

HELMINTH PARASITES OF CERTAIN RATS IN INDIA,

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The rat, more than any other wild animal, has adapted itself to man's habitations and is found in them all, from the most modern mansion in highly civilised countries to the most lowly hut of primitive races, so that all over the world this rodent is found living in much closer association with man than many of his so-called domestic animals. It has long been recognised that on account of its ubiquity, the rat is important as a transmitter or reservoir of certain diseases of human beings. Its greatest importance is probably with regard to bubonic plague, but as a host of numerous helminths it deserves attention also, and many censuses of its worm parasites has been taken in various parts of the world.

As far as we are aware, no systematic examination of rats has been made in India from the helminthological standpoint. We give below the results of our examination of 100 rats brought for routine plague examination to the Public Health Department of Bengal, to whom we are indebted for the material. This material has been recently amplified by the receipt of a large collection of worms from the Central Research Institute, Kasauli, which contained collections from 28 rats, nearly all collected in the Ambala District, Punjab.

The species of rat we examined in Calcutta was *Mus decumanus* Pallas, but the identification of the rats providing the Kasauli collection is not known nor the number of rats that were dissected to provide the 28 collections of worms. Therefore, the latter are shown below separately.

The following parasites were obtained from 100 specimens of *Mus decumanus* Pallas, from Calcutta, the number besides each species representing the number of host-specimens infected with it; 28 were uninfected. Multiple infections were common, but they have not been analysed and shown separately.

NEMATODA.

<i>Heterakis spumosa</i>	..	..	..	..	..	..	41
<i>Syphacia baylisi</i> , sp. nov.	..					..	17
<i>Mastophorus muris</i>							3
<i>Subulura andersoni</i>		..					1
<i>Capillaria prashadi</i> , sp. nov.			..	..	..		1
<i>Oxyuridae</i>	..	..	..	..	..	..	1

CESTODA.

<i>Hymenolepis diminuta</i>		..		..	..	14
<i>Hymenolepis nana</i>	..				..	7
<i>Raiilietina celebensis</i>		..				6
<i>Oochoristica symmetrica</i>					..	2
<i>Cysticercus fasciolaris</i>	..	..		..	..	11

ACANTHOCEPHALA.

<i>Moniliformis moniliformis</i>	..	..	..	20
No parasites .. ..	..	..	..	28

The Kasauli collection contained the following parasites :

NEMATODA.

<i>Mastophorus muris</i>	11
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CESTODA.

<i>Hymenolepis diminuta</i>	9
<i>Oochoristica symmetrica</i>	1
<i>Cysticercus fasciolaris</i>	7

NEMATODA.

***Syphacia baylisi*, sp. nov.**

Baylis (1936) recorded some female worms belonging to this genus which had been obtained from *Rattus rattus* at Lyallpur, Punjab. He expressed the opinion that these worms probably represented a new species, principally because the eggs measure 0.07×0.03 mm. compared with eggs of the size of $0.12-0.13 \times 0.036-0.04$ mm. found in a species of *Syphacia* obtained from a *Mus musculus* Linn. in Ceylon. This worm was identified as *S. obvelata* or *S. stroma*, but there is some doubt at present whether these two species are identical or different.

The worms in our collection obtained from 17 rats were all females ; 10 of these, which were measured, agreed with the measurements of Baylis' Lyallpur material. The sizes of eggs in our specimens were $0.078-0.02 \times 0.029-0.034$ mm. We consider that these results confirm Baylis' opinion that this is a distinct species with shorter eggs than those of *S. obvelata*. Even in the absence of males, we name this new species as *S. baylisi*.

***Subulura andersoni* (Cobbold, 1876) Railliet & Henry, 1914.**

This species was fully redescribed by Thwaite (1927) and there seems little doubt that our worms are the same species because nearly all the measurements fall within the limits given by him. The maximum length of both sexes is 0.5 to 1 mm. more than Thwaite's, a quite insignificant difference. The only other difference is in the position of the vulva which is 6.8 mm. from the anterior end in Thwaite's description, and is 9.2-9.8 mm. in our material. This is not, in our opinion, sufficient to justify making a new species, and its significance is lessened by the fact that our worms were longer than Thwaite's.

Mirza (1936) described a new species, *S. hindi*, basing his differentiation on Cobbold's original description of *S. andersoni*. He was evidently unaware that Thwaite (1927) had redescribed *S. andersoni* in detail. If Mirza's and Thwaite's drawings and descriptions are compared the following points emerge.

