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CESTODES OF VERTEBRATES OF RAJASTHAN

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Introduction

The cestode fauna of the vertebrates of the Indian Desert is not sufficiently known as yet. The only praiseworthy work has been done from there by Mukherjee (1970), Gupta (1976), Nama and Khichi (1972-80) and Wason and Johnson (1977).

The present work is based on the cestode material collected at Jodhpur, Jaisalmer and their surrounding areas in Rajasthan from lizards, birds and rodents. Although all the cestodes have been identified to be the known forms, the study is marked by concise descriptions, important synonymies and interesting remarks.

The host animals were collected by the staff of the Desert Regional Station, Z. S. I., Jodhpur (Rajasthan) including the author himself. The hosts examined for the cestode parasites were wall lizards, garden lizards, Monitor lizards, Great Indian Bustard, hedgehogs and house rats. The cestodes thus recovered were processed to prepare permanent mounts according to the standard method. The measurements are in millimeters unless otherwise stated. The drawings have been made with the aid of a camera lucida. All the material will be submitted to the National Helminthological Collections of Z. S. I., Calcutta. Figs. 10 and 15a from Nama (1975) and Gupta (1976) respectively have been included for the complete description of the species.

Systematic Account

Order CYCLOPHYLLIDEA Benden in Braun, 1900

Family Anoplocephalidae Cholodkvosky, 1902

Subfamily Linstowiinae Fuhrmann, 1907.

Genus 1. **Oochoristica** Lühe

1898. *Oochoristica* Lühe, *Zool. Anz.*, Leipzig, **21** : 650-652.
1932. *Diochetos* Harwood, *U. S. nat. Mus.*, **81** : 1-71.
1948. *Skrjabinochora* Spassky, *Dokl. Akad. Nauk SSSR, n. s.* **59** (2) : 409-412.

The genus *Diochetos* Harwood, 1932 was erected against the genus *Oochoristica* Luhe, 1898 on the basis of the position of the genital pore and the larger ratio of the length of the gravid segment with its width. It was stated that in *Diochetos* the genital pore is formed at a level of 2/5th of the length of the segment from the anterior segmentation and the gravid segments are 2-6 times longer than broad. Spassky (1951)

considered that these are variable characters and therefore he synonymised *Diochetos* with *Oochoristica*. Schmidt (1970, 1986) does not seem to agree with this synonymy and maintains *Diochetos* as distinct entity from that of *Oochoristica*. The present author has collected a number of this anoplocephalid cestode from wall lizard, garden lizard and Monitor lizard from the desert areas of Rajasthan. On study and analysis of the entire material, he is convinced that the differences between *Diochetos* and *Oochoristica* are untenable. Therefore he is inclined to concur with Spassky (1951) who has also considered his own genus *Skrjabinochora* as a synonym of *Oochoristica*.

1. **Oochoristica karachiensis** (Bilqees and Siddiqui) n. comb. (Figs. 1-3)

1975. *Diochetos karachiensis* Bilqees and Siddiqui, *Pakistan J. Sci. Ind. Res.*, 18 (6) : 261-264.

1977. *Oochoristica jodhpurensis* Nama, *Rev., Bev. Brasil. Biol.*, 37 (1) : 121-123.

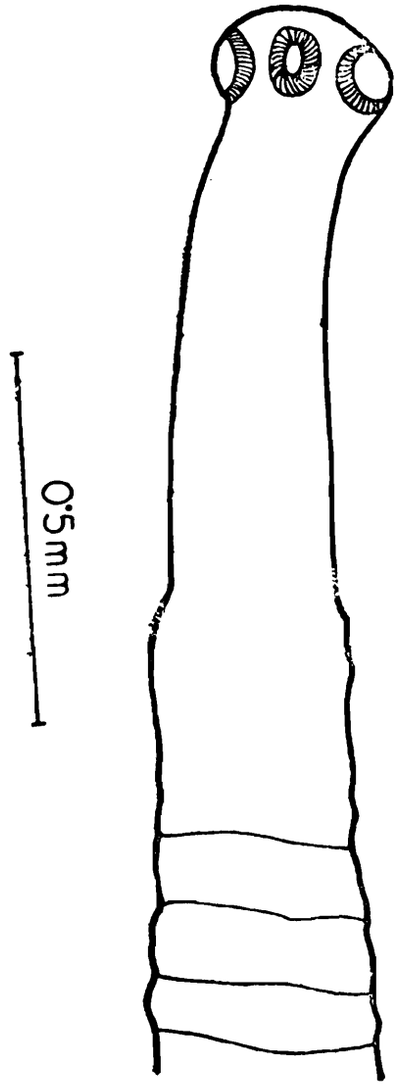


Fig. 1

Oochoristica karachiensis :
Fig. 1. Scolex with neck.

Material : *Host* : *Hemidactylus brooki*, (Squamata : Sauria : Gekkonidae) and an unidentified gekkonid lizard ; location—intestine ; localities—Paota and Lal Sagar (Jodhpur) respectively ; specimens—on 7+9 slides ; collected in August, 1981 and September, 1982.

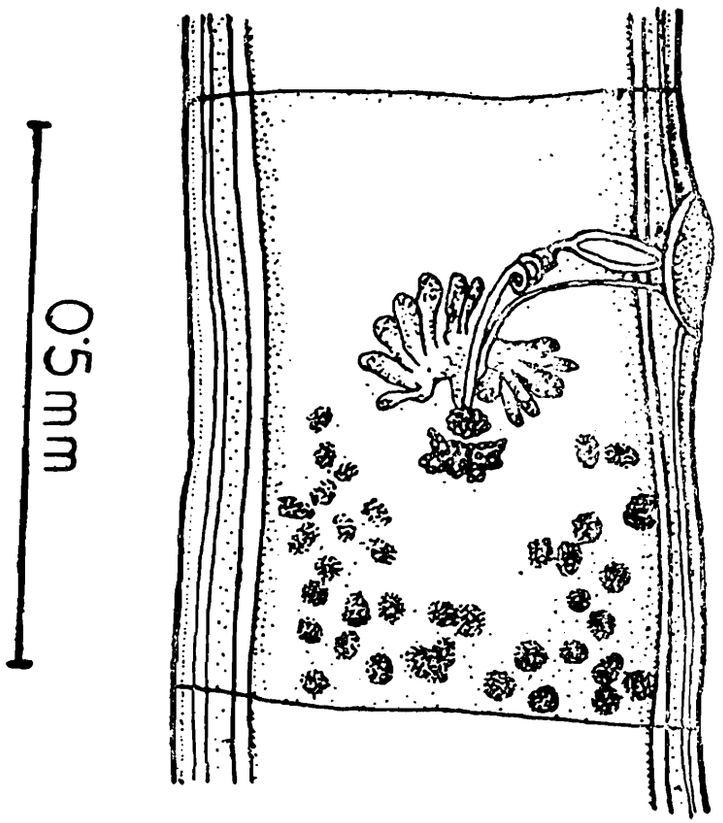


Fig. 2

Fig. 2. Mature segment.

Description : Strobila acraspedote, velum not formed. Scolex subglobular, small, 0.10-0.22 in diametere. Suckers four, with weak musculature. Neck present, long. In beginning proglottids narrow, rectangular, wider than long, free from internal organs. First maturing proglottids squarish ; fully mature ones longer than wide : gravid proglottids cylindrical, much longer than broad. Genital organs not extending into space anterior to level of genital atrium. Genital atrium deep, muscular, irregularly alternating, situated at a level about $\frac{1}{4}$th to $\frac{1}{3}$ from anterior segmentation. Testes 26-38 in number, arranged in two groups in posterior half of proglottid in lateral fields posterior to ovary, tending to coalesce in middle near posterior segmentation. Vas deferens a narrow duct coiled at turning level, eventually opening into cirrus sac. Cirrus sac elongate, almost spindle-shaped, horizontal in disposition, extending much beyond excretory canals to less than half width of proglottids, opening into genital atrium. Ovary bilobed, lobes being unequal consisting of several lobulations. Vagina

horizontal, posterior to cirrus sac, opening into genital atrium just behind male pore. Shell gland irregularly globular, median, immediately posterior to ovary. Vitellarium compact, irregularly semilunar, larger than and immediately posterior to shell gland. Traces of male and female ducts seen in some of gravid proglottids near remnant of genital atrium. Parenchymatous capsules formed, each one having a single egg. Whole of gravid proglottid filled with evenly distributed such capsules. Onchospheres with hooks formed.

