

# BIOSYSTEMATIC STUDIES ON COTUGNIA ORIENTALIS SP. NOV. (CESTODA: DAVAINIIDAE, FUHRMANN 1907) FROM GALLUS GALLUS DOMESTICUS

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## KEY WORDS

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## ABSTRACT

The present investigation deals with a new species of the genus *Cotugnia*, Dimare 1893 from the intestine of *Gallus gallus domesticus* at Loha, District – Nanded (M. S.) India. The new species *Cotugnia orientalis* come closer to all the known species of the genus *Cotugnia* in general topography of organ but differs due to having scolex quadrangular, suckers four, placed at four corners and muscular, Rostellar hooks 115 – 125 in numbers, arranged in a single circle, mature proglottids broader than long, tests oval to rounded 45-50 in numbers, cirrus poucy cylindrical, cirrus short, contained within cirrus pouch, vas deference long tube, genital pore marginal, vagina posterior to the cirrus pouch, ovary bilobed, 'W' shaped, gravid proglottids broader than long, egg capsules 50-60 in numbers and having 6-7 eggs in each capsule.

## INTRODUCTION

Birds are the important components of the ecosystem. They are very important for the ecological and economical point of view. Man uses many birds as delicious and nutritious food. Similarly birds also produce some important products like meat, eggs and beautiful feathers. Tapeworm infection is a major problem in *Gallus gallus domesticus*. The infections of cestode parasites are found in birds. They create some problems to health and productivity of birds. Parasitic infections are responsible for significant chronic mortalities and poor growth that is reflected in low survival and poor yield affecting marketability. The application of therapeutic measures, it is only possible after the identification of parasite or their taxonomic observation. Biosystematic study is a basic tool for describing and explaining biological diversity. It also acts as historical framework for bio control, biogeography, ecology and evolution.

The genus *Cotugnia* was erected by Diamare, (1893) with type species *C. digonopora* (Pasquale, 1890) collected from the domestic fowl. So far following species of the avian cestode Genus *Cotugina* are reported.

1. *C. digonopora* (Pasquale, 1890), Diamare, 1893.
2. *C. polyacantha*, Fuhrmann, 1909.
3. *C. cuneatea tenuis*, Meggitt, 1924.
4. *C. joyeuxi*, Baer, 1925.
5. *C. Parva* Baer, 1925
6. *C. fleari* Meggitt, 1927.

7. *C. bahli* Johri, 1934.
8. *C. intermedia* Johri, 1934.
9. *C. noctua* Johri, 1934.
10. *C. taiwanensis* Yamaguti, 1935.
11. *C. rimandoi* Tubangui and Masilungan, 1937.
12. *C. magna* Burt, 1940.
13. *C. aurangabadensis*, Shinde, 1969.
14. *C. columbae*, Shinde, 1969.
15. *C. srivastavi*, Malviya and Dutta, 1970.
16. *C. magdoubii*, Magzoubi et al., 1980.
17. *C. satpulensis*, Malhotra and Capoor, 1983.
18. *C. yamaguti*, Shinde et al., 1985.
19. *C. vishakhapatnamensis* Kolluri et al., 1988.
20. *C. rajivji* Jadhav et al., 1994.
21. *C. kamatiensis*, Kharade and Shinde, 1995.
22. *C. chengmaii* Wongsawod and Jadhav, 1998.
23. *C. manishae*, Shinde et al., 1999b.
24. *C. ganguae* Shinde et al., 1999a.
25. *C. mehdii* Mahajan, 1999.
26. *C. alii*, Shinde et al., 2002.
27. *C. sillodensis* Jadhav et al., 2004.
28. *C. singhi* Pawar et al., 2004.
29. *C. lohaensis* Jadhav et al., 2004.
30. *C. shankari* Tat and Jadhav 2005.
31. *C. liviae* Patil et al., 2005.
32. *C. streptopelii* Jadhav et al., 2009.
33. *C. hafeezi* Nanware et al., 2010

Keeping in mind the food value and economic importance of

birds, present investigation on biosystematics of avian cestodes has been carried out.