Mirza bases the differentiation of his species from *S. andersoni* on the following three points : " Number and disposition of caudal papillae in the male, the length of the spicules, and the position of the vulva in the female ". Regarding the caudal papillae, the disposition depicted

in the drawings of both authors is the same, but Mirza shows a third pair of papillae in the most posterior group. These papillae are very small and in our material it was in some cases hard to determine whether the third pair was present or not. Therefore, this point is not considered to be of specific value. Variation in this group of papillae is well known and accepted fact in several allied genera. Mirza says that the spicules are equal and are 9.1 mm. in length. Thwaite says they are equal or subequal and measure 0.85-1 mm. in length, and we found them to be 0.9-1.06 mm., so that this character is of no value. The vulva is given as 5.69 mm. from the anterior end by Mirza, 6.5-8 mm. by Thwaite and we found it to be 9.2-9.8 mm. in slightly larger worms, and as this is the sole difference that remains we do not consider it to be of any specific value. In view of these facts we consider that *S. hindi* Mirza, 1936, is a synonym of *S. andersoni* Cobbold, 1876.

Mastophorus muris (Diesing, 1853) Chitwood, 1938.

Chitwood (1938) divided the worms contained in the genus *Protospirura* Seurat, 1914, into two groups leaving some of them in *Protospirura*, and placing the others in *Mastophorus* Diesing 1853; and *muris* becomes the type of *Mastophorus* for the following reasons. Seurat, when he created the genus *Protospirura*, named *P. numidica* Seurat, 1914 as the type; he next transferred *Lumbricus muris* Gmelin, 1790 to this genus and, a little later, said that it was identical with *Mastophorus echiurus* Diesing, 1853. Stiles and Hassall had made *M. echiurus* the type of *Mastophorus* by "subsequent designation" in 1905. Therefore, according to the rules, the genus *Protospirura* becomes invalid. But since the worms in this group, headed by the original type of the genus, namely *P. numidica*, are clearly defined, Chitwood recommends retaining this generic name.

The correct name and synonymy of the species under discussion is therefore :—

Mastophorus muris (Diesing, 1853) Chitwood, 1938.

Syn. *Lumbricus muris* Gmelin, 1790.

Protospirura muris Seurat, 1915.

Mastophorus echiurus Diesing, 1853.

Syn. *Protospirura muris* Seurat, 1916.

A further point is that Chitwood distinguished two varieties of *M. muris*, viz., *M. muris muris* with large teeth and *M. muris ascaroides*¹ with small teeth. All our specimens belong to the large-toothed variety. He also expressed the opinion that four of the other species that he put in this genus, viz., *columbiana*, *gracilis*, *labiodentata* and *oligodonta* are identical with *M. muris muris* and that another species, *marsupialis*, is also probably the same.

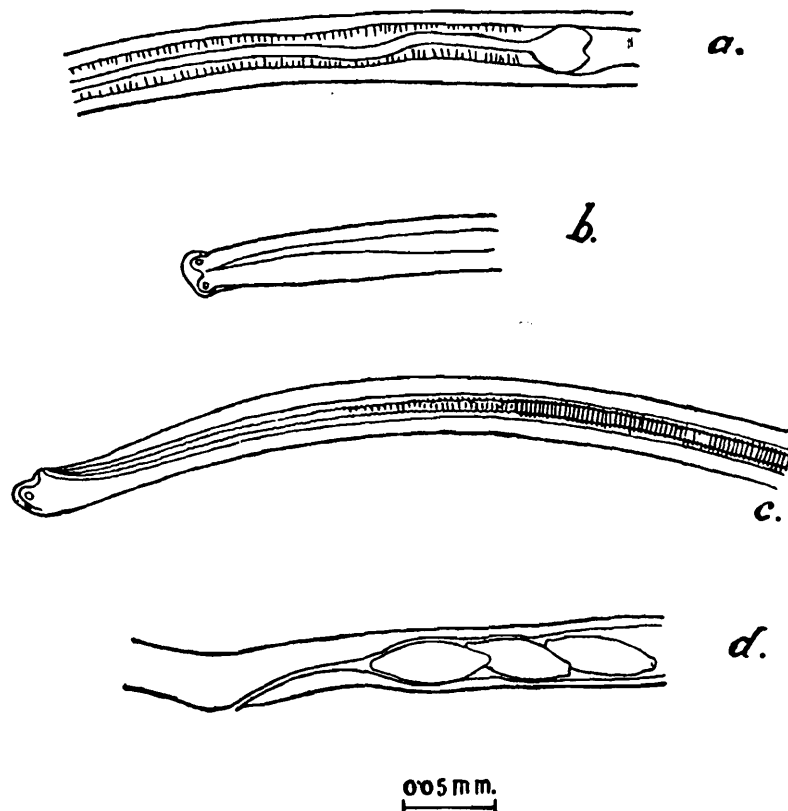
The species he leaves in *Protospirura* are : *numidica*, *muricola*, *bonnei* and *suslica*.