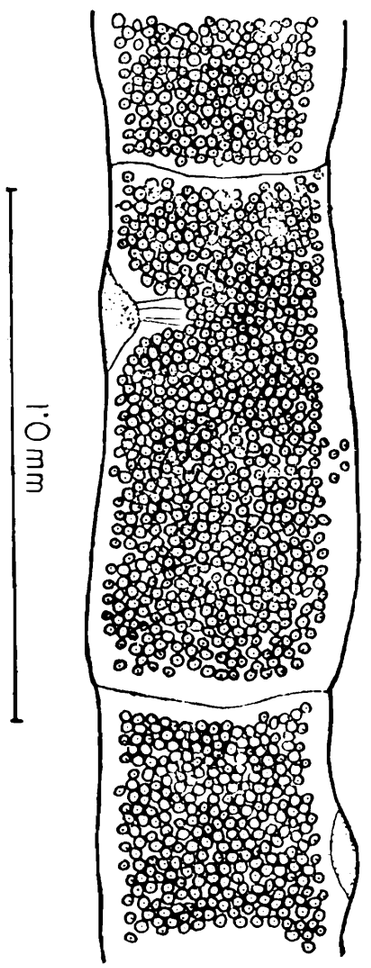


Fig. 3

Fig. 3. Gravid segment.

Remarks : The above description closely resembles that of *Oochoristica karachiensis* (Bilques and Siddiqui, 1975) and *O. jodhpurensis* Nama, 1977. Nama (1677) did not compare his species with that of Bilqees and Siddiqui (1975). The author is inclined to refer his present material to *O. karachiensis*, and to consider *O. jodhpurensis* as a synonym of *O. karachiensis*.

2. **Oochoristica calotes** Nama and Khichi

(Figs. 4-6)

1974. *Oochoristica calotes* Nama and Khichi, *Folia Parasitol.*, Praha, **21** : 373-375.

Material : Host—*Calotes versicolor*, (Squamata : Sauria : Agamidae) ; location—intestine ; locality—Ramgarh (Jaisalmer, Rajasthan) ; specimens—on 3 slides ; collected in September, 1982.

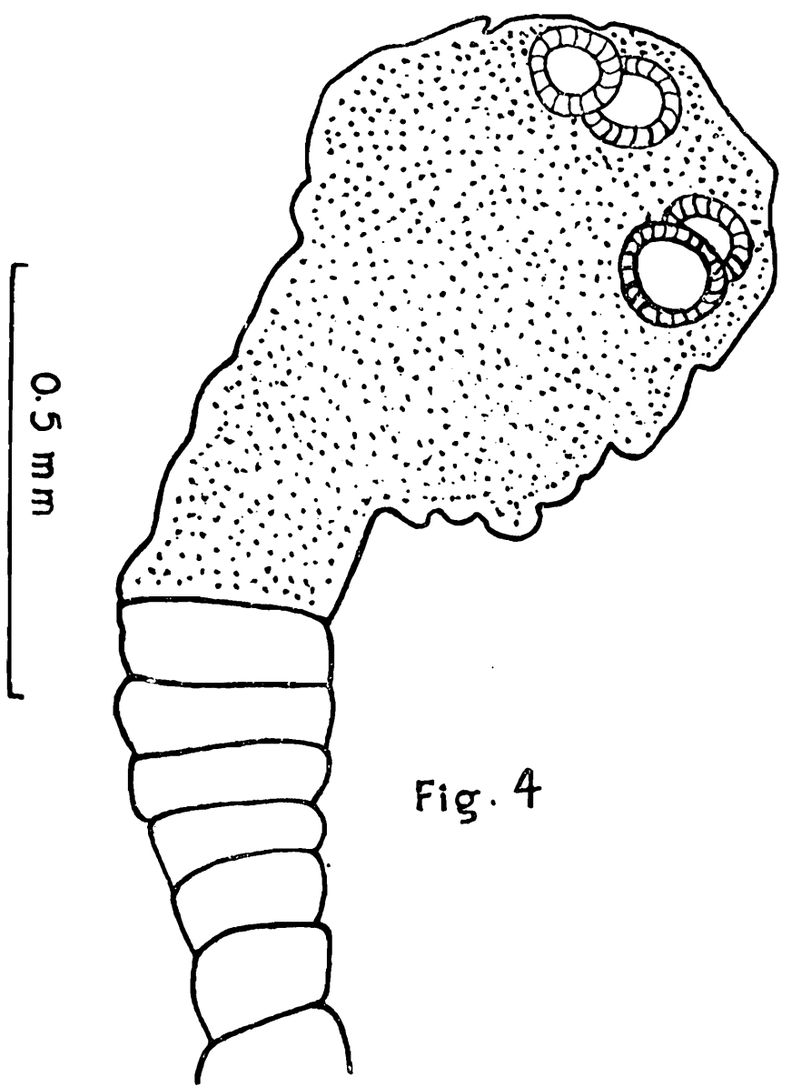


Fig. 4

Oochoristica calotes :

Fig. 4. Scolex with neck.

Description : Scolex simple, small, with four suckers. Neck present. Segmentation of strobila very faint, in some cases not seen at all. Immature proglottids squarish, slightly wider than long. With development of gonads, proglottids increase

in length, so much so that fully mature proglottids becoming rectangular, i. e., longer than broad. Gravid proglottids much longer than broad. Genital atrium deep, thickly muscular, extending up to dorsal excretory canal, irregularly alternating, situated at a level 1/3 or 2/5 from anterior segmentation of proglottid. Space of proglottid anterior to level of genital atrium devoid of any internal organs.

