

Senga bhauraoae n.sp.

Cotyloda	Wardle, McLeod and Radinovsky 1974.
Pseudophyllidea	Carus, 1863.
Ptychobothridae	Luhe, 1902.
Senga	Dollfus, 1934.

***Senga bhauraoae* n. sp.**

DESCRIPTION

Nine cestode parasites were collected from the intestine of fresh water fish *Mastacembellus armatus* from Panchaganga river at Kolhapur, M.S. India in the month of November 2006. These cestodes were flattened, preserved in 4% formalin and five specimens were stained with Harris haematoxyline, passed through various alcoholic grades, cleared in xylol, mounted in DPX and whole mount slides were prepared for further studies.

All the specimens of cestode parasites were thin, medium in size, consisting of scolex, immature, mature and gravid proglottids.

The scolex is large in size, almost dome shaped, narrower anteriorly, broader posteriorly, distinctly marked off from the strobila and measures 1.060 [0.681 - 1.439] x 1.250 [0.681 x 1.8181]. Scolex bears an armed rostellum and two bothridia. Rostellum is 0.038 x 0.099 in size, rostellar hooks are pointed, stout, arranged in two circles, 35 to 40 in number.

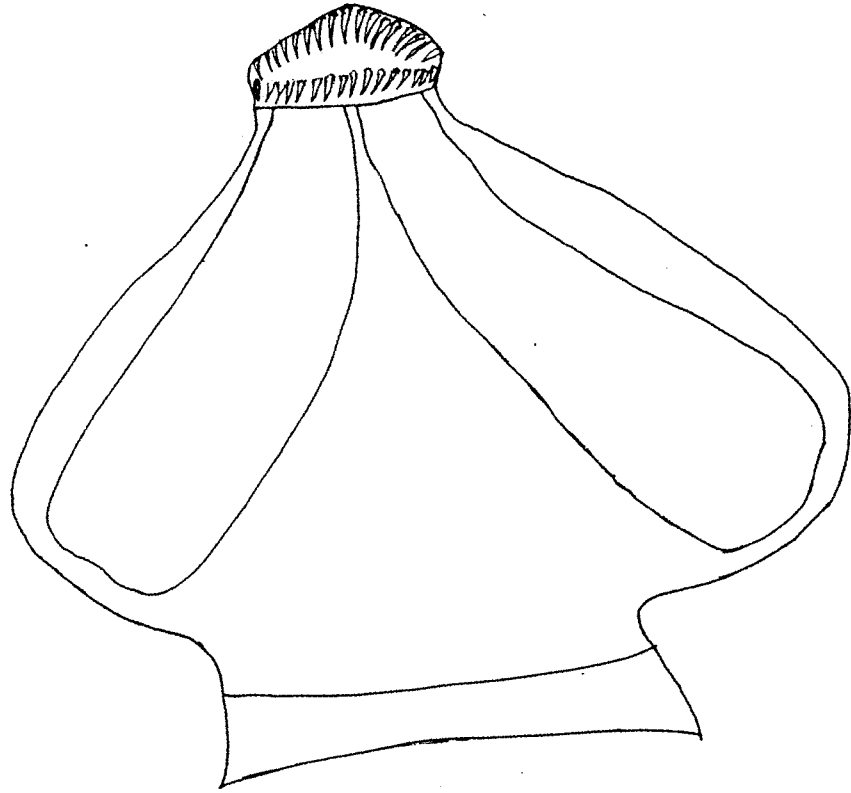
The rostellar hooks measure 0.038 [0.034 - 0.043] in length and 0.003 [0.003 - 0.002] in width.

Neck is very short 0.094 in length and 0.928 in width.

The mature segments are broader than long, almost four times broader than long and measures 0.522 [0.513 - 0.530] in length x 1.875 [1.856 - 1.893] in breadth. The testes are small, rounded in shape, densely arranged, evenly distributed in the lateral field of ovary, 150-200 in number, 0.018 in length and 0.026 in width. Cirrus pouch is medium and oval in shape. It measures 0.0416 in length and 0.026 in width. Ovary is bilobed, flattened sac like structure, transversely placed near the posterior margin of the segment, measures 0.109 [0.106 - 0.113] in length x 0.401 [0.386 - 0.416] in breadth. The vagina is thin tube, slightly coiled, arises from the genital pore, runs posteriorly, obliquely and open into the ootype and measure 0.045 in length and 0.018 in width.

