



Original Research Article

A New Species of *Circumoncobothrium* (Cestoda) from the Freshwater Fish *Mastacembelus armatus* Collected from Koradi Dam, Buldhana District (MS) India

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Abstract: The present study describes a new cestode species, *Circumoncobothrium khushalraoi* sp. Nov., recovered from the intestine of the freshwater fish *Mastacembelus armatus* collected from Koradi Dam in January 2024. Eight mature specimens were examined using standard parasitological techniques, including fixation in 4% formalin, staining with acetocarmine and haematoxylin, and whole-mount preparation. Detailed morphological observations were made with the aid of camera lucida drawings. The worms are elongated and segmented, consisting of a cylindrical scolex, reduced neck, and mature proglottids. The scolex bears a rounded anterior end with a distinct rostellum armed with 17–20 hooks arranged in a single row, and two elongated bothria extending nearly the entire length of the scolex. Mature proglottids are broader than long and contain 125–130 oval to circular testes distributed throughout the segment. The ovary is small, bilobed, and situated in the posterior half of the segment. The cirrus pouch is small and oval, positioned anterior to the ovary, while the uterus is saccular and filled with numerous eggs. Vitellaria are granular and arranged in two lateral rows along the margins of each segment. Comparative morphological analysis with all previously described species of the genus reveals significant differences in the number of rostellar hooks, testes, shape of scolex, configuration of ovary, and arrangement of vitellaria. These distinguishing features justify the establishment of a new species under the genus. The species is named *C. khushalraoi* sp. Nov. in honour of Mr. Khushalrao Bhagajirao Gawai. This study contributes to the expanding taxonomy of *Circumoncobothrium* and enriches knowledge of cestode diversity in freshwater fishes of Maharashtra, India.

Keywords: *Circumoncobothrium khushalraoi*, *Mastacembelus armatus*, Cestode parasite, Rostellar hooks and Taxonomy.

INTRODUCTION

The genus *Circumoncobothrium* was established by Shinde G.B. (1968) from the intestine of the freshwater fish *Ophiocephalus leucopunctatus*, with *C. ophiocephali* designated as the type species. Subsequently, Jadhav and Shinde (1976) added three new species to the genus: *C.*

aurangabadensis and *C. raoii* from *Mastacembelus armatus*, and *C. gachuai* from *Ophiocephalus gachua*. Chincholikar and Shinde (1976) described two additional species: *C. shindei* from *M. armatus* and *C.*

bagariusi from *Bagarius* species. Shinde (1977) reported *C. khami* from *O. striatus*, while Jadhav et al. (1990) described *C. yamaguti* from *M. armatus*. Further additions include *C. alii* from *M. armatus* (Shinde et al., 1994), *C. vadgaonensis* from *M. armatus* (Patil et al., 1998), and *C. baimaii* from *M. armatus* (Wongasawad and Jadhav, 1998). Kalse and Shinde (1999) added *C. punctatusi* from *O. punctatus*, followed by *C. mastacembelusae* from *M. armatus* (Shinde et al., 2002) and *C. armatusae* (minor) from *M. armatus* (Pawar et al., 2002). Tat and Jadhav (2004) reported *C. manjari* from *O. gachua*, and Supugade et al. (2005) described *C. vitellariensis* from

M. armatus. Later contributions include *C. cirrihinae* from *Cirrihina mrigala* (Kharade et al., 2007), *C. mehdii* from *M. armatus* (Shelke et al., 2007), *C. ambajogaiensis* from *M. armatus* (Pardeshi et al., 2007), *C. yogeshwari* from *M. armatus* (Jawalikar et al., 2008), *C. purnae* from *M. armatus* (Borde and Jawale, 2008), *C. naidui* from *M. armatus* (Kalse et al., 2009), and *C. paithenensis* from *M. armatus* (Shah, 2010). Menkudale and Jawale (2010) added *C. thapari* from *O. striatus*, Pardeshi and Hiware (2011) described *C. jadhavae* from *M. armatus*, and Dhole and Kadam (2011) added *C. clariase* from *Clarias batrachus*. Most recently, Fartade A.M. et al. contributed four species from *Channa marulius*: *C. maruliusae* (2013), *C. nathii* (2015), *C. godavarae* (2016), and *C. govindii* (2017).