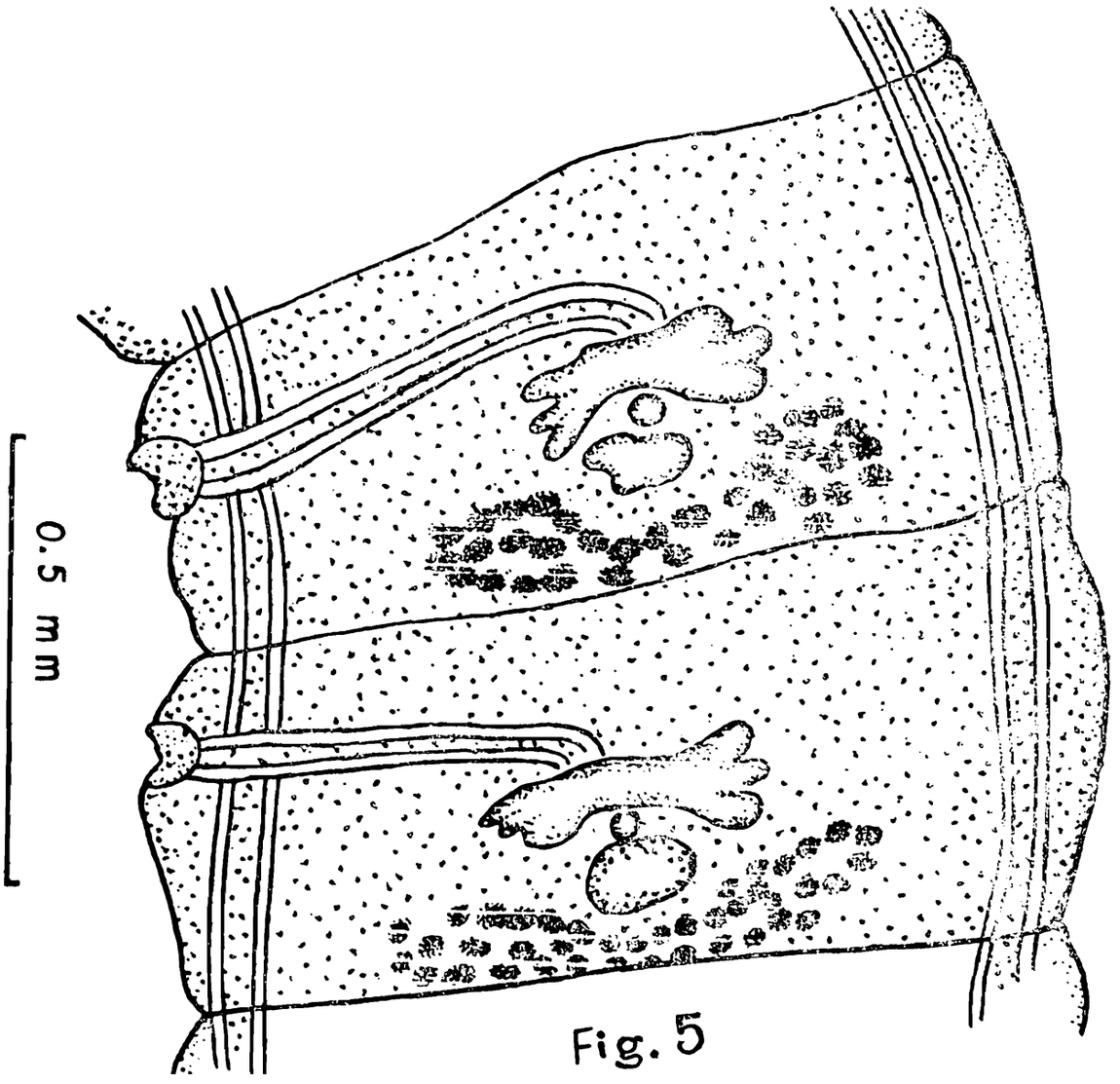


Fig. 5. Mature segment.

Tests 50-60 in number, postovarian, arranged in two lateral fields, tending to meet each other near posterior segmentation. Vas deferens much coiled. Cirrus sac long, wide, occasionally ovate, extending almost up to ventral excretory canal. Ovary median, bilobed, each lobe being further divided into many smaller lobes, smaller lobe poral, larger one aporal. Vagina a narrow straight tube running parallel posterior to cirrus sac, opening into genital atrium beside male pore. Shell gland a small roundish body medianly situated at level of posterior end of poral half of ovary. Vitellarium follicular, immediately behind shell gland.

Gravid proglottids rectangular, all internal organs gradually disintegrated except traces of genital ducts and genital atrium. Parenchymatous capsules formed around each egg, latter developing into onchosphere. Whole gravid proglottid filled with such parenchymatous capsules each containing single onchosphere.

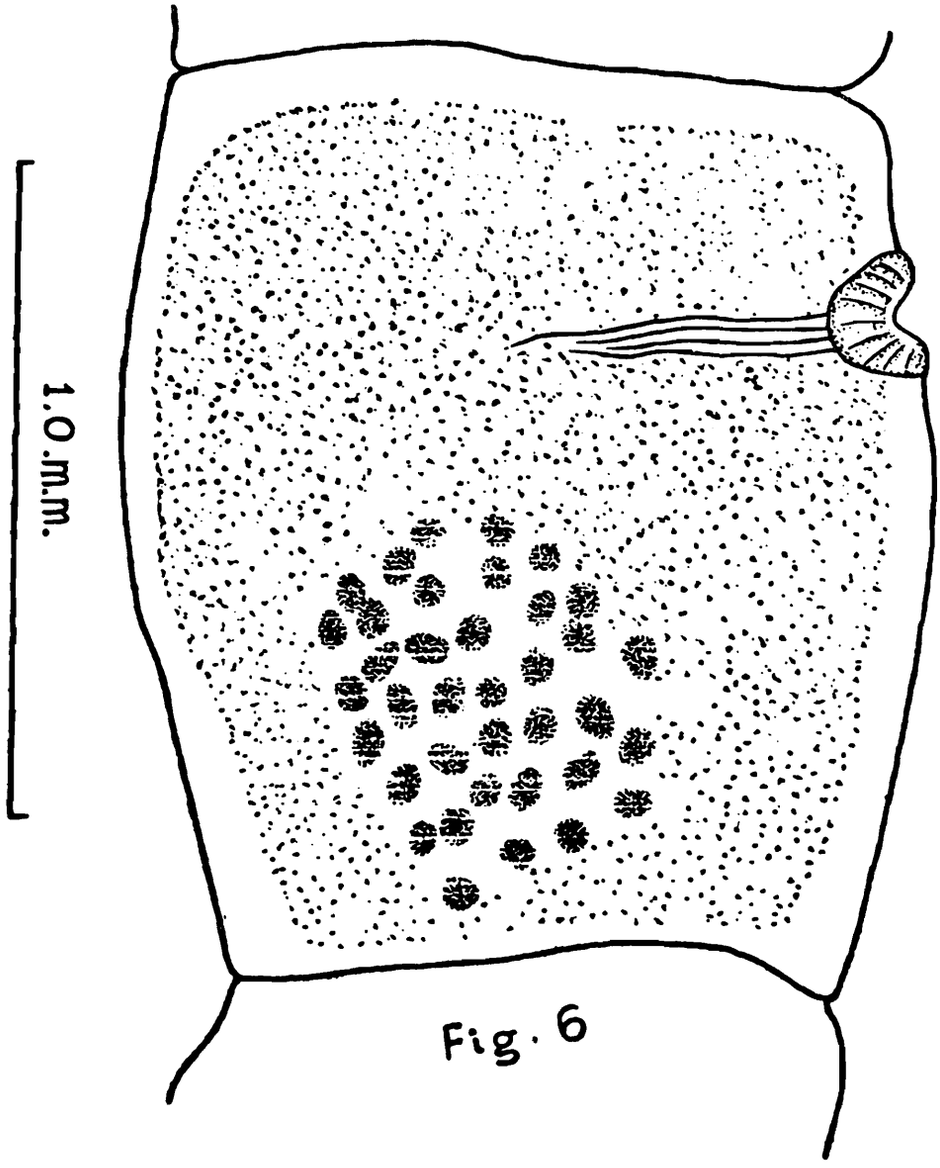


Fig. 6. Gravid segment.

Remarks : So far five species have been reported from India from the intestine of *C. versicolor*. They are : *Oochoristica sigmoides* Moghe, 1926 ; *O. thapari* Johri, 1934 ; *O. indica* Misra, 1945 ; *O. mandapamensis* Johri, 1958 ; and *O. calotes* Nama and *Khichi*, 1974. The present specimens collected from the same ecosystem and host as those of *O. calotes* Nama and Khichi, 1974 and in broad details they agree with their species.

3. **Oochoristica varani** Nama and Khichi
(Figs. 7-9)

1972. *Oochoristica varani* Nama and Khichi, *Proc. natl. Acad. Sci. India*, B. 42 : 240-241.

Material : Host—*Varanus monitor* (L.), (Squamata : Sauria : Agamidae) ; location intestine ; locality—Kalyanpur (Jodhpur, Rajasthan) ; specimens—on 13 slides, collected in September, 1982.