## MATERIALS AND METHODS

During collection of avian cestode parasites, twenty seven cestodes were recovered from the intestine of *Gallus gallus domesticus* at Loha, Nanded, India during July 2006 to June 2009. These cestode parasites were flattened, preserved in 4% formalin, passed in alcoholic grades, stained with Harri's haematoxyline and mounted in D.P.X. Drawing were made with the aid of camera lucida. Average measurements are recorded in millimeters.

## RESULTS

### (Description based on twenty seven specimens) (Fig. 1 and 2)

The worms are long creamy white in colour, thick, having scolex, neck, immature, mature, gravid proglottids and measures 30 mm in length. Scolex oval, quadrangular, large distinctly marked off from body and measures 1.266 (1.102 - 1.431) in length and 0.927 (0.901-0.954) in width. Scolex bears four suckers of equal sized, rounded to oval in shape, muscular, equidistantly placed and measures 0.196 (0.159-0.233) x 0.180 (0.148-0.212) in length and width. Rostellum large in size, oval in shape, armed with rostellar hooks and measures 0.227 (0.106-0.349) x 0.636 (0.583-0.689) in length and width. Rostellar hooks are 115-125 in numbers, arranged in single circle and measures 0.286 (0.106-0.466) in length and 0.021 (0.01-0.031) in width. Scolex is followed by neck, which is short, slightly wider anteriorly, narrow posteriorly and measures 0.259 (0.222-0.296) in length and 0.673 (0.604-0.742) in width.

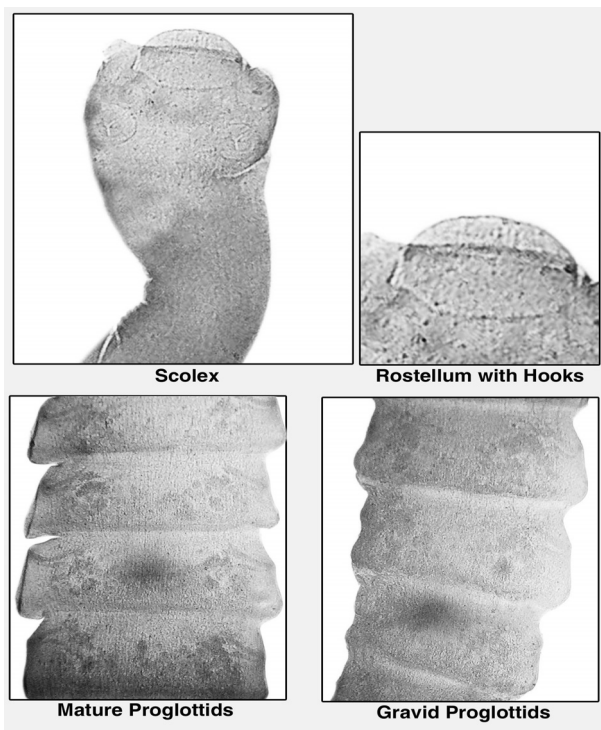


Figure 1: Micro-photoplate of *Cotugnia orientalis* Sp. Nov.

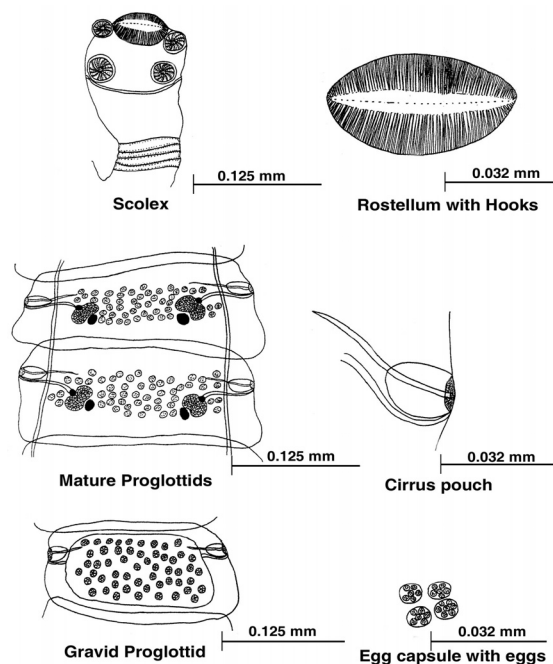


Figure 2: Camera Lucida diagram of *Cotugnia orientalis* Sp. Nov.