MATERIAL AND METHOD

Koradi, Maharashtra, and recognized by means of common ichthyological keys. Cestode parasites were extracted from the fishes' intestines after they were dissected, cleaned in regular saline, relaxed in lukewarm water, and preserved in 4% formalin. Hematoxylin Harris staining, graded alcohol series dehydration, xylene clearing, and DPX mounting were performed on the specimens in order to prepare them for permanent slide preparation. Using a camera lucida attachment, line drawings of diagnostic structures (scolex, proglottids, and reproductive organs) were created after thorough morphological observations were done under a compound microscope. Taxonomical identification was carried out based on morphological characters following standard keys and descriptions given by Yamaguti and Wardle and McLeod.

DESCRIPTION

- Eight mature cestode parasites were collected from the intestine of the freshwater fish *Mastacembelus armatus* (Lacepede, 1800) from Koradi Dam, District Buldhana (M.S.), India, in January 2024.

The cestodes were flattened, preserved in 4% formalin, stained with Acetocarmine and Haematoxyline, passed through graded alcohols, cleared in xylene, and mounted in D.P.X. Whole-mount slides were prepared for detailed anatomical study, and drawings were made using a camera lucida. All measurements are given in millimeters.

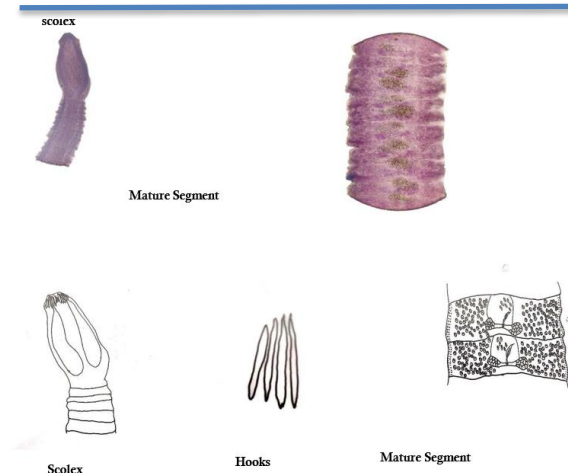
All collected cestodes were elongated, comprising a scolex, neck, and both immature and mature proglottids. The scolex was cylindrical in shape, with a length of 1.555 mm (range: 1.462–1.649 mm) and a width of 0.578 mm (0.459–0.697 mm).

The anterior tip of the scolex was rounded and featured a distinct rostellum armed with 17–20 hooks

arranged in a single row, measuring 0.502 mm (0.493–0.510 mm) in length and 0.034 mm (0.017–0.051 mm) in width. Laterally, the scolex had two bothria extending nearly the full length, narrow at the anterior end where they crossed each other and gradually widening toward the posterior, measuring 1.088 mm (1.054–1.122 mm) in length and 0.204 mm (0.136–0.272 mm) in width.

The neck is reduced.

- The mature proglottids were medium in size, approximately three times wider than long, measuring 0.510 mm (0.425–0.595 mm) in length and 1.910 mm (1.870–1.955 mm) in width.
- The testes were oval to circular, numbering 125–130, distributed throughout the segment, and measured 0.060 mm (0.051–0.068 mm) in length and 0.026 mm (0.017–0.034 mm) in width.
- The cirrus pouch was small and oval, located anterior to the ovary in the mid-region of the segment, with dimensions of 0.127 mm (0.102–0.153 mm) in length and 0.034 mm (0.017–0.051 mm) in width.
- Within this pouch, the cirrus was a thin tubular structure measuring
- 0.076 mm (0.068–0.085 mm) in length and 0.025 mm (0.017–0.034 mm) in width.
- The ovary was small, oval to rounded with unequal lobes, situated in the posterior half of the segment and connected by a short isthmus, measuring 0.110 mm (0.068–0.153 mm) in length and 0.612 mm (0.561–0.663 mm) in width.
- The vagina was a thin tube originating from the genital pore and extending posteriorly past the cirrus pouch, measuring 0.068 mm (0.051–0.085 mm) in length and 0.017 mm in width.
- The genital pore was small, rounded, and positioned posterior to the cirrus pouch, measuring 0.026 mm (0.017–0.034 mm) in both length and width.
- The uterus was saccular, filled with numerous eggs, and measured 0.289 mm (0.238–0.340 mm) in length and 0.399 mm (0.340–0.459 mm) in width.
- The vitellaria were granular and arranged in two lateral rows along the margins of each segment.



