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MORPHOMETRIC STUDIES OF A NEW CESTODE Dipylidium sarwari FROM Felis domesticus AT BADNAPUR, M.S., INDIA

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AUTHOR'S CONTRIBUTION

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Dipylidium sarwari n. sp. belonging to order Dilepididea is described from *Felis domesticus* collected from Badnapur village of Jalna district, M.S. India. The collected cestodes were flattened and preserved in formalin. The preserved worms were stained with Harris haematoxylene, dehydrated in alcohol and mounted in D.P.X. Figures were drawn using camera lucida. The present species has triangular scolex; rostellar hooks in 15 rows and 125 in number; testes medium, oval to round, 145-155 (149) in number; cirrus pouch large, flask shaped; ovary indistinctly bilobed and vitelline gland large, single mass. The present worm has significant morphological variations to accommodate it as a new species.

Keywords: Cestoda; Dipylidium sarwari n. sp.; Felis domesticus; Badnapur; Jalna.

1. INTRODUCTION

The most common tapeworm found in domestic dog is the genus *Dipylidium* which also infects cats. Investigations have suggested the existence of two distinct genotypes of *Dipylidium caninum* in dog and cat showing distinct host interaction [1,2]. Humans, particularly young children between the ages 0-5 years get accidentally infected by ingesting the fleas while they come in contact with these pets [3-5].

The genus *Dipylidium* was added in 1863 with type species *D. caninum* by Leuckart. It was emended in 1927 by Lopez-Neyra as double genitalia genus having muscular holdfast; retractable rostellum with three or four crowns of hooks; upto 200 testes; net-like mature uterus which is replaced by egg capsules in gravid segment; each capsule having 5-30 embryonated eggs [6]. Till date twenty species have

been added under this genus by different researchers which include: *D. ascalabotidis* [7,8], *D. monticellii* [9,10], *D. sexcoronatum* [10], *D. oerleyi* [10,11], *D. walkeri* [10,12], *D. halli and D. buencaminoi* [6,10,13], *D. compactum*, *D. crassum*, *D. diffusum D. gracile and D. longulum* [6,14,10], *D. carracidoi and D. porimammillanum* [15], *D. catus* [16], *D. otocyonis* [17], *D. nandedensis* [18], *D. chausae* [19], *D canisi* [20] and *D. mehdii* [21]. The above species were identified by different researchers on the basis of their morphological studies. Vertebrate hosts in which the above species were found are mentioned along with their characters in Table 1.

Species D. sexcoronatum, D. walkeri, D. compactum, D. crassum, D. halli, D. diffusum D. gracile, D. longulum, D. carracidoi and D. porimammillanum were considered synonymous of D. caninum by Witenberg [22] in 1932. He removed D. monticellii

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from list of species due to inadequate sketches. Witenberg considered *D. sexcoronatum* as synonym of *D. caninum*, due to overlapping of morphological characters but later work by Stewart M.A. [23] in 1939 proved that there are physiological difference as regards to antihelminthic drug, iso-amyl-orthocresol and hence cannot be considered synonym. The present study deals with the description of a new species *D. sarwari.*

2. METHODOLOGY

2.1 Materials and Methods

Ten cestode worms were obtained from the small intestine of a domestic cat, Felis domesticus, at Badnapur, Taluka Badnapur, District Jalna, M.S., India in the month of November 1997. These cestodes were flattened between glass slides and preserved in 4% formalin. For further anatomical studies the preserved cestodes were washed with water and stained using Harris haematoxylin. The stained cestodes were dehydrated by passing through various concentration grades of ethanol, cleared in xylol and whole mount slides were prepared in D.P.X. Sketches were made using camera lucida. Measurements are recorded in mm. The whole mount slides are preserved in Zoology Department of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India. Classification and relevant description of genus Dipylidium has been obtained from the available literature resources [24,25].