Mature proglottids are almost 2-3 times broader than long, medium, with convex margin, each segment is having double set of reproductive organs and measures 0.927 (0.742-1.113) in length and 2.310 (2.12-2.501) in width. Testes are 45-50 in number, oval to rounded in shape, placed at the centre of proglottids in between ovary and measures 0.074 (0.063-0.084) in diameter. Cirrus pouch is large, cylindrical, and measures 0.168 (0.151-0.186) in length and 0.128 (0.108-0.148) in width. Cirrus short, tube like contained within the cirrus pouch and measures 0.166 (0.162-0.170) in length and 0.014 (0.013-0.015) in width and forms vas deferens which is long, coiled tube and measures 0.402 (0.381-0.424) in length and 0.021 (0.010-0.031) in width. Cirrus and vagina opens from the common genital pores, which is oval, marginally placed and measures 0.058 (0.053-0.063) in length and 0.047 (0.042-0.053) in width.

Vagina is thin tube, opens from genital pore, posterior to cirrus pouch runs transversely and measures 0.349 (0.328-0.0371) in length and 0.026 (0.021-0.031) in width and forms receptaculum seminis, which is thin, short tube and reaches to the ootype and measures 0.143 (0.127-0.159) in length and 0.026 (0.021-0.031) in width. Ootype is small, oval, compact and measures 0.053 in diameters. Ovary is bilobed, 'W' shaped, placed at lateral side of the segment, having many blunt acini and measures 0.291 (0.159-0.424) in length and 0.265 (0.212-0.318) in width. Vitelline gland is rounded, post-ovarian, compact and measures 0.116 in diameter. Longitudinal excretory canal present on either side of the segment and measures 0.821 (0.816-0.826) in length and 0.013 (0.010-0.015) in width.

Gravid proglottids are broader than long and measures 0.969 (0.901-1.038) in length and 1.870 (1.802-1.939) in width. Uterus is sac like and filled egg capsules. Egg capsules are oval to rounded, 50-60 in number, having 6-7 eggs in each

capsule and measures 0.054 in diameter. Eggs are oval to round and measures 0.013 in diameter.

## DISCUSSION

The present worm under discussion comes closer to all the known species of the genus *Cotugnia* Diamare, 1893 in general topography of organ but differs due to some characters from following species.