The gravid segments, broader than long; saccular uterus is placed at the anterior region of the segment, which measures 0.181 [0.174 - 0.189] in length and 0.284 [0.151 - 0.416] in width. Uterus is filled with eggs, which are somewhat rounded and oval in shape measures 0.011 in diameter.

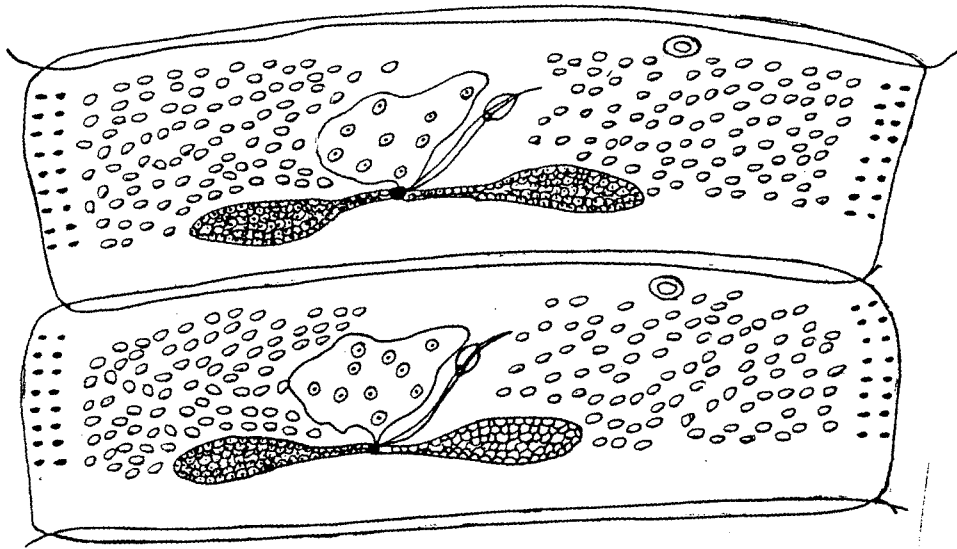
The vitellaria are follicular on each lateral side, from anterior to posterior margin of the segment.



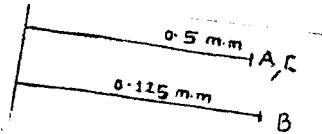
A



B



C



The worm under discussion, *Senga bhauraoe* n. sp. is having scolex large, dome shaped, rostellar hooks 35-40 in number; testes small, densely arranged, 150-200 in numbers; ovary long sac like structure. The vitellaria follicular, follicles small, in two rows, on each side of segment.

1. The present worm differs from *S. besnardi* in the shape of scolex which is triangular, rostellar hooks are 50 in number; neck absent; total number of testes 160-175.
2. The present cestode differs from *S. ophiocephalina*, which shows rostellar hooks 47-50 in number; neck absent; testes are 50-55 in number.
3. The present tapeworm differs from *S. pycnomera* in the shape of elongated scolex, rostellar hooks 68 in number; mature segments are indistinct; ovary is discontinuous in two groups.
4. The present worm differs from *S. lucknowensis* which shows pear shaped scolex, rostellar hooks 36-48 in number; vitellaria lobulate and discontinuous in two groups.
5. The present cestode differs from *S. malayana* which shows circular scolex with 60 rostellar hooks.
6. The tapeworm differs from *S. parua* because *S. parua* having pear shaped scolex.
7. The present cestode differs from *S. pahangensis* in the shape of triangular scolex, rostellar hooks are 52 in numbers. Testes laterally situated in the proglottids, vitellaria lobulated.

DISCUSSION

The genus *Senga* is erected by Dollfus, 1934 with the type species *S. besnardi*.