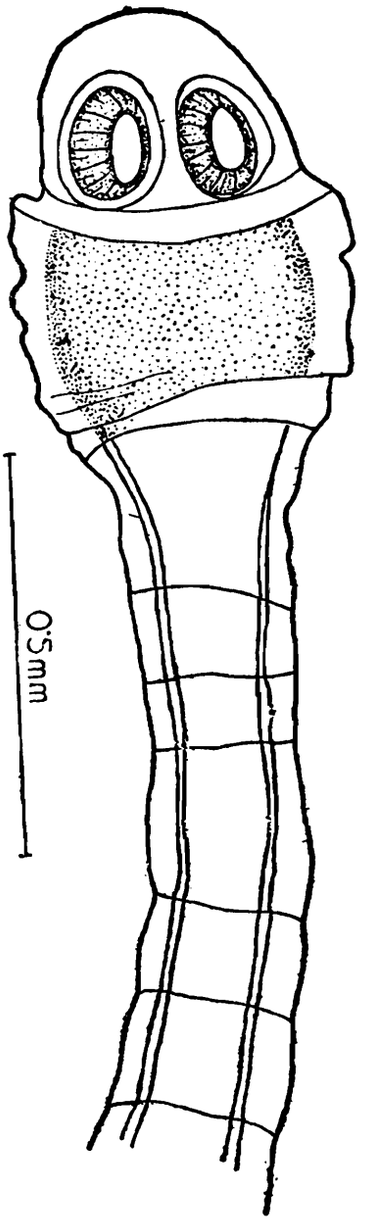


Fig. 7

Oochoristica varani :

Fig. 7. Scolex with neck.

Description : Strobila acraspedote ; proglottids without velum. Initial segments squarish, without development of any organs. Genital atrium prominent, muscular, deep but not extending upto excretory canal, situated at a level about 2/5th from anterior segmentation, irregularly alternate. A pair of ventral and a pair of dorsal excretory canal present. Scolex subglobular, 0.45-0.5 in diameter, prominent, with large suckers.

Fully mature segments squarish, slightly longer than wide. No organs anterior to level of genital atrium. Testes 50-60 in number, arranged in two groups in lateral fields posterior to ovary, tending to coalesce near posterior margin of proglottid. Vas deferens convoluted, surrounded by faint prostate gland cells. Cirrus sac quite wide,

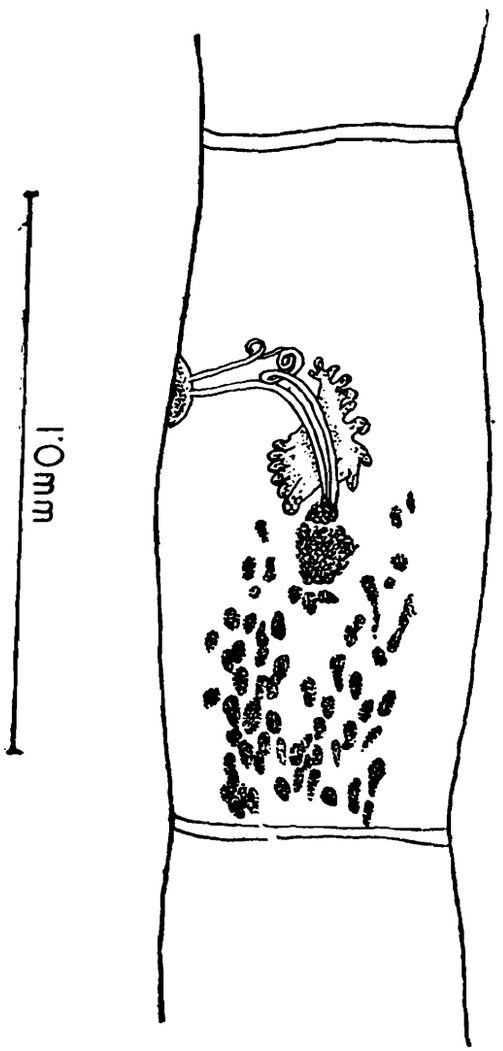


Fig.8

Fig. 8. Mature segment.

elongate, extending beyond ventral excretory canal, opening into genital atrium. Ovary median, bilobed, poral half comparatively smaller than aporal half, each half consisting of several small lobes. Vagina prominent, running posterior to male tube, opening into genital atrium behind male pore. Seminal receptacle formed behind convolutions of male tube. Shell gland small, globular, median, postovarian. Vitellarium large, compact mass of follicles, situated immediately behind shell gland. Gravid segments squarish to rectangular, much longer than broad, all internal organs

disintegrated leaving traces of genital atrium and ducts, filled with innumerable parenchymal capsules, each surrounding a single egg. Onchospheres present.

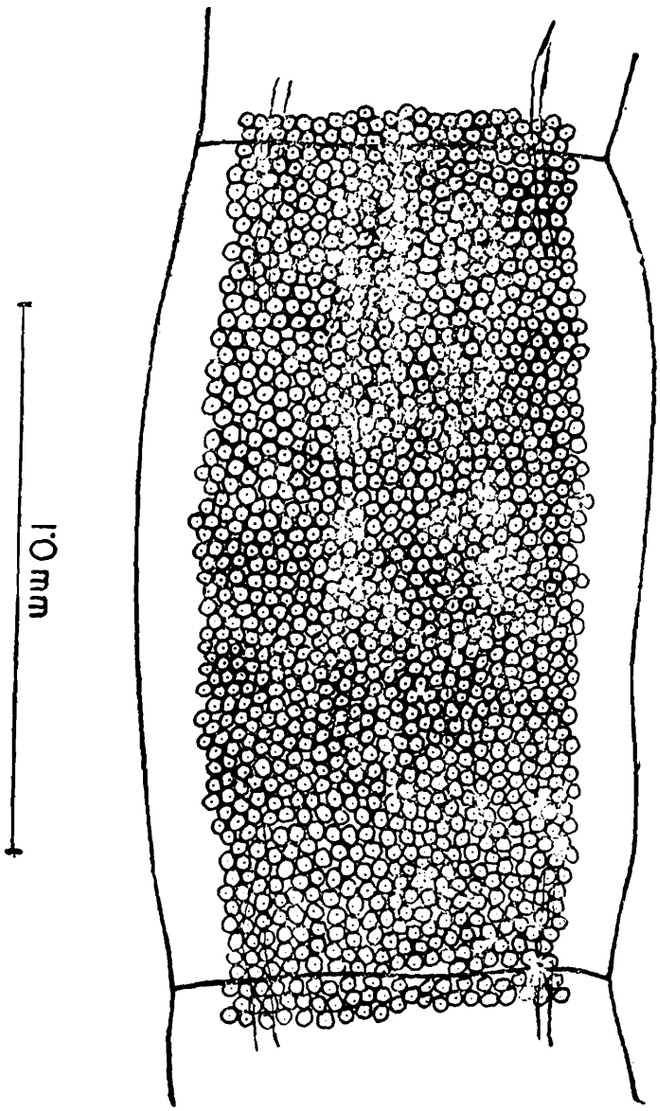


Fig. 9

Fig. 9. Gravid segment.

Remarks: Mukherjee reported *Oochoristica tuberculata* (Rudolphi, 1819) from *Varanas monitor* from Bikaner and Jaisalmer districts, Rajasthan. Nama and Khichi (1972) described *Oochoristica varani* from the same monitor lizard from Jodhpur, Rajasthan. They held their species distinct from *O. tuberculata* in larger scolex, suckers and cirrus pouch, smaller size of embryonal hooks and 40-45 testes instead of 25-30. On the basis of the present material I concur with them that *O. varani* is district from *O. tuberculata.*

Genus 2. **Mathevotaenia** Akhumian

1946. *Mathevotaenia* Akhumian, *Gelmint. Sborn., Let. Deiatelnost Skrjabin*, Akademiya Nauk SSSR, Moscow : 37-41.

4. **Mathevotaenia paraechinis** Nama
(Figs. 10-12)

1975. *Mathevotaenia paraechinis* Nama, *Rev. Brasil. Biol.*, 35 (1) : 117-120.

Material : Host—*Paraechinus micropus micropus* Blyth, Hedgehog, (Insectivora : Exinaceidae) ; location—intestine ; locality—Chopasni (Jodhpur, Rajasthan) ; specimens —on 7 slides ; without scolex.