- 1) The observed species differs from *C. diagonopra*, (Pasquale, 1890, Diamare, 1893), in the size of the scolex 1.266 x 0.927 as against 1.5, Size of rostellum 0.227 x 0.636 as against 0.15, Number of testes 45-50 as against 100-150 and size of cirrus sac 0.168 x 0.128 as against 0.300.
- 2) The present form differs from *C. polycantha* Furhmann, 1909, in the size of scolex 1.266 x 0.927 as against 0.45, Size of rostellum 0.227 x 0.636 as against 0.22, Number of rostellar hooks 115-125 as against 420, Number of testes 45-50 as against 100 and reported from *Gallus gallus domesticus* as against *Columba livia*.
- 3) The present parasite differs from *C. cunetea* tenuis, Meggitt, 1924, in the size of the scolex 1.266 x 0.927 as against 0.26, Size of rostellum 0.227 x 0.636 as against 0.12, Number of hooks 115-125 as against 400, Number of testes 45-50 as against 50 and reported from *Gallus gallus domesticus* as against *Columba livia*.
- 4) The present worm differs from *C. joyeuxi*, Baer, 1925, in the size of scolex 1.266 x 0.927 as against 0.67, Size of rostellum 0.227 x 0.636 as against 0.19, Number of hooks 115-125 as against 250, number of testes (45-50 as against 30-50) and size of cirrus pouch (0.168 x 0.128 as against 0.075).
- 5) The present cestode differs from *C. parva*, Baer, 1925, in the the size of the scolex 1.266 x 0.927 as against 0.49-0.68x 0.69-0.85), Size of rostellum 0.227 x 0.636 as against 0.15, Number of hooks (115-125 as against 378-396) Number of tests (45-50 in numbers as against 32-41), Size of cirrus pouch (0.168 x 0.128 as against 0.0196-0.106) and reported from *Gallus gallus domesticus* as against *Columba livia*.
- 6) The present form differs from *C. fleari*, Meggitt, 1927, in the the size of the scolex 1.266 x 0.927 as against (0.45-0.58), number of testes (45-50 as against 28-44), Size of cirrus pouch (0.168 x 0.128 as against 0.29-0.31) and reported from *Gallus gallus domesticus* Vs *Columba livia*.
- 7) The present parasite differs from *C. bahli*, Johri, 1934, in having the size of the scolex 1.266 x 0.927 as against 0.50, Size of rostellum 0.227 x 0.636 as against 0.34, Number of hooks 115-125 as against 332 and number of testes (45-50 as against 69-74).
- 8) The observed specimen differs from *C. intermedia*, Johri, 1934, in having the size of the scolex 1.266 x 0.927 as against 0.44x0.525, Number of testes (45-50 as against 69-74) and size of cirrus sac (0.168 x 0.128 as against 0.215-0.225).
- 9) The present cestode differs from *C. noctua*, Johri, 1934, in having the size of the scolex 1.266 x 0.927 as against 0.51, Size of rostellum 0.227 x 0.636 as against 0.225, Number of testes (45-50 as against 170-182).
- 10) The present parasite differs from *C. taiwanesis*, Yamaguti, 1935, in having the size of the scolex 1.266 x 0.927 as against 0.54-0.74, Size of rostellum 0.227 x 0.636 as against 0.54-0.74, Number of hooks (115-125 as against 200) Number of testes (45-50 as against 12-13) and reported from *Gallus gallus domesticus* Vs *Columba livia*.
- 11) The present form differs from *C. rimondoi* Tubangui and Masilungan, 1937, in the having the number of hooks (115-125 as against 300), Numbers of testes 45-50 as against 100-136 and reported from *Gallus gallus domesticus* Vs *Columba livia*.
- 12) The present worm differs from *C. magna*, Burt, 1940, in having the size of the scolex 1.266 x 0.927 as against 0.58-0.62, Size of rostellum (0.227 x 0.636 as against 0.285-0.315), number of hooks (115-125 as against 480-500), Number of testes (45-50 as against 150), Size of cirrus pouch (0.168 x 0.128 as against 0.238-0.270) and reported from *Gallus gallus domesticus* Vs *Columba livia*.
- 13) The present cestode differs from *C. aurangabadensis*, Shinde, 1969, in having the shape and size of scolex quadrangular, 1.266 x 0.927 as against broad, 0.483, shape and size of rostellum oval, 0.227 x 0.636 as against flat 0.300, number of hooks (115-125 as against 500), Number of testes (45-50 as against 80-90), Shape and size of cirrus pouch (cylindrical, 0.168 x 0.128 as against slender, 1.30 x 1.040) shape of ovary (bilobed against compact) and reported from *Gallus gallus domesticus* Vs *Columba livia*.
- 14) The present parasite differs from *C. columbae*, Shinde, 1969, in having the shape and size of the scolex quadrangular 1.266 x 0.927 as against (0.54-0.74), Size of rostellum 0.227 x 0.636 as against 0.447, Number of hooks (115-125 as against 1200), Number of testes (45-50 as against 12-14), shape and size of cirrus sac (cylindrical 0.168 x 0.128 as against narrow, short, 0.3), Ovary ('W' shaped as against bilobed), Vitelline gland compact as against absent and described from *Gallus gallus domesticus* Vs *Columba livia*.
- 15) The present form differs from *C. shrivastavai*, Malviya and Dutta, 1970, in the size of the scolex 1.266 x 0.927 as against 0.726, size of rostellum 0.227 x 0.636 as against 0.446, Number of testes (45-50 as against 80-85) described from *Gallus gallus domesticus* Vs *Columba livia*.
- 16) The present worm differs from *C. magdoubii*, Megzoubi et al., 1980, in having the size of the scolex 1.266 x 0.927 as against 0.44-0.55, Size of rostellum 0.227 x 0.636 as against 0.25-0.44, Size of cirrus pouch 0.168 x 0.128 as against 0.15-0.18 and described from *Gallus gallus domesticus* Vs *Columba livia*.
- 17) The present cestode differs from *C. satpulensis*, Malhotra and Capoor 1983, in having the size of the scolex 1.266 x 0.927 as against 0.535, Size of rostellum 0.227 x 0.636 as against 0.230, Number of hooks (115-125 as against 337), Number of testes 45-50 as against 43-52 described from *Gallus gallus domesticus* Vs *Columba livia*.