Later on the following species are added to this genus

- 1) *S. opiocephalina* Tseng, 1933
- 2) *S. pycnomerus* Woodland, 1924
- 3) *S. lucknowensis*, Johri, 1956
- 4) *S. malayana*, Furnando and Furtado 1963.
- 5) *S. parva* Furnando and Furtado, 1963
- 6) *S. phangensis* Furtado and Furtado, 1963
- 7) *S. vishakhapatnomensis* Ramadevi and Rao 1973
- 8) *S. khami*, Deshmukh, 1980
- 9) *S. aurangabadensis*, Jadhav and Shinde, 1980
- 10) *S. godavari* Shinde & Jadhav 1980
- 11) *S. paithanensis* Kadam *et al.* 1981
- 12) *S. jagannathae*, M.A. Majid and G.B. Shinde, 1984
- 13) *S. Raoi*, M.A. Majid and G. B. Shinde, 1984
- 14) *S. gachuae*, Jadhav *et al.* 1991
- 15) *S. maharashtrii*, Jadhav *et al.* 1991
- 16) *S. chauvani* Monzer Hasnain 1992
- 17) *S. mohekarae* Tat and Jadhav 1997
- 18) *S. armatusae*, Hiware *et al.* 1999
- 19) *S. toppi*, Patil & Jadhav, 2003
- 20) *S. ayodhensis*, Pande *et al.* 2006
- 21) *S. baughi*, Pande *et al.* 2006
- 22) *S. jadhavae* Bhure *et al.* 2007
- 23) *S. kolhapurensis* n. sp. (described earlier)

8. The worm differs from *S. vishakhapatnamensis* which shows circular scolex, rostellar hooks are 46-52 in number, two large rudimentary hooks; neck absent; testes 50-55 in number.
9. The present worm differs from *S. khami* which have rectangular scolex, shallow bothria, rostellar hooks are 55-57 in number; testes rounded 155 in number; cirrus pouch is elongated.
10. The cestode differs from *S. aurangabadensis* which bear oval scolex, rostellar hooks are 50-52 in number, in two half crowns overlapping on each other; neck absent, mature segment longer than broad. Testes 240-260 in number.
11. The present tapeworm differs from *S. godavari* which have pear shaped scolex broader in the center and tapering at anterior and posterior end, hooks 40-42 in number which overlap on each other. Neck absent. Testes are rounded 220-230 in number.
12. This cestode differs from *S. paithanensis* which shows prominent large triangular scolex, rostellar hooks are 54 in number and arranged in two half crowns overlap on each other. Testes are rounded, 130-135 in number. Cirrus pouch oval and curved anteriorly to the isthmus of the ovary in the center of the segment.
13. This tapeworm differs from *S. jaggnathae* which bears large, oval scolex, rostellar hooks 40-44 in numbers, testes 200-210 in number and vitellaria non lobate to lobate.

14. The present cestode differs from *S. raoii* which bears pear shaped scolex; neck is absent; testes 65-70 in number; vagina is short tube.
15. The cestode under discussion differs from *S. gachuae* in medium, oval, elongated scolex, rostellar hooks are 22-25 in number. Mature segments almost three times broader than long; testes 300-310 in number and elongated ovary.
16. The present cestode differs from *S. maharashtrii* which shows muscular scolex. Hooks 45-47 in number, large and arranged in two half crowns. Neck absent. Testes oval 80-90 in number.
17. The present tapeworm differs from *S. chauvani* which shows large oval scolex, rostellar hooks 40-44 in number; testes 200-210 in number and vitellaria are non lobate to lobate.
18. The present cestode differs from *S. mohekarae* which shows rostellar hooks 22-26 in number. Testes 60-70 in number; ovary bilobed, posterior to middle of segment.
19. The worm under discussion differs from *S. armatusae* which shows triangular scolex, rostellar hooks are 32-40 in number, neck absent.
20. The present cestode differs from *S. tappi* which has hooks 42-44 in number. Mature segment three times broader than long. Testes small, rounded ovary bilobed, elongated, post equatorial, medially situated.
21. The present tapeworm differs from *S. ayodhensis* in the shape of conical scolex, rostellar hooks are 29 in number. Neck absent. Testes are numerous. Cirrus

- pouch placed centrally. Ovary bilobed and pre-equatorial.
22. The worm under discussion differs from *S. baughi* which bears two bothria, fleshy notched on two sides; rostellar hooks are 28 in numbers. Neck present. Testes rounded 40-50 in numbers and compact, oval, large, unilobed ovary.
 23. The present cestode differs from *S. jadhavae* which have triangular scolex, rostellar hooks 50-54 in numbers. Neck present. Testes are small, rounded 310-320 in number. Cirrus pouch oval and preovarian and large bilobed ovary.
 24. The present worm differs from *S. kolhapurensis* n. sp. (described earlier) in having large scolex, rostellar hooks 50-60 in numbers; neck is absent; mature segments five times broader than long; testes 70-80 in numbers; cirrus pouch small; ovary distinctly bilobed and dumb-bell shaped.

