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Bio-systematic Studies on *Cotugnia tetragona* Sp. Nov. (Cestoda: Davaineidae) from *Columba livia*

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Abstract

The present investigation deals with a new species of the genus *Cotugnia* [1] from the intestine of *Columba livia*, district Nanded, (M.S.) of India. The new species *Cotugnia tetragona* is comes closer to all the known species of the genus *Cotugnia* in general topography of organ but differs due to scolex tetragonal, four rounded suckers, rostellum large, oval, rectangular with 120-130 rostellar hooks, mature segments broader than long, testes 60-70 in numbers, oval to rounded and post-ovarian, cirrus pouch elongated, cirrus thin lie within cirrus sac, vas deferens short, coiled tube, upward directed, genital pore marginal at both side in the middle of segment, vagina posterior to cirrus pouch, receptaculum seminis present, ootype small, vitelline gland large, compact.

Key Words: Cestoda, *Cotugnia tetragona* Sp. Nov., Davaineidae, *Columa livia*

Introduction

Genus *Cotugnia* was erected by Diamare[1] with type species *C.digonopora* [2]collected from the domestic fowl. So far following species of the avian cestode Genus *Cotugina* are reported.

1. *C. digonopora* [1,2]
2. *C.polyacantha,* [3]
3. *C. cuneatea tenuis*,[4]
4. *C. joyeuxi* [5]
5. *C. Parva* [5]
6. *C. fleari* [6]
7. *C. bahli* [7]
8. *C. intermedia* [7]
9. *C. noctua* [7]
10. *C. taiwanensis* [8]
11. *C. rimandoi* [9]
12. *C. magna* [10]
13. *C. aurangabadensis*, [11]
14. *C. columbae*, [11]
15. *C. srivastavi*, [12]
16. *C. magdoubii*, [13]
17. *C. satpulensis*, [14]
18. *C. yamaguti*, [15]
19. *C. vishakhapatnamensis* [16]
20. *C. rajivji* [17]
21. *C. kamatiensis*, [18]
22. *C. chengmaii* [19]
23. *C. manishae*, [20]
24. *C. ganguae* [21]
25. *C. mehdii* [22]
26. *C. alii*, [23]
27. *C. sillodensis* [24]
28. *C. singhi* [25]
29. *C. lohaensis* [26]
30. *C.shankari* [27]
31. *C. liviae* [28]
32. *C.streptopelii* [29]
33. *C. hafeezi* [30]
34. *C. indiana* [31]

Material and Methods

During the course of investigation eight out of total eleven *Columba livia* from Hadgaon, district Nanded, (M.S.) of India during July 2006 to June 2009 were found infected with seventeen tapeworms. These were processed for morphological examination after washing in lukewarm water and fixation in Bouins fluid for 20 minutes. The worms were washed till they become transparent and permanent stained preparations of the cestodes were prepared in Harri's Haematoxylene, mounted in D.P.X., Camera Lucida sketches were made from the permanent preparations. All measurements are recorded in Millimeter.

Results

(Description Based on seventeen alike specimens)
(Figure- 1 & 2)

The worms are creamy white in colour, long, having 300-400 proglottids and measures 28 mm in length. Scolex is tetragonal in shape, large, muscular, distinctly marked off from storbilla and measures 0.927 (0.688-1.166) x 0.773 (0.667-0.879) in length and breadth. The scolex bears suckers, which is four in numbers, muscular, placed at four corners and measures 0.222 (0.201-0.243) x 0.212 (0.201-0.222) in length and breadth. The rostellum is large, oval, having rostellar ring with numerous rostellar hooks and measures 0.2809 (0.212-0.3498) x 0.4505 (0.4240-0.4770) in length and breadth. The rostellar hooks are 120-130 in numbers, placed on rostellar

ring, in a single circle and measures 0.033 (0.027-0.040) x 0.002 (0.001-0.003) in length and breadth. The neck is absent.

