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Cestode Parasite (Platyhelminthes) of Rodent *Rattus rattus* (Linnaeus, 1758) from Aurangabad, Maharashtra, India with a Redescription of *Hymenolepis diminuta* (Rudolphi, 1819)

Shaikh Kalim Mansursab

Department of Zoology, Poona College of Arts, Science and Commerce Camp, Pune 411001 (MS), India

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Abstract: In this study Cestodes collected from a species of rodents of the genera *Rattus rattus* (Linnaeus, 1758) from Aurangabad district Maharashtra, India are reported. Sixty three specimens of the cestode parasites were collected from 23 infected intestines after examining 110 host house rat (*Rattus rattus*) at Aurangabad, (MS), India during the period of April, 2005-March, 2007. The present form of cestode parasite is redescribed on the basis of some similar characters with the previously described species *Hymenolepis diminuta* (Rudolphi, 1819). The characters of present form are similar with *Hymenolepis diminuta* having the scolex well-marked rostellum, hooks in single crown on rostellum, oval cirrus pouch, three testes, one poral and two aporal, two pairs longitudinal excretory canal and pre-ovarian ootype but differs due to globular scolex, squarish mature proglottids and differs in size of ovary (0.526 - 0.552 x 0.114 - 0.184 mm).

Keywords: Platyhelminthes, Cestodes, *Rattus rattus*, *Hymenolepis diminuta*, Scolex, Proglottids

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Introduction

Cestodes representing the genus *Hymenolepis* Weinland, 1858 (Yamaguti, 1959) occur primarily in rodents and insectivores, and have been reported from these mammals in most biogeographic regions of the world (Burt, 1980). Cestodes are an important group of Platyhelminthes which usually infects the rodents and specially invades the gastrointestinal tracts of the host. The cestode fauna of rodents in Aurangabad District Maharashtra and its adjacent territories is poorly documented, in spite of the susceptibility of these rodents to harbor cestodes

of zoonotic significance. Hymenolepiasis is a neglected zoonotic disease in humans, caused by cestodes *Hymenolepis nana* (dwarf tapeworm) and *Hymenolepis diminuta* (rat tapeworm) (Cheng T *et al.*, 2016). *Hymenolepis diminuta* has been found in the Netherlands; 50% (15/30) in farms, 10.2% (5/49) in rural environments, and 10.5% (4/38) in suburban environments in 2016 (Franssen *et al.*, 2016).

The occurrence of *Hymenolepis nana* and *Hymenolepis diminuta* in brown rats in Heilongjiang Province, suggesting that rodents

infected with both cestodes have the potential to transmit hymenolepiasis to humans (Di Yang *et al.*, 2017). The rat tapeworm, *Hymenolepis*, is cosmopolitan in distribution and rarely infects humans. Infection is infrequent because of the obligate need for an arthropod intermediate host, in which the cysticeroid larvae develop. Human infection usually occurs following the accidental ingestion of infected beetles that contaminate grain or cereal products. Adult tapeworms develop in the small intestine. Hymenolepiasis is the term for a human to be infected with either *Hymenolepis diminuta* or *Hymenolepis nana*, a dwarf sister species very closely related to *Hymenolepis diminuta* (Arai, 1980; Andreassen *et al.*, 1999; Roberts and Janovy, 2000).

Hymenolepis spp. recovered from rodents and humans has been reported by Gardner and Schmidt (1988); Andreassen *et al.* (1999); Stojcevic *et al.* (2004); Rafique *et al.* (2009) Makarikov and Tkach (2013); Ahmad *et al.* (2014); Hancke and Suárez (2016) and Tresnani *et al.* (2016). House rat is common host of cestode parasite and contributes the infections to the human population and other animals. The present study was undertaken to describe morpho-taxonomy of cestode genus *Hymenolepis*. The genus *Hymenolepis* was erected by Weinland in 1858.

Materials and Methods

Cestodes were recovered from the digestive tracts of rodents. Sixty- three specimens of the cestode parasites were collected from 23 infected intestines after examining 110 host *Rattus rattus* (Linnaeus, 1758) at Aurangabad, (MS) India during the period of April, 2005 - March, 2007. The cestode parasites were isolated, rinsed in water to render them from intestinal contents and were preserved in hot 4 % Formalin. Twenty tapeworms were stained with Borax carmine and Haematoxylin stain. For dehydration tapeworms were passed through various alcoholic grades i.e. 30%, 50%, 70%, 90% and 100%, cleared in xylene and mounted in DPX. To examine internal

features the drawing were made with the aid of Camera Lucida. The cestodes were prepared for identification by standard methods (Yamaguti, 1959). In descriptions, measurements are given in millimetres (mm) unless otherwise specified. A detailed microscopic study of the scolex and representative proglottids showed that the tapeworm was *H. diminuta* (Rudolphi, 1819).