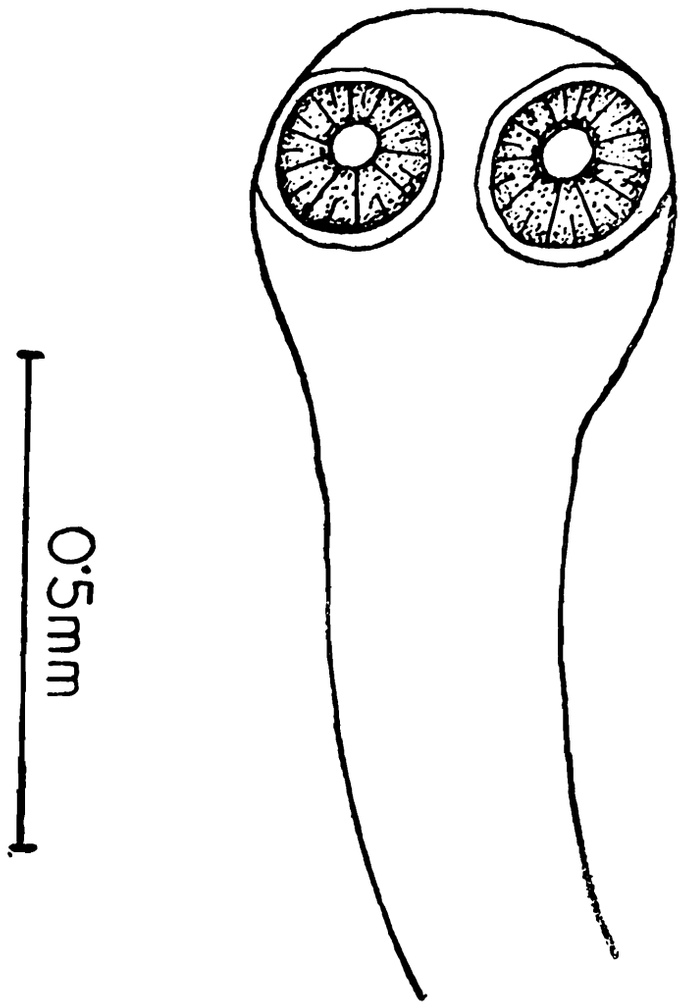


Fig.10

Mathevotaenia paraechinis :
Fig. 10. Scolex with neck. (after Nama, 1975)

Description : Strobila craspedote, proglottids without velum. Neck short. Initial segments behind neck without any internal organs. Mature segments broader than

long, posterior most gravid segments either squarish or slightly longer than broad. Genital pores irregularly alternate, situated on margin near anterior segmentation of of proglottid. Genital atrium shallow. Testes 50-60 in number, arranged in two groups in lateral fields behind ovary. In last maturing proglottids, two groups of

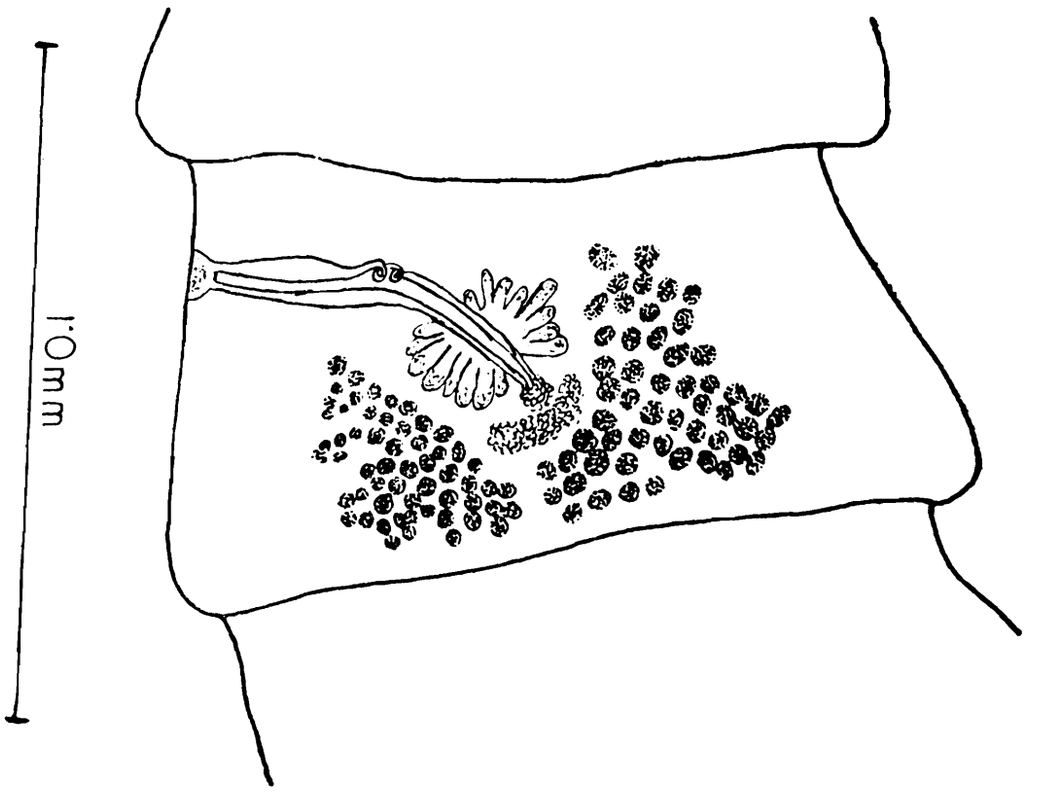


Fig. 11

Fig. 11. Mature segment.

testes separate, in older ones testes near posterior segmentation tending to meet. Seminal vesicle absent. Vas deferens coiles before entering cirrus sac. Cirrus sac extending beyond dorsal excretory canal. Ovary bilobed, each lobe being further divided into several smaller lobes. Vagina straight, running behind male duct, opening into genital atrium behind male pore. Shell gland globular, median and postovarian. Vitellarium compact, almost semilunar, surrounding shell gland posteriorly. Gravid proglottids full of parenchymatous capsules, each having a single egg, traces of genital atrium seen. Onchospheres formed in eggs.

Remarks : Three species of *Mathevotaenia* have been described from Rajasthan from three different mammals. They are : *M. sanchorensis* Nama and Khichi, 1973 from *Herpestes* sp. (mongoose) ; *M. paraechinis* Nama, 1975 from *Paraechinus micropus micropus* (hedgehog) ; and *M. symmetrica* Akhumian, 1946 from *Rattus rattus* (house rat).

The present specimens come very close to *M. paraechinis* Nama, 1975 in respect of host, number and size of testes and the size of eggs.

