring 0.0475 mm in length and 0.0285 mm in width. The genital pore is small and rounded, measuring 0.039 mm in both length and width. The vitellaria are granular and arranged in two rows along each lateral margin of the segments.

Discussion:

1. The genus *Senga* was established by Dollfus in 1934 with the type species *Senga besenardi* from *Betta splendens* (Dollfuss, 1934). The present cestode parasites resemble known species of the genus *Senga* in the general topography of organs but differ in several characteristics from the following species.
2. *S. besnardi* (Dollfus, 1934) the present cestode parasite differs in the shape of the scolex (Cylindrical vs. triangular), number of hooks (65 vs. 50), mature segment width (Three to four times broader than long vs. wider than long), number of testes (100-150 vs, 160-175), and vitellaria (granular vs. lobate).
3. *S. ophiocephalina* (Tseng, 1933), the present worm differs in the shape of the scolex (cylindrical vs. pear-shaped), number of hooks (65 vs, 47-50), number of testes (100-150 vs. 50-55), and vitellaria (granular vs. lobate). The neck is present in the current species but absent in *S. ophiocepha*lina.
4. *S. pcynomera* (Woodland, 1924) The present tapeworm differs in the shape of the scolex (cylindrical vs. elongated), mature segment width (three to four times broader than long vs. distinct), and the presence of a neck (Present vs. absent).
5. *S. lucknowensis*, the present worm differs in the shape of the scolex (cylindrical vs. pear-shaped), number of hooks (65 vs. 34-48), the shape of the ovary (dumbbell-shaped vs. bilobed), and vitellaria (granular is double layers vs. lobate and discontinuous). The neck is present in the current species but absent in S. *lucknowensis.*
6. *S. malayana*: the tapeworm differs in the shape of the scolex (cylindrical vs. circular) and vitellaria (granular vs. lobulated and discontinuous). The neck is present in the current species but absent in *S. malayana.*
7. *S. parva*: the present parasite differs in the shape of the scolex (cylindrical vs. pear-shaped), number of the rostellar hooks (65 vs. 38-40), number of testes (100-150 vs. 150-180), and shape of the ovary (dumbbell-shaped vs. globular). The neck is present in the current species but absent in *S. parva.*
8. *S. pahangensis*: the present cestode differs in the shape of the scolex (cylindrical vs. triangular). Number of hooks (65 vs. 52), and vitellaria (granular vs. lobulated).
9. *S. vishakapatanamensis*: the present worm differs in the shape of the scolex (cylindrical vs. circular), number of rostellar hooks (65 vs, 46-52), number of testes (100-150 vs. 50-60), and vitellaria (

granular vs. biolobed). The neck is present in the current species but absent in *S. vishakapatanamensis.*

10. *S. khami*: the present cestode differs in the shape of the scolex (cylindrical vs. pre-oval), number of rostellar hooks (65 vs. 50-55), mature segments width (three to four times broader than long vs. one to two times broader), number of testes (100-150 vs. 155), vitellaria (granular vs. follicular). Shape of the vagina (straight tube vs. convoluted tube).
11. *S. aurangabadensis*: the present worm differs in the shape of the scolex (cylindrical vs. pre-oval), number of the rostellar hooks (65 vs. 50-52), number of testes (100-150 vs. 240-260), and presence of a neck (present vs. absent). The mature segment's width (three to four times broader than long vs. two times broader). The shape of the cirrus pouch (oval vs. medullary), and the arrangement of vitelline (two layers at both margins vs. follicular) also differ.
12. *S. godavarii*: the present tapeworm differs in the shape of the scolex (cylindrical vs. pear-shaped), and the number of rostellar hooks (65 vs. 40-42). Number of testes (100-150 vs. 220-230), and presence of a neck (present vs. absent).
13. *S. paithanensis*: The present cestode parasite differs in the shape of the scolex (cylindrical vs. triangular), number of rostellar hooks (65 vs. 54), number of testes (100-150 vs. 130-135), and arrangement of vitellaria (two layers at both margins vs. follicular).
14. *S. raoi:* The present worm differs in the shape of the scolex (cylindrical vs. pear-shaped), number of rostellar hooks (65 vs. 46), number of testes (100-150 vs. 65-170), and presence of a neck (present vs. absent).
15. *S. jagannathae*: The present parasite differs in the shape of the scolex (cylindrical vs. pear-shaped), number of rostellar hooks (65 vs. 44), number of testes (100-150 vs. 240-250), and vitellaria (granular vs. discontinuous).
16. *S. gachuae*: The present worm differs in the shape of the scolex (cylindrical vs. pear-shaped), number of rostellar hooks (65 vs. 20-25), number of testes (100-150 vs. 60-70), and vitellaria (granular vs. follicular).
17. *S. maharashtrii*: The present cestode parasite differs in the shape of the scolex (cylindrical vs. muscular), number of rostellar hooks (65 vs. 45-46), number of testes (100-150 vs. 80-90), and vitellaria (granular in two rows vs. follicular in 4-5 rows).
18. *S. chauhani*: The present worm differs in the shape of the scolex (cylindrical vs. oval), number of rostellar hooks (65 vs. 40-45), number of testes (100-150 vs. 200-210), and vitellaria (granular vs. non-lobate to lobate).
19. *S. armatusae*: The present parasite differs in the shape of the scolex (cylindrical vs. triangular), number of hooks (65 vs. 32-40), number of testes (100-150 vs. 204-230), and vitellaria (granular in two layers vs. follicular).
20. The present tapeworm differs from *S. mohekarae* in the shape of the scolex (cylindrical vs. pear), number of rostellar hooks (65 vs. 151), and number of testes (100-150 vs. 300-310).
21. The present worm differs from *S. tappi* in the shape of the scolex (cylindrical vs. triangular), number of hooks (65 vs. 29), number of testes (100-150 vs. 285-295), and vitellaria (granular vs. follicular lateral to testicular).
22. The present cestode parasite differs from *S. ayodhensis* in the shape of the scolex (cylindrical vs. conical), number of hooks (65 vs. 29), number of testes (100-150 vs. numerous rounded), and vitellaria (granular vs. follicular).