¹ Hall (1916) named the species as *Protospirura ascaroidea* and not *ascaroides*. Therefore, the varietal name used by Chitwood should be *ascaroidea*.

Capillaria prashadi, sp. nov.

This species was found in only one rat, *Mus decumanus*.

Male.—Only a single male was found and the anterior end was missing, so that the full length cannot be given. The length of the fragment was 7 mm., and if this is compared with the lengths of the whole females it is clear that the greater part of the specimen was recovered. The maximum diameter is 0.49 mm. The worm ends in a rounded cuticular expansion which is supported by a pair of thick ray-like prolongations of the body. These rays end in small papillae directed dorsally. The anus is subterminal (figs. *b*, *c*). The



Capillaria prashadi, sp. nov.

a. Proximal end of spicule (lateral view); *b*. Posterior end of male (dorsal view); *c*. Posterior end of male (lateral view); *d*. Vulvar opening of female (lateral view).

spicule is lightly chitinized and at the proximal end it has a bulbous dilation which is 0.023×0.022 mm. (fig. *a*). The total length of the spicule is 0.95 mm.; it is 0.008 mm. thick just behind the bulb, and tapers slightly towards the tip, being 0.006 mm. in diameter just before it narrows to end in a fine straight point; the spicule sheath is muscular with transverse striations, and it has spiral markings on its inner surface (fig. *c*).

Female.—The six females, which were intact, measured 10.2-13 mm. in length and 0.61-0.67 mm. in maximum diameter. The oesophagus is 4.2-5.3 mm. in length, and the vulva which is a simple opening without lips, is 0.1-0.2 mm. behind the posterior end of the oesophagus (fig. *d*). The eggs are 0.058-0.064 mm. in length, including the terminal plugs, and 0.024-0.029 mm. in maximum diameter; the shells show radial striations, but no surface pattern could be made out.

A careful comparison with the most nearly similar species of *Capillaria* of mammals listed by Travassos (1936) demonstrates that this is

a distinct species. For example, *C. muris-sylvatici* differs with regard to the posterior end of the male, the shape of the spicule and the vulva in the female. It resembles *C. felis-cati* and *C. auritae* in the male caudal extremity, but the spicules, spicule-sheaths and eggs are of different shapes and dimensions. In *C. linsi* the caudal end of the male is also similar and the proximal end of the spicule is dilated, but in this case it is definitely funnel-shaped and not globular as in our species, and the length of the spicule is also different. Since the other known species differ greatly from *prashadi*, a detailed comparison is not necessary.

The name *Capillaria prashadi*, sp. nov. is proposed for this worm in recognition of the kind assistance received over many years from Dr. Baini Prashad, Director, Zoological Survey of India, in the identification of the hosts of our parasitic worms and in many other ways.

FAM. OXYURIDAE.

Some Oxyurid worms were also found, but as only females were available, and nothing sufficiently characteristic was found these could not be identified.

CESTODA.

***Raillietina celebensis* (Janicki, 1902).**

All the specimens obtained by us agreed with *R. celebensis* or *R. celebensis paucicapsulata*, except that there were no spines, and in two worms the genital pores were not unilateral throughout the strobila.

The absence of spines is of no importance, as it is generally accepted that they are lost during fixation.

The alternation of the genital pores is a more important character, but in the present instance we are inclined to regard it as a variation of no specific value, because the alternation only occurred once or twice in the whole chain and there were 20 to 30 segments with pores all on one side followed by a similar number with the pores on the opposite side. Such a condition is very different from the usually accepted definition of alternating pores which means two or three pores on the side followed by two or three on the other, throughout the length of the worm.

It was also noted in two of our worms that the number of egg capsules varied from 95 to over 200 in different segments of the same worm. Meggitt and Subramanian (1927) created the variety *R. celebensis paucicapsulata* on the fact that *R. celebensis* has 180 to 200 egg-capsules to a segment, whereas their worms had 100 to 120 egg-capsules. Our discovery of a much wider variation of capsules in a single chain indicate that this distinction is not valid and that consequently the name *R. celebensis paucicapsulata* should be dropped.

***Hymenolepis nana* (v. Siebold, 1852) Blanchard, 1891.**

In considering this species we have followed the now generally accepted fact that *H. fraterna* and *H. longior* are identical with *H. nana*

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