The mature proglottids four times broader than long with irregular margin, narrow anteriorly, broad posteriorly and measures 0.662 (0.614-0.699) x 2.443 (2.374-2.512) in length and breadth. Each segment with double set of reproductive organs. The testes are 60-70 in numbers, small, oval to rounded in shape, placed in between female reproductive organs, in a central medulla and measures 0.053 in size. Cirrus pouch is medium, elongated, transversely placed to segment and measures 0.1855 (0.1802-0.1908) x 0.09 (0.084-0.095) in length and breadth. Cirrus short, thin, contained within the cirrus pouch, tubular and measures 0.153 x (0.148-0.159) x 0.009 (0.007-0.10)) in length and breadth and forms vas deferens, which is short, coiled, tubular and measures 0.206 (0.201-0.212) x 0.007 (0.005-0.01) in length and breadth. Cirrus and vagina are opens from common genital pores, which is small, oval to rounded in shape, marginal, placed at middle of the segment and measures 0.106 (0.0954-0.1166) x 0.0265 (0.0212-0.0318) in length and breadth.

Vagina is thin tube, opens from the genital pores, posterior to the cirrus pouch runs transversely and measures 0.3816 (0.371-0.392) x 0.0132 (0.0106-0.0159) in length and breadth and forms receptaculum seminis, which is thin, short tube, reaches to the ootype and measures 0.1802 (0.1696-0.1908) x 0.0185 (0.0159-0.0212) in length and breadth. The ootype is small rounded placed in between two lobe of ovary and measures 0.053 in diameter. The ovary is distinctly bilobed, arise from ootype, having numerous blunt accini and measures 0.1908 (0.1696-0.212) x 0.0689 (0.053-0.0848) in length and breadth. The vitelline gland is rounded, compact, large, post ovarian and measures 0.084 in diameter. Longitudinal excretory canal present on either side of segment which is long, tubular and measures 0.641 (0.614-0.667) x 0.013 (0.010-0.015) in length and breadth.

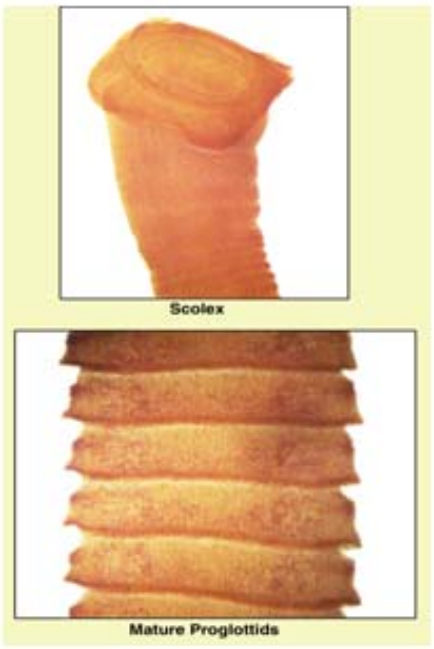

Figure 1 –Microphotoplate of *Cotugnia tetragona* Sp.Nov.

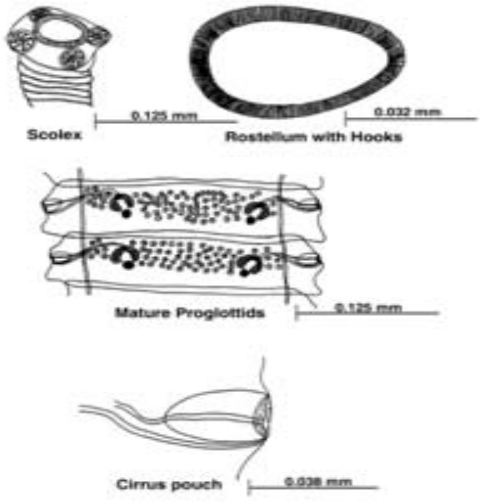

Figure 2 –Camera Lucida diagram of *tetragona* Sp.Nov.