- 18) The present parasite differs from *C.yamagutii*, Shinde *et al.*, 1985, in having the shape and the size of the scolex, quadrangular 1.266 x 0.927 as against globular, 0.51-0.60, shape and size of rostellum, large, cylindrical to oval, 0.227 x 0.636 as against rounded, 0.26-0.27, number of hooks (115-125 as against 500), Number of testes (45-50 as against 190-200) and reported from *Gallus gallus domesticus* Vs *Columba livia*.
- 19) The present cestode differs from *C.vishakhapatnamensis* Kolluri *et al.*, 1988, in having the size of the scolex (1.266 x 0.927) as against (28-35 x 0.336-1.056).
- 20) The present form differs from *C.rajivji*, Jadhav *et al.*, 1994, in having the shape and the size of the scolex, quadrangular, 1.266 x 0.927 as against oval, 0.62-1.006, size of rostellum 0.227 x 0.636 as against 0.37-0.44, number of hooks (115-125 as against 350-400), number of testes (45-50 as against 60-65), size of cirrus pouch (0.168 x 0.128 as against 0.280-0.2823) and ovary 'W' shaped as against bilobed.
- 21) The present form differs from *C.kamatiensis*, Kharade and Shinde, 1995, in having the shape and the size of the scolex oval, quadrangular, 1.266 x 0.927 as against squarish, (0.84-1.00 x 0.0917-1.099), size of rostellum 0.227 x 0.636 as against 0.068 x 0.152, number of hooks (115-125 as against 200-210), number of testes (45-50 as against 95-105), size of cirrus pouch (0.168 x 0.128 as against 0.005-0.60), Ovary 'W' shaped as against bilobed and vagina (posterior to cirrus pouch as against anterior to cirrus pouch).
- 22) The present parasite differs from *C.chaingmai*, Wongsawod and Jadhav, 1998, in the size of the scolex (1.266 x 0.927 as against 0.58-0.738), size of rostellum (0.227 x 0.636) as against (0.194 x 0.249), Number of hooks (115-125 as against numerous), Number of testes (45-50 as against 30-35), Size of cirrus pouch (0.168 x 0.128 as against 0.32 x 0.43), genital pores (marginal as against 1/3<sup>rd</sup> of the segment), and ovary 'W' shaped as against bilobed.
- 23) The present cestode differs from *C.manishae*, Shinde *et al.*, 1999b, in having the size of the scolex (1.266 x 0.927 as against 0.462 x 0.485), size of rostellum (0.227 x 0.636) as against (0.22 x 0.227), Number of hooks (115-125 as against 110-120), Number of tests (45-50 as against 85-90), shape of ovary bilobed 'W' shaped as against oval) and described from *Gallus gallus domesticus* Vs *Columba livia*.
- 24) The present form differs from *C.ganguae*, Shinde *et al.*, 1999a, in the shape and the size of the scolex oval, quadrangular, large, (1.266 x 0.927) as against squarish, (0.529 x 0.636), Size of rostellum (0.227 x 0.636 as against 0.189 x 0.216), Number of hooks (115-125 as against 275-300) Number of testes (45-50 as against 155-160), size of cirrus pouch (0.168 x 0.128 as against 0.260), ovary ('W' shaped as against bilobed) and reported from *Gallus gallus domesticus* Vs *Corvus splendens*.
- 25) The present cestode differs from *C.mehdii*, Mahajan *et al.*, 1999, in having the size of the scolex (1.266 x 0.927 as against 0.985-1.516), size of rostellum (0.227 x 0.636 as against 0.129 x 0.182), Number of hooks (115-125 as against 110) and number of tests (45-50 as against 140-150).
- 26) The present form differs from *C.alii*, Shinde *et al.*, 2002, in the size of the scolex (1.266 x 0.927 as against 0.450-0.456 x 0.639-0.657), Number of hooks (115-125 as against 100-110), Number of testes (45-50 as against 80-85) and described from *Gallus gallus domesticus* Vs *Columba livia*.