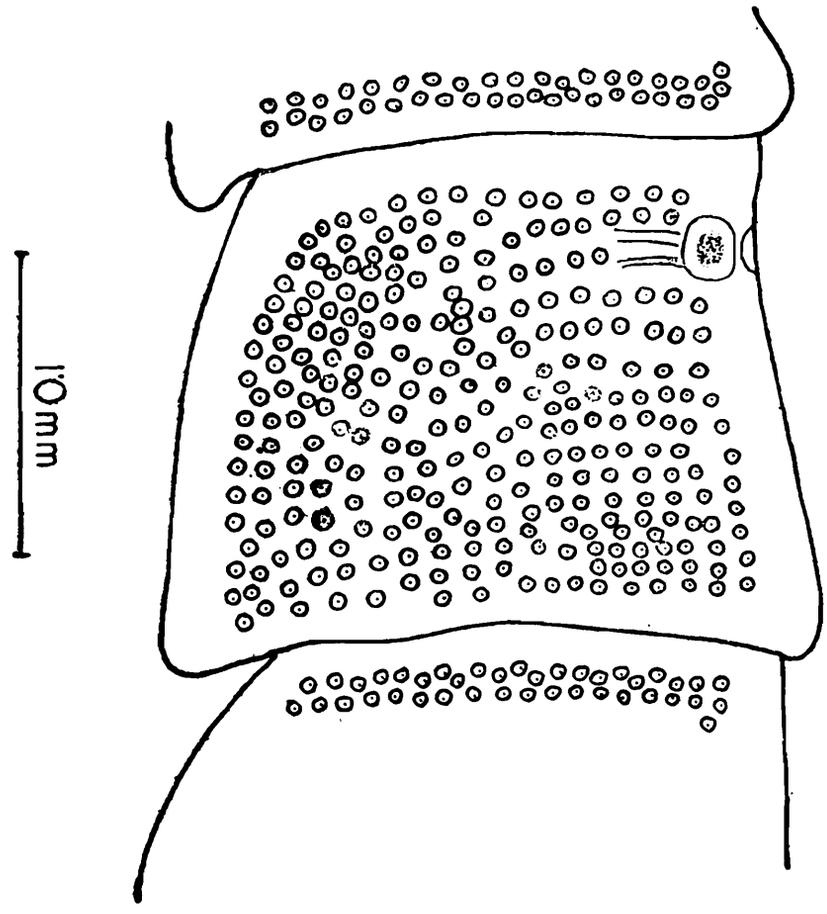


Fig. 12

Fig. 12. Gravid segment.

Family DAVAINEIDAE Fuhrmann, 1907

Subfamily IDIOGENINAE Fuhrmann, 1932

Genus 4. **Otiditaenia** Beddard

1912. *Otiditaenia* Beddard, *Proc. zool. Soc. London*, 1912 : 194-221.

1912. *Schistometra* Cholodkovsky, [Explanatory catalogue of the collection of parasites of the Imperial Military Academy of Medicine, I. Tapeworms (Cyclophyllidea)], St. Petersburg, 1912 (in Russian) : 1-96.

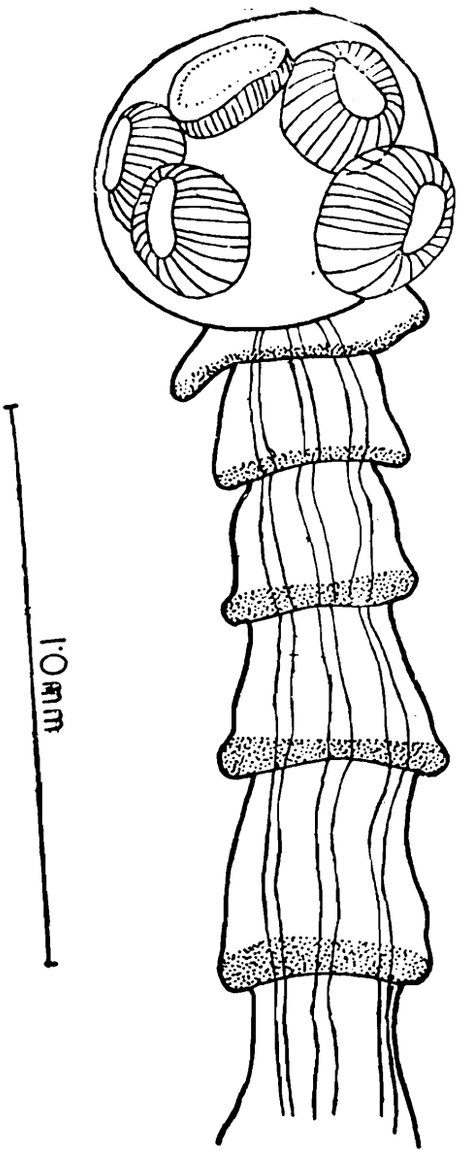
1930. *Paraschistometra* Woodland, *Parasitology*, **22** : 214-229.

5. **Otiditaenia ntgriceps** (Gupta) Schmidt (Figs. 13-15)

1976. *Schistometra nigriceps* Gupta, *J. Bombay nat. Hist. Soc.*, **73** : 183-186.

1986. *Otiditaenia nigriceps* : Schmidt, *CRC Handbook of Tapeworm Identification* : 240.

Material : Host—*Choriotis nigriceps* (Vigors), (Gruiformes : Otididae) ; location—intestine ; locality—Jaisalmer (Rajasthsn) ; specimens—several, on 17 slides.



Otiditaenia nigriceps :
Fig. 13. Scolex with a part of strobila.

Description : Strobila craspedote with velum. Proglottids squarish or slightly longer than broad behind neck, devoid of any internal organs, becoming much wider than long with development of gonads, last few gravid proglottids very narrow. Scolex globular, quite prominent, distinctly marked off from neck behind. Suckers four, prominent, each having unarmed margin but with two muscular lappets. Two circles of minute rostellar hooks present, but can be seen with difficulty. Genital pores irregularly alternating, genital atrium present, submarginal, situated in anterior half of lateral margin.

Testes 60-80 in number, arranged along posterior border of proglottids between excretory canals of two sides. Cirrus sac extending inside beyond ventral excretory canal, with eversible cirrus.

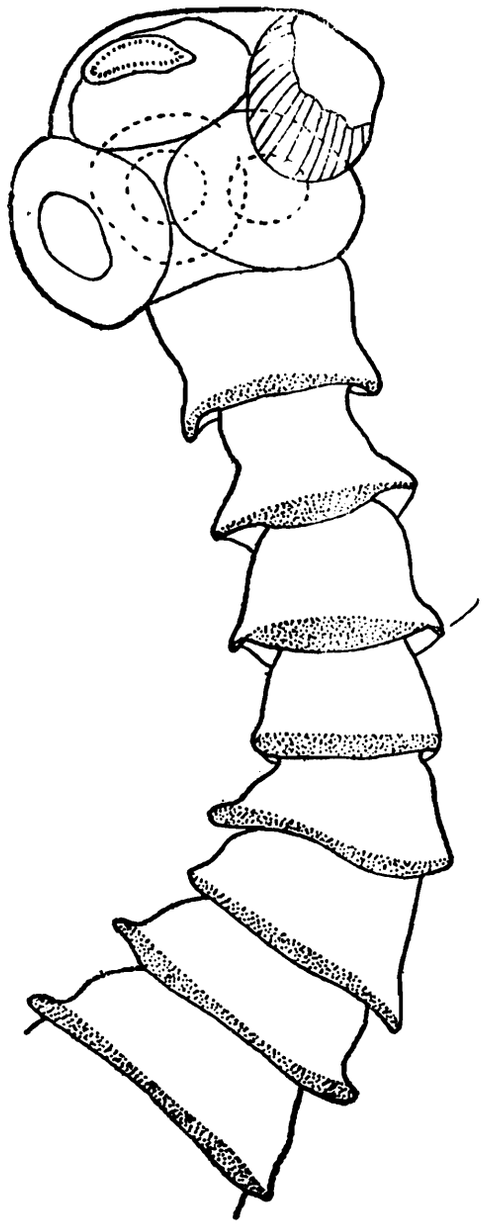


Fig. 14. Scolex with a part of strobila of another specimen.

Female glands poral. Ovary globular or ovoid, poral. Vagina opening into genital atrium, ventral or dorsal to cirrus sac. Vitellarium compact mass, occasionally crescent-shaped. Uterus a transverse tube or sac parallel to posterior border of segments. Paruterine organ not seen.