Discussion

The present parasite under discussion is having scolex tetragonal, four rounded suckers, rostellum large, oval, rectangular with 120-130 rostellar hooks, mature segments broader than long, testes 60-70 in numbers, oval to rounded and post-ovarian, cirrus pouch elongated, cirrus thin lie within cirrus sac, vas deferens short, coiled tube, upward directed, genital pore marginal at both side in the middle of segment, vagina posterior to cirrus pouch, receptaculum seminis present, ootype small, vitelline gland large, compact.

The present form comes closer to all the known valid species of the genus *Cotugnia*[1] in general topography of organs but differs due to some taxonomic characters by following species.

1. The present cestode differs from *C.diagonopra*, in the size of the scolex (0.9275 x 0.7738 Vs 1.5), size of rostellum (0.2809 x 0.4505 Vs 0.15), Number of testes (60-70 Vs 100-150), Size of cirrus sac (1.855 x 0.901) in length and breadth. Vs 0.300 and reported from *Columba livia* Vs *Gallus gallus domesticus*.
2. The present tapeworm differs from *C.polycantha,* in the size of the scolex (0.9275 x 0.7738 Vs 0.45), Size of rostellum (0.2809 x 0.4505 Vs 0.22).Number of rostellar hooks (120-130 Vs 420) Number of testes (60-70 Vs about 100) and reported from *Columba livia* Vs *Columba turtur*.
3. The present parasite differs from *C.cuneata*, in the size and shape of scolex (0.9275 x 0.7738, tetragonal Vs 0.26 rounded), shape and size of rostellum (large, compact with rostellar ring 0.2809 x 0.4505 Vs rounded 0.12), Number of rostellar hooks (120-130 Vs 400) and number of testes (60-70 Vs 50).
4. The present worm differs from *C.joyeuxi,* in the size of scolex (0.9275 x 0.7738 Vs 0.67), Size of rostellum (0.2809 x 0.4505 Vs 0.19), number of rostellar hooks are (120-130 Vs 250), Number of testes (60-70 Vs 30-50) and size of cirrus pouch (0.185 x 0.090 Vs 0.075).