These characters are enough to erect a new species to accommodate these worms under the genus *Senga* and hence the name *S. bhauraoae* n. sp. is proposed, in honour of Dr. Karmaveer Bhaurao Patil, who is founder of Asia's number one educational Institution, Rayat Shikshan Sanstha, Satara; which provide education through self help to the poor and backward people as well as all the grades in society.

Type species	<i>Senga bhauraoae</i> n. sp.
Host	<i>Mastacembellus armatus</i>
Habitat	Intestine
Locality	Kolhapur, M.S., India
Date of collection	3 rd Nov. 2006

**A KEY TO THE SPECIES OF THE
GENUS SENGADOLLFUS, 1934**

- Scolex circular in shape1
- Scolex rectangular in shape *S. khami*
Deshmukh *et al.* 1980
- Scolex oval in shape 2
- Scolex pear shaped 3
- Scolex elongated 4
- Scolex triangular 5
- Scolex conical 6
1. Hooks below 50 in number
-*S. vishakhapatnamensis*
Ramadevi and Rao, 1973
- Hooks above 50 in number *S. malayana*
 Furnando and Furtado, 1963
2. Testes below 100 in number *S. maharastrii*
 Jadhav *et al.*, 1991
- Testes above 210 in number *S. aurangabadensis*
 Jadhav and Shinde, 1980
3. Vitellaria follicular 7
- Vitellaria granular 8
- Vitellaria lobulate 9
4. Hooks below 50 in number *S. bhauraoe* n. sp.
- Hooks in between 50-100 in number.... ..
-*S. picynomera*
 Woodland, 1924
- Hooks above 100 in number*S. mohekarae*
 Tat & Jadhav, 1997
5. Vitellaria granular *S. besnardi*
 Dollfus, 1934

- Vitellaria follicular 10
- Vitellaria lobulate *S. paithanensis*
Kadam *et al.* 1997
6. Hooks below 50 in number *S. ayodhanensis*
Pande *et al.* 2006
- Hooks above 50 in number *S. kolhapurensis* n.sp.
7. Neck absent *S. godavari*,
Shinde and Jadhav 1980
- Neck present 11
8. Testes below 200 in number 12
9. Hooks below 50 in number *S. lucknowensis*
Johri, 1956.
- Hooks above 50 in number *S. ophiocephalina*
Teseng, 1933.
10. Neck present 13
- Neck absent *S. ormatusae*
11. Ovary compact *S. baughi*
Pande *et al.* 2006
- Ovary bilobed *S. gauchi*
12. Neck absent *S. raoi*
- Neck present *S. parua*
Furnando & Furtado, 1963.
13. Testes below 200 in number *S. paithanensis*
Kadam *et al.*
- Testes above 200 in number 14
14. Hooks below 50 in number *S. tappi*
Patil & Jadhav, 2003
15. Hooks above 50 in number *S. jadhavae*
Bhure *et al.* 2007.

Comparative chart of the genus *Senga* Dollfus, 1934

Species ♂ Characters ♀	<i>S. besnardi</i> Dollfus, 1934	<i>S. ophiocephalina</i> Tseng, 1933	<i>S. pycnomera</i> Woodland, 1924
Locality	Vinecunes, France	Taimen, China	Allahabad, India
Host	<i>Betta splendens</i>	<i>Ophiocephalus argus</i>	<i>Ophiocephalus Marulius</i>
Scolex	Triangular	Pear shaped	Flongated
Hooks	No. of hooks - 50	No. of hooks = 47 - 50	Number of hooks - 68
Neck	Absent	Absent	-
Mature segments	Wider than long Finally longer than wide	Wider than long	-
Testes	160-175 in numbers	50-55 in numbers	-
Cirrus pouch	-	-	-
Genital pore	-	-	-
Ovary	Compact, not-bilobed	Bilobed, but equatorial in position	Discontinuous in two groups