Remarks : Gupta (1976) described his species from the Great Indian Bustard received from Pokharan (Jaisalmer, Rajasthan). The present author also collected the

Fig.15 a

Fig. 15a. Mature segment. (after Gupta, 1976)

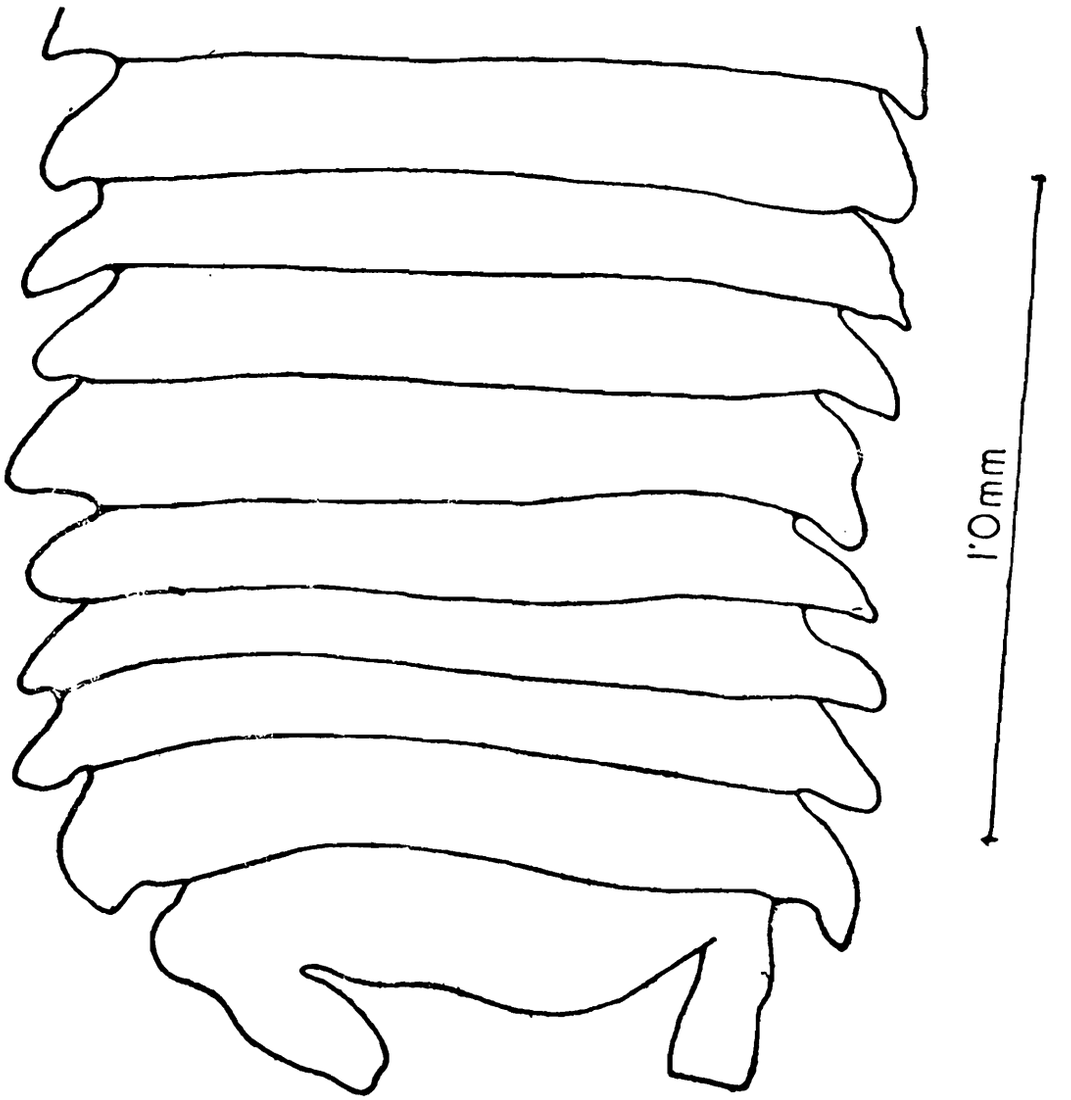


Fig. 15b

Fig. 15b. Posterior part of strobila showing narrow segments with velum.

material from a dead bird of the same species from Jaisalmer. Gupta (*loc. cit.*) placed this species in the genus *Schistometra* Cholodkovsky, 1912 but Schmidt (1986) transferred it to the genus *Otiditaenia* Beddard, 1912. Fuhrmann (1932) and later on Schmidt (1986) considered *Schistometra* Cholodkovsky, 1912 and *Paraschistometra* Woodland, 1930 as identical and consequently synonymised them with *Otiditaenia* Beddard, 1912.

Family HYMENDEPIDIDAE Railliet and Henry, 1909

Subfamily HYMENOLEPIDINAE Perrier, 1897.

Genus 5. **Hymenolepis** Weinland

1858. *Hymenolepis* Weinland, *Proc. Boston Soc. nat. Hist.*, **6** : 300-301.
1903. *Triorchis* Clerc, *Rev. Suisse zool.*, **11** : 241-368.

6. **Hymenolepis diminuta** (Rudolphy) Weinland
(Figs. 16-19)

1819. *Taenia diminuta* Rudolphi, Entozoorum synopsis cui accident mantissa duplex et indices locupletissini, Berolini, x+811 pp.
1858. *Hymenolepis diminuta* (Rudolphi) : Weinland, An essay on tapeworms of man, x+93 pp.

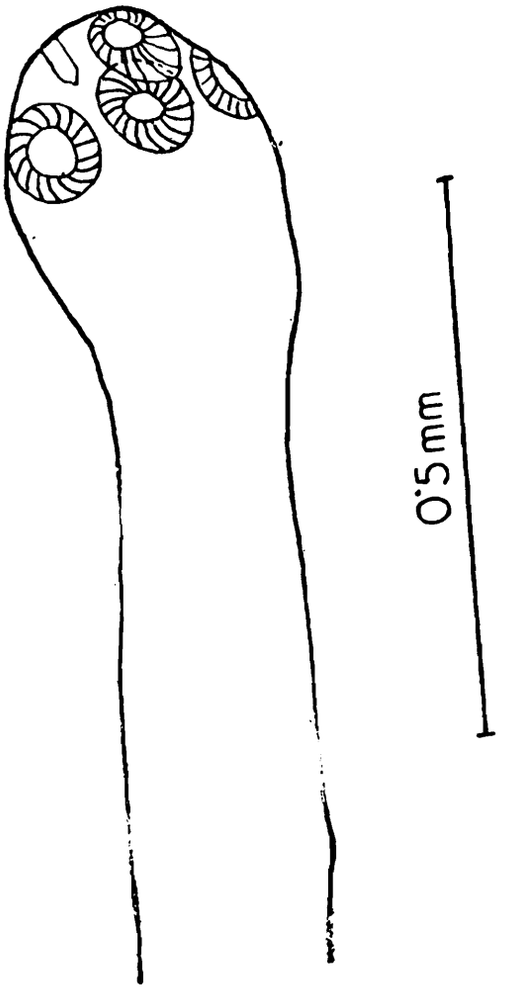


Fig. 16

Hymenolepis diminuta :
Fig. 16. Scolex with neck.

Material : Host—*Rattus rattus*, House rat, (Rodentia : Muridae) ; location—intestine ; locality—Jodhpur (Rajasthan) ; specimens—on 6 slides, collected in November, 1982.