Results and Discussion

During present study (April, 2005- March, 2007), a total of 110 rats were examined for the investigation of *Hymenolepis diminuta* (Rudolphi, 1819). Out of 110 examined rats 23 were found infected with cestode parasites of 63 specimens of *H. diminuta*. (Figs. 1, 2).

The scolex is medium in size, globular with well-marked rostellum with rostellar hooks and measures 0.142 (0.129-0.155) in length and 0.145 (0.111-0.180) in width. The scolex bears four suckers, which are medium in size, oval in shape and arranged in two pairs, one pair in each lateral half of the scolex, slightly overlapped on each other situated in anterior three-fourth regions of the scolex and measures 0.051 (0.046-0.056) in length and 0.034 (0.028-0.041) in breadth. The rostellum is unarmed, retractile with rostellar sac which is medium in size, roughly triangular in shape, narrow proximally and broad distally, situated at the tip of the scolex just between the two suckers and measures 0.045(0.038-0.051) in length and 0.034 (0.031-0.038) in width. Hooks are situated in single crown on rostellum, 16 in number slightly curved in middle and broad at base and sharp at apex and measures 0.045 (0.043-0.047) in length and 0.003 (0.002-0.004) in width. The rostellar sac is triangular and measures 0.031 (0.025-0.036) in length and 0.032 (0.025-0.038) in width. The neck is long, medium in width, longer than broad, about 2-3 times longer than broad, slightly broad anteriorly and narrow posteriorly, measures 0.202 (0.186-0.219) in length and 0.108 (0.085-0.131) in width. The mature proglottids are medium in size, squarish in shape, broader than long about three times broader than long with convex lateral margin

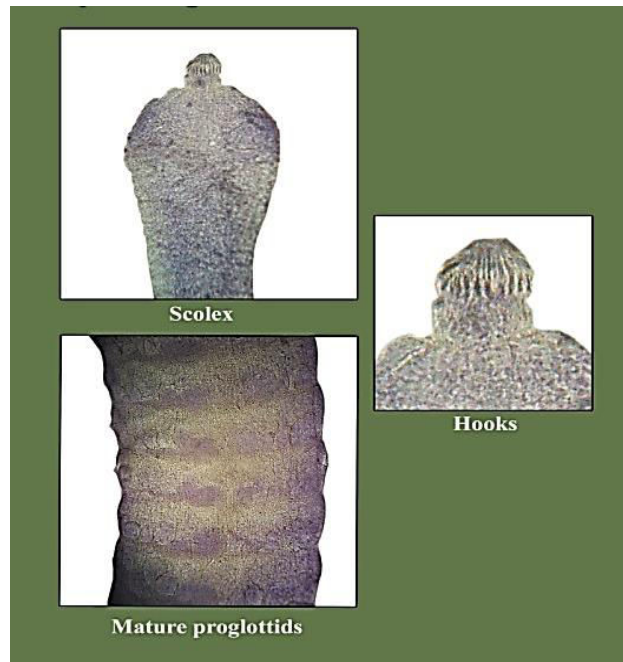


Fig. 1: *Hymenolepis diminuta* (Rudolphi, 1819) -- Scolex, Hooks and Mature Proglottids.