Species ♂ Characters ♀	<i>S. tucknowensis</i> Johri 1956	<i>S. malayana</i> Furnando & Furtado 1964	<i>S. parva</i> Furnando & Furtado 1964
Locality	India	Malasia	Malasia
Host	<i>Mastacembellus armatus</i>	<i>Channa striata</i>	<i>Channa micropeltes</i>
Scolex	Pear shaped	Circular	Pear shaped
Bothria	-	-	-
Hooks	Large, as well as small hooks, 36-48	Number of hooks - 60	Number of hooks = 38-40
Neck	-	-	-
Mature segments	-	-	-
Testes	-	-	-
Cirrus pouch	-	-	-
Genital pore	-	-	-
Ovary	Bilobed post equatorial	Slightly, bilobed equatorial	post
Vitellaria	lobulate and discontinuous in two groups	Lobate, discontinuous in two groups	-

Species ♂	<i>S. pahangensis</i>	<i>S. vishakhapatanamensis</i>	<i>S. khami</i>
Characters ♀	Furtado 1964	Ramadevi et al. 1972	Deshmukh - 1971
Locality	Tasek, Bera	India	Aurangabad, M.S., India
Host	<i>Channa micropeltes</i>	<i>Ophiocephalus punctatus</i>	<i>Ophiocephalus marulius</i>
Scolex	Triangular	Circular	Rectangular
Bothria	-	-	Shallow
Hooks	No. of hooks = 52	No. of hooks = 46 to 52	No. of hooks = 55 to 57
Neck	Present	Absent	Present
Mature segments	Obscured segmentation broader than long	-	Broader than long
Testes	Testicular lobes situated laterally	50-55 in number	Rounded, 155 in number
Cirrus pouch	-	-	Elongated, anterior half of segment
Genital pore	-	-	Middle of the segment
Ovary	Bilobed post equatorial, medullary	-	Post equatorial bilobed
Vitellaria	Lobulated	-	Follicular

Species ♂ Characters ♀	<i>S. aurangabadensis</i> Jadhav et al., 1980	<i>S. godavari</i> Shinde et al. 1980	<i>S. paithanensis</i> Kadam et al. 1981
Locality	Aurangabad, M.S., India	Nanded, M.S., India	Paithan M.S., India
Host	<i>Mastacembellus armatus</i>	<i>Mastacembellus armatus</i>	<i>Mastacembellus armatus</i>
Scolex	Oval length 0.804 & breadth 0.26	Pear shaped broad in the middle	Prominent, large triangular
Bothria	Two in number & 0.67 x 0.19	1.24 in length	Two in number extend upto posterior end
Hooks	50-52 in numbers in two half crowns	40-42 in numbers, in two half crowns	54 in numbers
Neck	Absent	Absent	Present
Mature segments	0.37 in length and 1.28 in breadth	Broader than long	Broader than long
Testes	240-260 in numbers	Rounded arranged in two fields 220-230	Rounded, oval, 130-135 in number
Cirrus pouch	0.014 in length and 0.06 in breadth	Oval, situated in ant. half of segment	oval, curved anteriorly to the isthmus
Genital pore	Middle of the segment, rounded	Middle of the segment & rounded	small and central
Ovary	Post, equatorial bilobed	Bilobed, short acini	Bilobed, blunt acini
Vitellaria	Short	Anterior to cirrus pouch	Thin tube, posterior to cirrus pouch

Species ♂	<i>S. jaggannathne</i>	<i>S. raoti</i>	<i>S. gachuae</i>
Characters ♀	M.A. Majid and G.B.Shinde 1984	M.A. Majid and G.B.Shinde 1984	Jadhav et al 1991
Locality	India	India	India
Host	<i>Channa punctatus</i>	<i>Channa punctatus</i>	<i>Mastacembellus armatus</i>
Scolex	large, oval anteriorly blunt	pear shaped	Medium, oval, elongated 0.670 x 0.398 mm
Bothria	Not mentioned	Two shallow bothria extending upto posterior region of scolex	Two bothria, extended upto posterior end
Hooks	40-44 in numbers	46 in numbers,	22-25 in numbers
Neck	Short	Absent	slightly broader than long
Mature segments	Broader than long	Broader than long	Almost three times broader
Testes	Rounded to oval 200-210 in number	65-70 in numbers, round and small	Medium, oval 300-310 in number
Cirrus pouch	Oval.	Oval, present at anterior side of segment	small, oval
Genital pore	small and central	middle of the proglottid	oval, middle of the proglottid
Ovary	Bilobed	post equatorial bilobed	Bilobed elongated
Vagina	Thin, tube like	Short tube	Thin, long coiled tube
Vitellaria	Non-lobate to lobate	Granular, lateral to testicular fields	Follicular, 3-4 rows