DISCUSSION

The genus *Circumoncobothrium* was first described by Shinde (1968), with *C. ophiocephali* designated as the type species, originally isolated from *Ophiocephalus punctatus*. The present specimen exhibits the general organ arrangement typical of species within this genus. Nonetheless, it can be distinguished from certain previously described species based on specific morphological features, as outlined below. The present cestode can be distinguished from *C. ophiocephali* Shinde, 1968 by its distinct scolex, 80 rostellar hooks, 70–80 testes, a single conical ovary, and follicular vitellaria; the latter was reported from *Ophiocephalus punctatus*, India.

1. It differs from *C. aurangabadensis* Jadhav & Shinde, 1976 in having a scolex broad at the middle and narrow at both ends, 42 rostellar hooks, a developed neck, 135–145 testes, a bilobed ovary, and granular vitellaria; reported from *Mastacembelus armatus*, India.
1. The worm differs from *C. raoii* Jadhav & Shinde, 1976 in presenting a mid- broad scolex, 46 hooks arranged in a single circle, a present neck, and 210– 215 testes; reported from *Mastacembelus armatus*, India.
2. It differs from *C. gachuai* Jadhav & Shinde, 1976 in having a pear-shaped scolex, 46 hooks, a present neck, squarish mature proglottids, 375–400 testes, and follicular vitellaria in two rows; reported from *Ophiocephalus gachua*, India.
3. Compared to *C. shindei* Chincholikar & Shinde, 1976, the worm exhibits a scolex narrow anteriorly and broad posteriorly, 49 hooks, and 260–275 testes; reported from *Mastacembelus armatus*, India.
4. It differs from *C. bagariusi* Chincholikar & Shinde, 1976 in having a scolex

narrow anteriorly and broad posteriorly, 55 hooks, absent neck, 275–285 testes arranged in two lateral fields, and follicular vitellaria; reported from *Bagarius* sp., India.

5. The cestode differs from *C. khami* Shinde, 1977 with 48 hooks, absent neck, 190–200 testes distributed evenly, and follicular vitellaria; reported from *Ophiocephalus* sp., India.
6. It is distinct from *C. yamaguti* Jadhav et al., 1990 in having a scolex narrow anteriorly and broad posteriorly, 56 hooks, 130–150 testes, and no neck; reported from *Mastacembelus armatus*, India.
7. The present species differs from *C. alii* Shinde et al., 1994 by a triangular scolex, 34 hooks, 230–240 testes, and granular vitellaria; reported from *Mastacembelus armatus*, India.
8. Compared to *C. vadgaonensis* Patil et al., 1998, it has a triangular scolex, 56 hooks, and 490–510 testes; reported from *Mastacembelus armatus*, India.
9. It differs from *C. baimaii* Wongsawad & Jadhav, 1998 in having a pear-shaped scolex, 48 hooks, 88–100 testes, a compact ovary, and granular vitellaria; reported from *Mastacembelus armatus*, Chang Mai.
10. It differs from *C. armatusae* Shinde et al., 1999 in having a triangular scolex, 23 hooks, a present neck, 90–100 testes, and a compact ovary; reported from *Mastacembelus armatus*, India.
11. The worm differs from *C. mastacembelusae* Shinde et al., 2002 by a pear- shaped scolex, 38 hooks, absent neck, 130–140 testes, and a bilobed ovary; reported from *Mastacembelus armatus*, India.
12. It differs from *C. armatusae* Pawar et al., 2002 with a triangular scolex, 58 hooks, absent neck, 190–200 testes, and follicular vitellaria; reported from *Mastacembelus armatus*, India.
13. Compared to *C. manjari* Tat & Jadhav, 2004, it shows a triangular scolex, 48 hooks in a single circle, and 128–145 testes; reported from *Ophiocephalus gachua*, India.
14. The parasite differs from *C. vitellariensis* Supugade et al., 2005 by having a large triangular scolex, 48 hooks, 250–260 testes, and a bilobed ovary; reported from *Mastacembelus armatus*, India.
15. It differs from *C. cirrhinae* Kharade et al., 2007 in having a large cylindrical, barrel-shaped scolex, 56 hooks, 300–305