5. The present cestode differs from *C.parva*, in the size of scolex (0.9275 x 0.7738 Vs 0.49-0.68 x 0.69-0.85), size of rostellum (0.2809 x 0.4505 Vs 0.15), Number of rostellar hooks (120-130 Vs 378-396), Number of testes (60-70 Vs 32-41) and size of the cirrus pouch (0.1855 x 0.0901 Vs 0.0196-0.106).
6. The present form differs from *C.fleari*, in the size of scolex (0.9275 x 0.7738 Vs 0.45-0.58), Number of testes (60-70 Vs 28-44) and size of cirrus pouch (0.1855 x 0.0901 Vs 0.29-0.31).
7. The present parasite differs from *C.bhali,* in having the size of scolex (0.9275 x 0.7738 Vs 0.50), Size of rostellum (0.2809 x 0.4505 Vs 0.34), Number of rostellar hooks (120-130 Vs 332), Number of testes (60-70 Vs 69-74) and reported from *columba livia* Vs *Gallus gallus domesticus*.
8. The present form differs from *C.intermedia*, in having the size of scolex (0.9275 x 0.7738 Vs 0.44-0.525), Number of testes (60-70 Vs 69-74), Size of cirrus sac (0.185 x 0.090 Vs 0.215-0.0225) and reported from *Columba livia* Vs *Gallus intermedia*.
9. The present cestode differs from *C.noctua*, in having the size of scoelx (0.9275 x 0.7738 Vs 0.51), Size of rostellum (0.2809 x 0.4505 Vs 0.225), Number of testes (60-70 Vs 170-182) and reported from *Columba livia* Vs *Columba intermedia*.
10. The present parasite differs from *C.taiwanensis*, in having the size of scolex (0.9275 x 0.7738 Vs 0.54-0.74), size of rostellum (0.2809 x 0.4505 Vs 0.54-0.74), Number of rostellar hooks (120-130 Vs 200) and number of testes (60-70 Vs 12-13).
11. The present form differs from *C.rimondoi*, in having the number of hooks (120-130 Vs 300) and number of testes (60-70 Vs 100-136).
12. The present worm differs from *C.magna*, in having the size of scolex (0.9275 x 0.7738 Vs 0.58-0.62), size of rostellum (0.2809 x 0.4505 Vs 0.285-0.315), Number of rostellar hooks (120-130 Vs 480-500), Number of testes (60-70 Vs 150) and size of cirrus sac (0.1855 x 0.0901 Vs 0.238-0.270).
13. The present cestode differs from *C.aurangabadensis*, in having the shape and size of scolex (tetragonal, 0.9275 x 0.7738 Vs broad, 0.483), Shape and size of rostellum (large, muscular with rostellar hook ring 0.2809 x 0.4505 Vs Flat, 0.300), Number of rostellar hooks (120-130 Vs 500) , Number of testes (60-70 Vs 80-90), Shape and size of cirrus pouch (elongated, 0.185 x 0.090 Vs 1.30 x 1.040) and genital pores, (Marginal, middle of the segment Vs anterior of the segment).
14. The present parasite differs from *C.columbae*, in the shape and size of scolex (tetragonal, 0.9275 x 0.7738 Vs wide, 0.54-0.74), Size of rostellum (0.2809 x 0.4505 Vs 0.447), Number of rostellar hooks (120-130 Vs 1200), number of testes (60-70 Vs 12-14), Shape and size of cirrus sac (elongated, 0.185 x 0.090 Vs narrow, short, 0.3), Genital pores (middle Vs 1/3 rd of anterior margin), and presence of vitelline gland Vs absence of vitelline gland .
15. The present form differs from *C.srivastavai*, in the size of the scolex (0.9275 x 0.7738 Vs 0.726), Size of rostellum (0.2809 x 0.4505Vs 0.446), and number of testes (60-70 Vs 80-85).