- 27) The present form differs from *C.sillodensis*, Jadhav *et al.*, 2004, in having the size of the scolex (1.266 x 0.927) as against (0.851-1.192 x 1.192-1.395), size of rostellum (0.227 x 0.636 as against 0.170 x 0.281) and number of rostellar hooks (115-125 as against 220-250).
- 28) The present parasite differs from *C.singhi*, Pawar *et al.*, 2004. Which is having the size of the scolex (1.266 x 0.927 as against 0.363 x 0.436), size of rostellum (0.227 x 0.636 as against 0.154 x 0.225), Number of hooks (115-125 as against 200-210), Number of testes (45-50 as against 65-70), Ovary 'W' shaped as against 'H' shaped and described from *Gallus gallus domesticus* Vs *Columba livia*.
- 29) The present parasite differs from *C.lohaensis*, Jadhav *et al.*, 2004, Which is having the shape and the size of the scolex (quadrangular, 1.266 x 0.927 as against oval, 0.590-0.660 x 0.741-0.757), size of rostellum (0.227 x 0.636 as against 0.227 x 0.242), Number of hooks (115-125 as against 190-210), Number of testes (45-50 as against 28-30), size of cirrus pouch (0.168 x 0.128 as against 0.086-0.097 x 0.004-0.009), Ovary ('W' shaped as against bilobed) and reported from *Gallus gallus domesticus* Vs *Columba livia*.
- 30) The present cestode differs from *C.shankari*, Tat and Jadhav, 2005, in having the size of the scolex (1.266 x 0.927 as against 0.947-1.000 x 0.955-1.175), size of rostellum (0.227 x 0.636 as against 0.049-0.092 x 0.182-0.213), Number of hooks (115-125 as against 105-205), Number of testes (45-50 as against 27-40), Ovary ('W' shaped as against bilobed) and reported from *Gallus gallus domesticus* Vs *Columba livia*.
- 31) The present worm differs from *C.liviae*, Patil *et al.*, 2005, in having the size of the scolex (1.266 x 0.927 as against 0.369 x 0.359 – 0.437 mm), size of rostellum (0.227 x 0.636 as against 0.175-0.0189 x 0.097 – 0.131), Number of hooks (115-125 as against 250-270), Number of testes 45-50 as against 120-125(123), size of cirrus pouch (0.168 x 0.128 as against 0.225 x 0.068) and reported from *Gallus gallus domesticus* Vs *Columba livia*.
- 32) The present parasite differs from *C.streptopelli* Jadhav, *et al.*, 2009, by having the size of the scolex (1.266 x 0.927 as against 8.04 – 5.36 x 9.82-5.36), Number of testes (45-50 as against 27-30), Size of ovary (0.291 x 0.265 Vs 5.36-4.46 x 5.34-4.46), Size of vas deferens 0.402 (0.381-0.424) x 0.021(0.010-0.031) as against (3.53-0.18 x 3.57-0.18), size of vagina 0.349(0.328-0.371) x 0.026(0.0212-0.0318) Vs 7.32 – 6.25.
- 33) The present parasite differs from *C. hafezi* Nanware *et*

*al.*, 2010, by having in having size of scolex 1.266 (1.102-1.431) x 0.927 (0.901-0.954) Vs 1.24(0.74-1.74) x 1.08(0.99-1.17), Number of Rostellar hooks (110-120Vs 55-60), Number of testes (45-50 Vs150-160), Size of cirrus pouch is 0.168 x 0.128 Vs 0.23 x 0.11, Shape and size of ovary (bilobed, 'W' shaped, 0.291 (0.159-0.424) x 0.265 (0.212-0.318) Vs bilobed, butterfly shaped, 0.30(0.26-0.34) x 0.107 (0.070 – 0.145).

From the above discussion it is clear that, the species under discussion is new to science and differs from the known valid species of the genus *Cotugnia* in respect to taxonomic characters. Hence it is desirable to erect a new species and named it as *Cotugnia orientalis* Sp.Nov.

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