3. RESULTS AND DISCUSSION

The parasites were small, whitish with thick musculature. Fig. 1 shows the morphometric details of *Dipylidium sarwari* sp. nov. Whole worm were obtained having scolex, many immature and mature proglottids. Scolex medium, roughly triangular in shape with narrow anterior and broad posterior end, clearly marked off from the strobila 0.364 to 0.534×0.296 to 0.568. Scolex bears oval to round suckers, present in two pairs, one pair in each half region of the scolex, overlapping on each other in each pair measuring 0.121 to 0.146 \times 0.121 to 0.151 and 0.121 in diameter.

Rostellum medium, oval, armed with hooks, present at the apex of scolex 0.024 to 0.083 × 0.034 to 0.121; rostellar hooks 125, present in 15 rows, every row having varying number of hooks, 1^{st} line – 4, 2^{nd} line – 6, 3^{rd} row line – 3, 4^{th} line – 6, 5^{th} line – 7, 6^{th} line – 7, 7^{th} row – 3, 8^{th} row – 7, 9^{th} row – 9, 10^{th} row – 11, 11^{th} row – 9, 12^{th} row – 11, 13^{th} row – 7, 14^{th} row – 11 and 15^{th} row -15. The hooks are small in size, rose-thorn shaped with single, curved, pointed prong and oval basal disc measuring 0.001 to 0.003×0.001 to 0.004; rostellar sac medium, oval, extends nearly up to the middle of the scolex, between the two pairs of suckers, measures 0.126 to 0.160 \times 0.049 to 0.112.

Neck medium, longer than broad, measures 0.898 to 0.946 \times 0.398 to 0.504. Mature segments medium, almost squarish, with convex lateral margins, acraspedote and each proglottid with double set of genitalia of size 1.15 to 1.657 \times 1.237 to 1.600.

Testes medium, oval to round, 145 to 155 (149) in number, almost evenly distributed, in a single field in the central medulla, from anterior to posterior margin and from one lateral to the other lateral margin of the segment, laterally restricted till the longitudinal excretory canals measuring 0.034 to 0.102×0.034 to 0.091 and 0.091 in diameter.

Cirrus pouch large in size, flask shaped, tubular at anterior end and broad at posterior end, parallel to the anterior margin of the segments, situated at $1/3^{rd}$ or slightly above the middle of the same, directed anteriorly measuring 0.363 to 0.375×0.045 to 0.147 in size. The cirrus is thin, stout, slightly wavy, protruding out from the genital pore and measures 0.590 to 0.760×0.011 in width. Vas deferens is thin, short, slightly wavy, directed towards anterior side and measures 0.282 to 0.305×0.011 in dimensions.

Ovary is present on either side, indistinctly bilobed, the poral lobe larger than the aporal one, having irregular margin, with many short, blunt, round acini, located slightly below the middle of the segments and internal to the longitudinal excretory canals, concave depressions anteriorly or posteriorly and measures 0.409 to 0.443 × 0.136 to 0.293. The vagina is a thin tube, slightly curved, begins from the genital pore, posterior to cirrus pouch, extends medially, crosses the ovary, and opens into the ootype measuring 0.681 to 0.738 × 0.011 in breadth. Ootype is medium, oval in shape, post-ovarian, located in the concavity of the ovary, touching or not to the vitelline gland and measures 0.045×0.034 in size.

Genital pores are large, oval, bilateral, marginal, situated almost at $1/3^{rd}$ or slightly above the middle of the segments measuring 0.079 to 0.090×0.034 in width; vitelline gland large, oval, having slight concavity anteriorly, compact, a single mass, situated in the posterior half of the segments measuring 0.159 to 0.170×0.079 to 0.102. The longitudinal excretory canals are wide measuring 0.068 to 0.090 in width.