16. The present worm differs from *C.magdoubii*, in having the size of scolex (0.9275 x 0.7738 Vs 0.44-0.55), Size of rostellum (0.2809 x 0.4505 Vs 0.25-0.44), and size of cirrus sac (0.185 x 0.090 Vs 0.15-0.18).
17. The present cestode differs from *C.satpulensis*, in having the size of scolex (0.9275 x 0.7738 Vs 0.535), Size of rostellum (0.2809 x 0.4505 Vs 0.230), Number of hooks (120-130 Vs 337) and number of testes (60-70 Vs 43-52).
18. The present parasite differs from *C.yamagutii*, in having the shape and size of scolex (tetragonal, 0.9275 x 0.7738 Vs globular ,0.51-0.60), shape and size of rostellum (large, muscular, 0.2809 x 0.4505 Vs rounded, 0.26-0.27), Number of hooks (120-130 Vs 500), Number of testes (60-70 Vs 190-200), Genital pores (middle of the segment Vs 1/4th from anterior margin of the segments) and ovary (small Vs bilobed with 8-10 accini.)
19. The present worm differs from *C.vishakhapatnamensis,* by having size of scolex 0.9275 x 0.7738 Vs 28-35 x 0.336-1.056.
20. The present form differs from *C.rajivji*, in having the shape and size of scolex (Tetragonal, 0.9275 x 0.7738 Vs oval 0.62-1.006), Size of rostellum (0.2809 x 0.4505 Vs 0.37-0.44), Number of rostellar hooks (120-130 Vs 350-400), Number of testes (60-70 Vs 60-65), size of cirrus sac (elongated, 0.1855x 0.090 Vs 0.280-0.2823) and reported from *Columba livia* Vs *Gallus gallus domesticus*.
21. The present form differs from *C.kamatiensis*, in having the shape and size of scolex (tetragonal, 0.9275 x 0.7738 Vs squarish, 0.84-1.00 x 0.917-1.099), Size of rostellum (0.2809 x 0.4505 Vs 0.068 x 0.152), Number of hooks (120-130 Vs 200-210), Number of testes (60-70 Vs 95-105), Shape and size of cirrus sac (elongated, 0.185 x 0.090 Vs oval, cylindrical, 0.005-0.60), Genital pore (marginal, middle of the segment Vs anterior to the middle of the segment), Vitelline gland (large, compact Vs medium, oval post ovarian), Vagina (posterior to cirrus pouch Vs anterior to cirrus pouch) and reported from C*olumba livia* Vs *Gallus gallus domesticus*.
22. The present parasite differs from *C.chengmaii*, in the shape and size of scolex (tetragonal, 0.9275 x 0.7738 Vs quadrangular, 0.58 x 0.738), Size of rostellum (large, muscular, 0.2809 x 0.4505 Vs spinose, 0.194 x 0.249), Number of rostellar hooks (120-130 Vs numerous), Number of testes (60-70 Vs 30-35), Size of cirrus sac (0.185 x 0.090 Vs 0.32 x 0.43), Genital pore (marginal middle of the segment Vs 1/3 rd of anterior margin of the segment), Vitelline gland (large, compact Vs small), Vagina posterior to cirrus pouch 0.381 x 0.013 Vs thin, 0.404 x 0.703) and reported from *Columba livia* Vs *Gallus gallus domesticus*.
23. The present cestode differs from *C.manishae,* in having the size of the scolex (0.9275 x 0.7738 Vs 0.462 x 0.485). Size of rostellum (0.2809 x 0.4505 Vs 0.22 x 0.227), Number of rostellar hooks (120-130 Vs 110-120), Number of testes (60-70 Vs 85-90), Size of cirrus pouch (0.185x 0.090 Vs 0.083-0.121x 0.030-0.038), Ovary (distinctly bilobed Vs oval) and vitelline gland (large, compact Vs oval to triangular).