23. The present parasite differs from *S. baughi* in the shape of the scolex (cylindrical vs. pear), number of testes (100-150 vs. 170-180), and vitellaria (granular vs. follicular).
24. The present form differs from *S. jadhavae* in the shape of the scolex (cylindrical vs. triangular), number of rostellar hooks (65 vs. 50-54), number of testes (100-150 vs. 310-320), and vitellaria (granular vs. follicular).
25. The present worm differs from *S. chandkapurensis* in the shape of the scolex (cylindrical vs. barrel), number of rostellar hooks (65 vs. 28-30), and number of testes (100-150 vs. 170-180).
26. The present cestode differs from *S. kaigaonensis* in the shape of the scolex (cylindrical vs. triangular), number of rostellar hooks (65 vs. 34), and number of testes (100-150 vs. 285-295).
27. The present form differs from *S. madhavae* in the shape of the scolex (cylindrical vs. triangular), several rostellar hooks (65 vs. 40-44), mature segment width (three to four times broader than long vs. five to six times broader than long), and some testes (100-150 vs. 200-225).
28. The present worm differs from *S. mangalbaiae* in the shape of the scolex (cylindrical vs. conical), number of hooks (65 vs. 28-30), and number of testes (100-150 vs. 70-80).
29. The present cestode parasite differs from S. *rupchandensis* in the shape of the scolex (cylindrical vs. flat, tubular), number of rostellar hooks (65 vs. 42-55), number of testes (100-150 vs. 350-370), and vitellaria (granular vs. follicular).
30. The present tapeworm differs from *S. rostellarae* in the shape of the scolex (cylindrical vs. pear), number of hooks (65 vs. 41), number of testes (100-150 vs. 217-242), and vitellaria (granular vs. follicular).
31. The present cestode differs from *S. chandrashekhari* in the shape of the scolex (cylindrical vs. broad), number of hooks (65 vs. 78), number of testes (100-150 vs. 98-117), and vitellaria (granular vs. follicular).
32. The present worm differs from *S. silcharensis* in the shape of the scolex (cylindrical vs. pear), number of rostellar hooks (65 vs. 44), number of testes (100-150 vs. 60), and vitellaria (granular vs. follicular).
33. The present parasite differs from *S. microtrigularis* in the shape of the scolex (cylindrical vs. triangular), number of rostellar hooks (65 vs. 18-20), mature segment width (three to four times broader than long vs. eight to nine times broader than long), number of testes (100-150 vs. 250-300), and vitellaria (granular vs. follicular).
34. The present form differs from *S. nandedensis* in the shape of the scolex (cylindrical vs. triangular), number of testes (100-150 vs. 150-200), and vitellaria (granular vs. follicular). The neck is present in the current species but absent in *S. nandedensis*.
35. The present cestode differs from *S. rostellata* in the shape of the scolex (cylindrical vs. oval), number of rostellar hooks (65 vs. 20-22), number of testes (100-150 vs. 25-30), and vitellaria (granular vs. follicular).

These distinct characteristics warrant the designation of a new species within the genus *Senga.* Hence, the name *Senga ashwiniae nov. sp.* is proposed, as it is reported from Niwali Dam, Taluka Jintur, District Parbhani, Maharashtra State, India.

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