Species Characters ♂	S. maharashtri Jadhav and Tat 1991 India	S. chauvani Monzersasnain 1992 Jamshedpur, India	S. mohekarae Tat et al. 1997 Pali, India
Locality	India	Jamshedpur, India	Pali, India
Host	<i>Mastacembellus armatus</i>	<i>Channa punctatus</i>	<i>Mastacembellus armatus</i>
Scolex	Oval, muscular	Large, oval	Pear shaped
Bothria	Two in number	-	Two bothria extend upto post end
Hooks	45-47 in numbers	40-44 in numbers,	22-26 in numbers
Neck	Absent	short	present
Mature segments	Broader than long	Broader than long	4 to 5 times Broader than long
Testes	Oval, arranged in two fields 80-90 in number	rounded, 200-210 in number	Oval in shape 65-70 in numbers
Cirrus pouch	oval,	oval	oval, situated in the ant. half of segment
Genital pore	small and central	small	-
Ovary	Bilobed,	Bilobed,	Bilobed, elongated
Vagina	Thin coiled tube like	Posterior to cirrus pouch	Anterior to cirrus pouch
Vitellaria	Follicular, rounded	Non-lobate to lobate	Follicular 5-6 rows in lateral side

Species ♂ Characters ♀	<i>Senga armatusae</i> Hiware et al 1999	<i>S. tappi</i> D.N. Patil 2000	<i>S. ayodhensis</i> Pande et al. 2006
Locality	Aurangabad, India	Shirpur, Dist : Dhule	India
Host	<i>Mastacembellus armatus</i>	<i>Mastacembellus armatus</i>	<i>Amphinuus cuchia</i>
Scolex	Triangular	Triangular	Conical
Bothria	Two	Two bothria extend upto post end	Two
Hooks	32-40	42-44 in number	29 in numbers
Neck	Absent	Present	Absent
Mature segments	Four times broader than long	Three times broader than long	Broader than long
Testes	Small, rounded	rounded 285-295	numerous
Cirrus pouch	Oval	Pre-ovarian in anterior half	Central
Genital pore	Middle of the segment	small, rounded	Middle of the proglottid, rounded
Ovary	Bilobed, post equatorial	Bilobed, elongated	Bilobed, preequatorial
Vagina	Anterior to cirrus	Thin tube	Thin coiled tube
Vitellaria	Follicular, double row	Follicular, lateral to testicular fields	Small follicles

Species ♂ Characters ♀	<i>S. boughi</i> Pande <i>et al.</i> 2006	<i>S. jadhavae</i> Bhure <i>et al.</i> 2007
Country	India	India
Host	<i>Rita - rita</i>	<i>Mastacembellus armatus</i>
Scolex	Pear shaped	Triangular anterior end pointed
Bothria	Two fleshy notched on two side	Two extended from anterior to posterior end
Hooks	28 in numbers	50-54 in numbers
Neck	Present	Present
Mature segments	Broader than long	Three times broader than long
Testes	small rounded, 40-50 in numbers	Rounded 310-320 in numbers
Cirrus pouch	Oval	Oval, pre-ovarian in the anterior half of segment
Genital pore	Median, anterior to ovary on dorsal side	small and rounded
Ovary	Compact, oval, large, unilobed	Large, bilobed
Vagina	Thin coiled tube	Thin tube
Vitellaria	Follicular	Follicular, lateral side of proglottid

Species Characters ♂	<i>S. kolhapurensis</i> n. sp.	<i>S. bhauraoae</i> n. sp.
Locality	Rukadi, Dist : Kolhapur	Kolhapur, M.S., India
Host	<i>Mastacembellus armatus</i>	<i>Mastacembellus armatus</i>
Scolex	Large	Large, dome shaped
Bothria	Two bothria distinctly marked off the segment	Two in number
Hooks	50-60 in numbers	35-40 in numbers
Neck	Absent	Very short
Mature segments	Five times broader than long	broader than long
Testes	small, oval 70-80 in numbers	smaller in size, densely arranged 150-200 in number
Cirrus pouch	small, oval preovarian	Medium in size and oval
Genital pore	small	small
Ovary	Distinctly bilobed, dumb-bell shaped	flattened, long sac like structure
Vagina	Long thin tube	slightly coiled tube
Vitellaria	Granular, thin strips corticalar	Follicular from anterior to posterior margin of the segments