The cestode being discussed, has medium sized scolex which is roughly triangular; medium, oval rostellum

bearing 15 rows of rostellar hooks, 125 in number; neck medium, testes medium, oval to round, 145-155 (149) in number; large, flask shaped cirrus pouch; ovary indistinctly bilobed, with irregular margin; vitelline gland large, single mass. After studying related literature work the cestode under discussion comes nearer to *D. oerleyi* [6], *D. halli* [13], *D. buecaminoi* [13], *D. longulum* [14], *D. crassum* [14] and in having testes number 145-155(149), but varies from them in a number of characters as described below.

- 1. The cestode under discussion varies from *D. oerleyi* [6] which has scolex 0.33×0.39 ; oval suckers which are not prominent; rostellum conical 0.067×0.071 ; neck short, but thick; testes 90-100 in number; cirrus pouch pyriform, curved.
- The parasite under discussion varies from *D.* halli [13] in bearing globular scolex, 0.25 × 0.33; rostellar hooks in 8 rows; testes 100-140

in number; cirrus pouch elongated, up to 1/3rd transversely.

- The present parasite differs from *D. buecaminoi* [13] in having rostellum elongated, 0.45 x 0.23; rostellar hooks in 4-5 rows with first 2-3 rows of hooks measuring 0.007; testes 150-180 in number; cirrus pouch pyriform and extends till longitudinal excretory canal; vitellaria follicular as large as ovary
- 4. The present worm varies from *D. longulum* [14] in bearing the scolex 0.410×0.440 ; rostellum 0.065×0.110 ; testes 180-240; cirrus pouch pyriform; bilobed and compact ovary; vitelline glands less in size than ovarian lobes.
- 5. The cestode being discussed, differs from *D. crassum* [14] which has scolex 0.33×0.38 ; rostellar hooks in 5 rows, occasionally 6-7; rostellum measures 0.095×0.090 ; neck is short and wide; testes 150-175; cirrus pouch pyriform; very compact and bilobed ovary; vitelline gland as large as ovarian lobes.



Fig. 1. Camera lucida diagram of *Dipylidium sarwari* sp. nov. (A – Scolex, B – Hooks, C – Mature proglottid)

Table 1. Summary chart of known species of Dipylidium (Leukart, 1863) on the basis of published records. The list of species is arranged as per year of publication

Species	Host	Locality	Scolex	Rostellar Hooks	Testes	Cirrus Pouch	Ovary	Vitelline gland	Eggs		
D. ascalabotidis, Marchi, 1873 (Hughes, Baker et Dawson, 1941) ^a											
D. monticellii, Diamere, 1893"											
D. oerleyi	Canis familiaris	^c	0.33x0.39	5 rows	90-100	Pyriform, curved,	^c	Irregular	Eggs lie in groups		
Ratz,1900	and <i>Felis</i>					Crosses lateral excretory					
	domestica					canal					
D. sexcoronatum	Canis familiaris	^c	^c	6 rows	130-140	Extends to lateral excretory	Compact almost	Reniform	2-15 eggs in a capsule,		
Ratz,1900						canal	spherical		size 0.021		
D. walkeri	Canis familiaris	Lahore	0.20x0.36	6-7rows	200-225	0.45-0.54	Bilobed, very	Larger than lateral	2-15 eggs in a capsule		
Sondhi, [12]						Х	diffused	ovarian lobes like a			
						0.020		bunch of grapes			
D. buencaminoi	Dog	Manila, Philippines	0.45x0.23	Largest hook	150-180	Pyriform, extends till	Bilobed	Vitellaria as large as	3-12 eggs in a capsule		
Tabangui, [13]	0			Size - 0.007		longitudinal excretory canal		ovary, shows follicles	size - 0.008		
D. halli	Cat	Manila, Philippines	0.25x0.33	8 rows	100-140	Pyriform upto 1/3 rd of	Bilobed, inner lobe	Distinct with coarse	5-7 eggs in each		
Tabangui, [13]						segment	larger	follicles	capsule, size - 0.025		
D. compactum	C	California	C	^c	^c	c	C	C	C		
Millizner, [14]											
D. crassum	C	California	0.33x0.38	5 rows,	150-175	Pyriform,	Bilobed, very	As large as lateral	6-15 eggs in a capsule		
Millizner, [14]				occasionally 6-7		0.255x0.065	compact	ovarian lobe, compact			
				rows			1				
D.diffusum	C	California	C	c	c	^c	C	C	c		
Millizner, [14]											
D. gracile	C	California	0.41x0.46	5-7 rows	200-250	Pyriform	Bilobed, very	Diffused as large as	0.036 in diameter		
Millizner, [14]						5	diffused	lateral ovarian lobe			
D. longulum	C	California	0.41x0.44	c	180-248	Pyriform, 0.27x0.175	Bilobed	Smaller than lateral	1-12 eggs in a capsule		
Millizner, [14]						5		ovarian lobe			
D. carracidoi	Cat	Spain -Granada	c	c	c	^c	C	C	^c		
Lopez-Nevra, [15]		-F									
D. porimamillanum	Dog and cat	Spain -Granada	C	6-7 rows	300-320	0.260-0.300	C	C	C		
Lopez-Nevra, [15]	0	-F				X					
						0.055-0.060					
D catus	Cat	India	C	C	C	Cirrus pouch extends	C	C	Size - 0 014-0 02		
Gulati [16]	cui					median to the longitudinal			5120 0.011 0.02		
Sumu, [10]						excretory canal					