24. The present form differs from *C.ganguae,* in the shape and size of scolex (tetragonal, 0.9275 x 0.7738 Vs squarish, 0.529 x 0.636), Shape and size of rostellum (large, muscular0.2809 x 0.4505 Vs big, oval, 0.189 x 0.216), Number of hooks (120-130 Vs 275-300), Number of testes (60-70 Vs 155-160), Shape and size of cirrus pouch (elongated, 0.185 x 0.090 Vs cylindrical, 0.260), ovary (distinctly bilobed Vs bilobed, lobes unequal in shape) and reported from *Columba liva* Vs *corvus splendens*.
25. The present cestode differs from *C.mehdii*, in having the size of scolex (0.9275 x 0.7738 Vs 0.985 x 1.516), Size of rsotellum (0.2809 x 0.4505 Vs 0.1229 x 0.182), Number of hooks (120-130 Vs 110), Number of testes (60-70 Vs 140-150), Size of cirrus sac (0.185 x 0.090 Vs 0.530) and reported from *Columba livia* Vs *Gallus gallus domesticus*.
26. The present form differs from *C.alii*, in the size of scolex (0.9275 x 0.7738 Vs 0.450-0.456 x 0.639-0.657), Number of rosterllar hooks (120-130 Vs 100-110) and number of testes (60-70 Vs 80-85).
27. The present form differs from *C.sillodensis,* in having the shape and size of the scolex (tetragonal, 0.9275 x 0.7738 Vs quadrangular, 0.851-1.192 x 1.192-1.395), Size of rostellum (large, muscular, 0.2809 x 0.4505Vs oval, 0.170 x 0.281), Number of rostellar hooks (120-130 Vs 220-250), size of cirrus pouch (0.185 x 0.090 Vs 0.067-0.092 x 0.035), Vagina (posterior to cirrus pouch Vs thin), ovary (distinctly bilobed, 0.190 x 0.068 Vs irregular, medium 0.321-0.628 x 0.178-0.267), Vitelline gland (large, compact Vs small, and reported from *Columba livia* Vs *Gallus dimesticus*.
28. The present parasite differs from *C.singhi,* which is having the size of scolex (0.9275 x 0.7738 Vs 0.363 x 0.436), Size of rostellum (0.2809 x 0.4505 Vs 0.154 x 0.255), Number of hooks (120-130 Vs200-210), Number of tests (60-70 Vs 65-70), size of cirrus pouch (0.185 x 0.090 Vs 0.229-0.159), Genital pore (middle of the segment Vs marginal), Ovary (distinctly bilobed Vs 'H' shaped) and vitelline gland (large, compact Vs post-ovarian).
29. The present parasite differs from *C.lohaensis, w*hich is having the shape and size of scolex (tetragonal, 0.9275 x 0.7738 Vs oval 0.590-0.660 x 0.741-0.757), Size of rostellum (0.2809 x 0.4505 Vs 0.227 x 0.242), Number of rostellar hooks (120-130 Vs 190-210), Number of testes (60-70 Vs 28-30), Size of cirrus sac (0.185 x 0.090 Vs 0.086-0.097 x 0.004-0.009), Size of ovary (0.190 x 0.068 Vs 0.023-0.233 x 0.071-0.097) and vitelline gland (large Vs post- ovarian).
30. The present cestode differs from *C.shankari,* in having the shape and size of scolex (tetragonal, 0.9275 x 0.7738 Vs quadrangular, 0.947-1.000 x 0.955-1.175), Size of rostellum (0.2809 x 0.4505 Vs 0.049-0.092 x 0.182-0.213), Number of rostellar hooks (120-130 Vs 105-205), Number of testes (60-70 Vs 27-40), size of cirrus pouch (0.185 x 0.090 Vs 0.098-0.030), Genital pore (middle of the segment Vs marginal), ovary (distinctly bilobed Vs bilobed) and vitelline gland (large, compact Vs medium, post-ovarian).
31. The present tapeworm differs from *C.liviae*, in having size of scolex (0.9275 x 0.7738 as against 0.369 x 0.359-0.437mm), Size of rostellum 0.2809 x 0.4505 as against 0.175-0.0189 x 0.097-0.131), Number of rostellar hooks (120-130 as against 250-270), Number of testes (60-70 Vs 120-125), and size of cirrus pouch (0.185 x 0.090 as against 0.225 x 0.068).
32. The present worm differs from *C.streptopelii* , in having size of scolex (0.9275 x 0.7738) as against (8.04-5.36 x 9.82-5.36), Number of testes (60-70 as against 27-30), Size of ovary (0.190 x 0.068 as against 5.36-4.46 x 5.34-4.46), Size of vas deferens (0.206 x 0.007 as against 3.53- 0.18 x 3.57 – 0.18), Size of vagina (0.381 x 0.013 as against 7.32-6.25).
33. The worms of the new species also showed difference from *C.hafeezi,* in having shape of scolex (tetragonal Vs quadangular), size of the scolex (0.9275 x 0.7738 Vs 1.2245 x 1.086 x 0.996-1.176), size of rostellum (0.2809 x 0.4505 Vs 0.395 X 0.317), Number of rostellar hooks (120-130 Vs 55-60) , Number of testes (60-70 Vs 150-160) and reported from *Columba livia* Vs *Gallus gallus domesticus*.
34. The worms of the new species also showed difference from *C.indiana* , in having shape of scolex (tetragonal Vs square), Number of rostellar hooks (120-130 Vs 110-120) and Number of testes (60-70 Vs 115-120) .

Conclusion

It is therefore concluded that based on significant differentiating features of the newer worms, the authors are inclined to raise a new species, *Cotugnia tetragona* Sp.Nov., named on account of having tetragonal shape of scolex.

Taxonomic Summary

Type species : *Cotugnia tetragona* Sp.Nov.
Host : *Columba livia*.
Habitat : Intestine
Locality : Hadgaon, District- Nanded (M.S.), India.
Prevalence : 17 specimens from 08 hosts out of 11 examined.
Period of collection : July 2006--June 2009.
No. of Specimen : 05
Accession number : PGDZ/YMN/1-5/July, 2006- June, 2009.
Deposition : Research Laboratory, Department of Zoology, Yeshwant Mahavidyalya, Nanded. (M.S.) India.
Etymology : The species *C.tetragona* Sp.Nov. is named on account of having Tetragonal shape of Scolex.

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