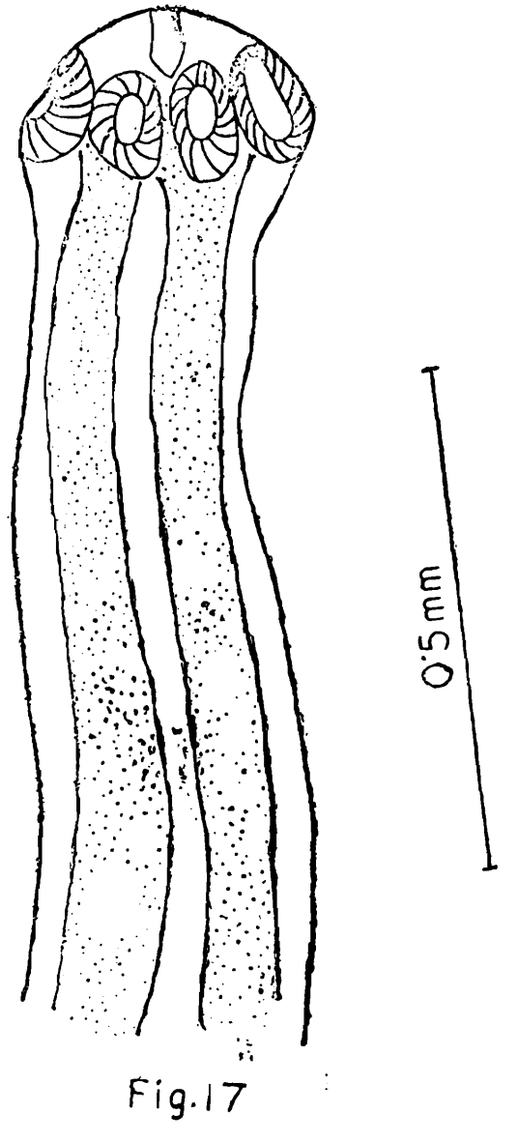


Fig. 17. Scolex with neck of another specimen

Description : Strobila craspedote but no velum formed. Scolex small, club-shaped, 0.2-0.4 in diameter, with a rudimentary apical rostellum without hooks ; suckers 4, small, unarmed. Neck long. Mature and gravid proglottids much broader than long, 0.25-0.3 long, 1.60-1.75 broad. Genital pores unilateral, in middle of lateral margin of proglottids. Testes 3, 0.04-0.05 in diameter, arranged in straight line or triangle, always one poral and two aporal, variously arranged with respect to ovary when not in straight line. Seminal vesicle present. Cirrus sac spindle-shaped, 0.135-0.152 in length, extending beyond excretory canal. Ovary single, median, having several lobules, situated nearer to the posterior segmentation, always between poral and next

aporal testes. Seminal receptacle formed near ovary. Vagina opening into genital atrium behind male pore. Gravid proglottids filled up with various sizes of egg-capsules, each containing several developed ova.

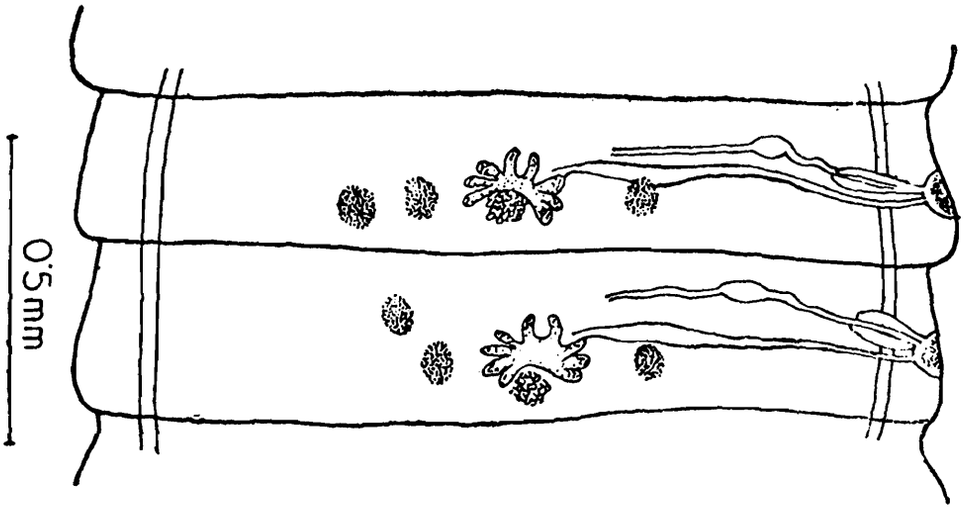


Fig. 18

Fig. 18. Mature segment.

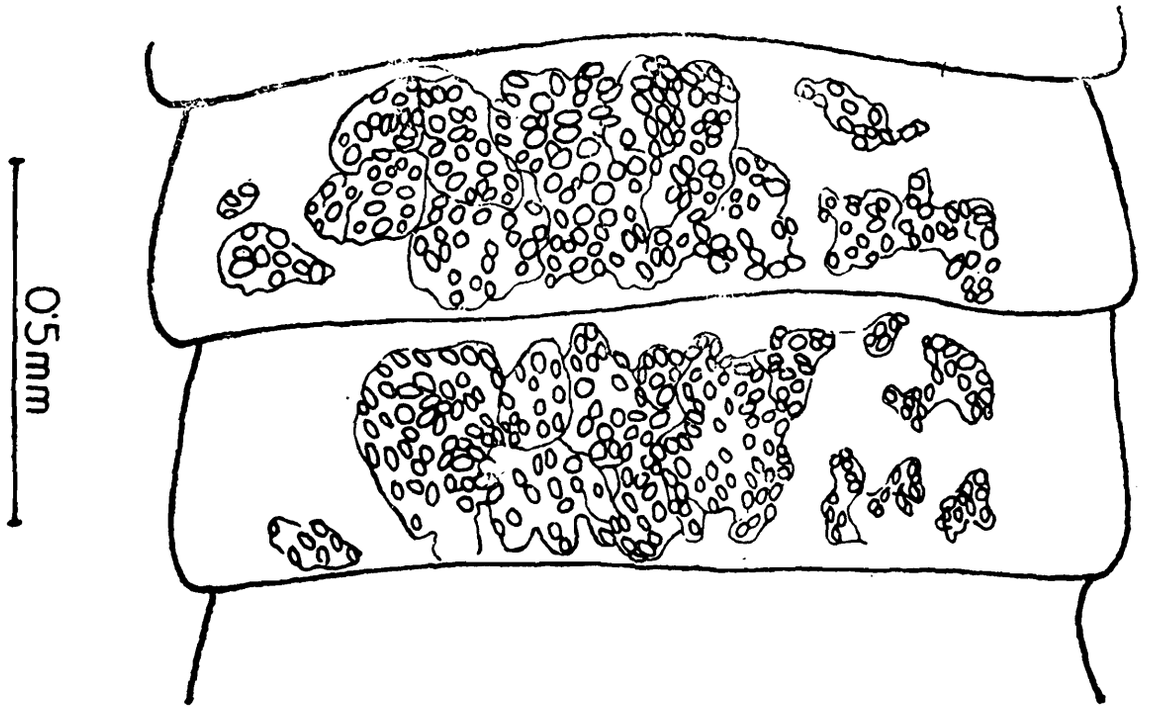


Fig. 19. Gravid segment.

Remarks : It is a common tapeworm parasiting house rat, mouce and shrew. Mukherjee (1970) has listed it from *Rattus rattus* and *Gerbillus gleadowi* from Rajasthan. Nama and Khichi (1975) reported it from *Rattus rattus* from Jodhpur (Rajasthan) and

recorded variations from Johri's (1950) description of this species. The present report also shows that the species exhibits morphological variations.

Primarily it is the parasite of the rodents as noted above, but man may also accidentally gets infected by it by eating food contaminated with the infected material.

Summary

The cestode material for the present study was collected from arid zones of Rajasthan from lizards, birds and rodents during 1981-82. It comprises 6 known species belonging to 5 genera and 3 families of the Order Cyclophyllidea. The species are : *Oochoristica karachiensis* (Bilqees and Siddiqui, 1975) n. comb. from *Hemidactylus brooki* and an unidentified lizard, considering *O. jodhpurensis* Nama, 1974 from *Calotes versicolor* as synonym of *O. karachiensis* ; *O. varani* Nama and Khichi, 1972 from *Varanus monitor* ; *Mathevotaenia paraechinis* Nama, 1975 from *Paraechinus micropus micropus* ; *Otiditaenia nigriceps* (Gupta, 1976) from *Choriotis nigriceps* ; and *Hymenolepis diminuta* (Rudolphi, 1819) from *Rattus rattus*. Concise descriptions of the species, important synonymies and interesting remarks are additional features of the present study.

Acknowledgements

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