Species	Host	Locality	Scolex	Rostellar Hooks	Testes	Cirrus Pouch	Ovary	Vitelline gland	Eggs
D. otocyonis	Otocyon megalotis North Somalilan,		0.40-0.13	4 rows, (14,16,20	230	^c	^c	^c	Size - 0.045-0.05
Joyeux, Baer and		Africa		& 26 hooks in					
Martin, 1936				subsequent rows)					
				76 hooks					
D. nandedensis	Felis domesticus	Nanded, India	3.24x	36	110-115	Elongated, 0.324-0.320	Bilobed, 0.183-0.154	oval	No gravid segment
Shinde G and Pawar S,			0.489-0.436	in 4 rows,		Х	Х		
[18]						0.045	0.106-0.097		
D. chausae	Felis chaus	Dharue, India	0.257-0.267	42	250-255	Spindle shaped, 0.285-0.320	Indistinctly bilobed,	oval	No gravid segment
Lakhe et al. [19]			Х	in 6 rows		Х	0.499-0.053		
			0.243-0.330			0.089-0.125	Х		
							0.107-0.178		
D. canisi	Canis familaris	Parli, India	0.665-0.718	56	315-320	Oval,	Bilobed, 0.045-0.056	C	No gravid segment
Pawar et al., [20]			Х	in 11 rows		0.090-0.113			
			0.587-0.626			Х			
						0.045-0.056			
D.mehdii	Feliscatus	^c	0.223-0.383	120	60-65	Flask shaped,	Indistinctly bilobed,	oval	No gravid segment
Pokale et al. [21]			Х	in 9 rows		0.215-0.247	0.225-0.259		
			0.461-0.606			х			
						0.022-0.068			
D. sarwari	Felis domesticus	Badnapur,	0.364-0.534	125	145-155	Flask shaped,	Indistinctly bilobed,	oval	No gravid segment
n. sp.		India	Х	in 15 rows		0.363-0.375	0.409-0.443		
			0.296-0.568			х	Х		
						0.045-0.147	0.136-0.293		

^a Witenberg, 1932 D. ascalabotidis in owls is probably an acanthocephalan; ^b Witenberg, 1932 removed D. monticellii from list of species of Dipylidium due to inadequate sketches; --^c Data not available

4. CONCLUSION

Taking into consideration the above mentioned significant morphological variations, it seems necessary to represent the present cestode as a new species. Therefore the name *Dipylidium sarwari*, n. sp., is proposed.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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