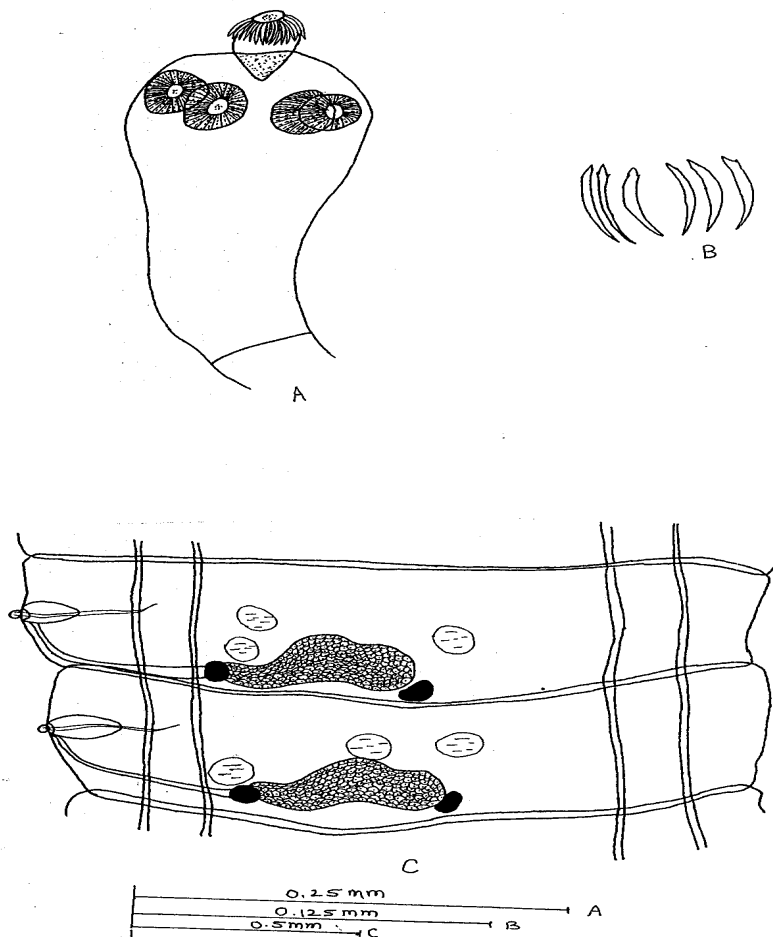


Fig. 2: Camera Lucida diagram of *Hymenolepis diminuta* (Rudolphi, 1819) - A. Scolex B. Hooks C. Mature Proglottids.

measuring about 1.763 (1.710-1.815) in length and 0.513 (0.482-0.543) in width. The testes are large in size, rounded in shape, three in number, straight in line, one poral and two aporal in the central medulla bounded laterally by longitudinal excretory canals and measures 0.109 (0.105-0.114) in length and 0.065 (0.052-0.078) in width. The cirrus pouch is medium in size, oval in shape, sac like, narrow proximally broad distally, situated at the middle region of the segment, anteriorly directed and measured 0.140 (0.131-0.149) in length and 0.061 (0.035-0.087) in width. Cirrus is thin, straight, contained within the cirrus pouch and measures 0.166 (0.157-0.175) in length and 0.015 (0.013-0.017) in width. The vas deferens is thin, long, straight, directed anteriorly and measures 0.131 (0.122-0.140) in length and 0.013 (0.008-0.017) in width. The ovary is large in size, distinctly lobulated, situated almost in the middle or slightly posterior to the middle of segments and measures 0.539 (0.526-0.552) in length and 0.149 (0.114-0.184) in width. The vagina is thin narrow tube, posterior to cirrus pouch, starts from the genital pore, runs posterior to the cirrus pouch, extend first anteriorly then transversely crosses the longitudinal excretory canals, then runs medially and open into the ootype and measures 0.355 (0.333-0.377) in length and 0.021 (0.017-0.026) in width. The ootype is medium in size, oval in shape, preovarian and measures 0.048 (0.043-0.052) in diameter. The genital pore are small in size, round in shape, unilateral situated at just in front of the middle lateral margin of the segments and measures 0.021 (0.017-0.026) in length and 0.015 (0.013-0.017) in width. The vitelline gland is medium in size, irregular in shape post ovarian situated posterior half of the segments and measures 0.045 (0.038-0.050) in length and 0.026 (0.020-0.032) in width. The longitudinal excretory canal are medium in size, arranged in two pairs at both side of proglottids and measures 0.045 (0.0464-0.482) in length and 0.013 (0.0080-0.017) in width. The gravid segments are not found.

Commensal rodents harbour many helminth species which cause morbidity in human. These helminth parasites include tapeworms

Hymenolepis diminuta and *Rodentolepis nana*, and round worms *Calodium hepaticum* (syn. *Capillaria hepatica*) and *Angiostrongylus cantonensis* (Meerburg *et al.*, 2009). Various studies report that these helminths disturb physiology and immunity of their hosts by damaging their tissues, compete for nutrients, decrease blood volume and other body fluids. *Hymenolepis diminuta* (Rudolphi, 1819) was previously recovered from a gray squirrel (*Sciurus carolinensis*) in Indiana (Thomas Joseph, 1974). After going through the literature the present worm in having the testes three, one poral and two aporal, comes closer to *Hymenolepis diminuta* (Rudolphi, 1819) and worm differs from *Hymenolepis diminuta* in the scolex (circular vs globular), the mature proglottids (broader than long vs squarish), the size of ovary (0.032-0.037 x 0.012-0.015 vs 0.526-0.552 x 0.114-0.184 mm). As the above characters are minor, it is redescribed here as *Hymenolepis diminuta* (Rudolphi, 1819) who reported his worm from *Rattus rattus* and *Bandicota* whereas the present worm are being reported from *Rattus rattus* at Aurangabad (M.S.), India.

Taxonomic Summary:

Genus	:	<i>Hymenolepis</i> Weinland, 1858
Species	:	<i>Hymenolepis diminuta</i> (Rudolphi, 1819).
Type of host	:	<i>Rattus rattus</i>
Habitat	:	Intestine
Type of locality	:	Aurangabad, (M.S.) India
Accession No.	:	HRL /2005-07/4/1-10
Holotype	:	Deposited in Helminthology Research Laboratory
Paratype	:	Department of Zoology, Dr. B. A. M. University, Aurangabad, India

Date of Collection : June 2005- May 2007

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