- testes, a medium oval ovary, and granular vitellaria; reported from *Cirrhina mrigala*, India.
 16. The cestode differs from *C. mehdii* Shelke et al., 2007 with a triangular scolex, medium squarish mature proglottids, 280–290 testes, and a distinctly bilobed ovary; reported from *Mastacembelus armatus*, India.
 17. It differs from *C. ambajogaiensis* Pardeshi et al., 2007 by a triangular scolex, absent neck, mature segments ten times broader than long, 250–300 testes, and a bilobed dumbbell-shaped ovary; reported from *Mastacembelus armatus*, India.
 18. The present worm differs from *C. yogeshwari* Jawalikar et al., 2008 in having a triangular scolex, 53 hooks, and 95–98 testes; reported from *Mastacembelus armatus*, India.
 19. Compared to *C. purnae* Borde & Jawale, 2008, it shows a triangular scolex, 52 hooks, absent neck, slightly broader-than-long squarish mature proglottids, 230–235 testes, and a bilobed ovary; reported from *Mastacembelus armatus*, India.
 20. It differs from *C. naidui* Kalse et al., 2009 in having a cylindrical scolex, 40 hooks, absent neck, 200–210 testes, and a medium, compact, transversely elongated ovary with acini; reported from *Mastacembelus armatus*, India.
 21. The cestode differs from *C. paithenensis* Shah, 2010 in having a triangular scolex, 58 hooks, and a bilobed ovary; reported from *Mastacembelus armatus*, India.
 22. It differs from *C. thapari* Menkudale & Jawale, 2010 in having 52 hooks, absent neck, 95 testes, medium oval ovary, and follicular vitellaria arranged in 2–3 rows; reported from *Ophiocephalus striatus*, India.
 23. The worm differs from *C. jadhavae* Pardeshi & Hiware, 2011 in having a triangular dome-shaped scolex, 35–45 hooks, 95–105 oval-to-round testes, and a bilobed ovary; reported from *Mastacembelus armatus*, India.
 24. Compared to *C. clariasi* Kadam & Dhole, 2011, it exhibits a triangular scolex, 48 hooks, and 249–259 oval testes; reported from *Clarias batrachus*, India.
 25. It differs from *C. heamlatae* Reddy et al., 2011 by a large triangular scolex, 54 hooks, 200–225 testes, a large bilobed ovary, and a small rounded genital pore; reported from *Mastacembelus armatus*, India.
 26. The cestode differs from *C. maruliusae* Fartade et al., 2013 in having a triangular scolex, 62–65 hooks, 60–65 testes, and a bilobed ovary; reported from *Channa marulius*, India.
 27. It differs from *C. nathii* Fartade et al., 2015 in presenting a cylindrical scolex, 63 hooks, 70 testes, and an irregularly bilobed ovary; reported from *Channa marulius*, India.
 28. Compared to *C. godavarae* Fartade et al., 2016, it shows a scolex narrow anteriorly and broad posteriorly, 27 hooks, 100–120 testes, a bilobed ovary, and follicular vitellaria in 2–3 rows; reported from *Channa marulius*, India.
 29. The present species differs from *C. govindii* Fartade et al., 2017 in having a conical scolex, 58–60 hooks, 80–89 testes, an irregularly bilobed ovary, and granular vitellaria; reported from *Channa marulius*, India.
- The above noted characters are sufficient to erect a new species; hence, the name *Circumoncobothrium khushalraoi*, Sp. Nov., is proposed in honor of the father of the author, Mr. Khushalrao Bhagajirao Gawai.

Taxonomic Summary

Genus *Circumoncobothrium*, Shinde, 1968.

Species *Circumoncobothrium khushalraoi*, Sp. Nov.

Type host *Mastacembelus armatus* (Lacepede, 1800).

Habitat (Site) Intestine.

Type locality Koradi Dam District Buldhana (M. S.) India

Holotype and Deposited in the Research Lab., Department of

Paratype Zoology, Lal Bahadur Shastri College, Partur Dist -Jalna

Date of collection January, 2024.

Etymology Name proposed in honor of father name of author

Mr. Khushalrao Bhagajirao Gawai.

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Conflict- No conflict of interest

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