Jap. J. vet. Res., **21**, 51~56 (1973)

HELMINTHS OF STRAY DOGS IN SAPPORO, HOKKAIDO, JAPAN

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(Received for publication, March 5, 1973)

Helminth parasites of 32 males and 29 females of adult stray dogs captured in Sapporo were investigated in September, 1972. Helminths were found in 47 (77.0%) of 61 dogs; 27 (84.4%) of 32 males and 20 (69.0%) of 29 females. The rate of helminth infection in dogs in Sapporo is lower than that of other districts of Japan. Eight helminth species belonging to 8 genera were recovered: *Clonorchis sinensis* (rate of infection 1.6%), *Plagiorchis muris* (19.7%), *Trichuris vulpis* (44.3%), *Dirofilaria immitis* (24.6%), *Ancylostoma caninum* (19.7%), *Toxocara canis* (3.3%), *Toxascaris leonina* (3.3%), *Corynosoma* sp. (1.6%). No cestode was recovered. In the infected dogs, cases parasitized by one, two and three species of helminths were 57.4%, 31.9% and 10.6% respectively. The case of *Clonorchis sinensis* is the first one recorded in Hokkaido. It is obscure whether this dog had been infected in Hokkaido or not, but *Bithynia ussuriensis*, which may serve as the first intermediate host, has been found in Hokkaido. Therefore, the establishment of life cycle of *C. sinensis* might be undeniable. The case of *Corynosoma* sp. in dogs is the first description in Japan. Infection rates in general and those of *T. vulpis*, *A. caninum*, *D. immitis and P. muris* were higher in males than females.

INTRODUCTION

Excepting particular parasites, e.g. *Echinococcus multilocularis* LEUCKART, 1863, no systematic survey on helminth parasites of the dog in Hokkaido has been known, although YAMASHITA & MORI (1954) studied helminths of house dogs in Sapporo by the fecal examination.

The authors have planned a long-term investigation of parasites of the dog in Sapporo, Hokkaido. This paper dealts with the result obtained in 1972, which includes the discovery of the first case of *Clonorchis sinensis* in Hokkaido.

MATERIALS AND METHODS

Thirty-two male and 29 female adult dogs captured in Sapporo were autopsied

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in September, 1972. All the visceral organs and tissues were carefully examined macro- and microscopically. The preparation of helminths recovered were made by the routine methods.

TABLE 1 *Helminth infection in dogs examined*

SEX OF DOGS	NO. OF DOGS		INCIDENCE (%)
	Examined	Infected	
Male	32	27	84.4
Female	29	20	69.0
Total	61	47	77.0

TABLE 2 *Relationship between sex of dogs and number of species of helminths*

SEX OF DOGS	NO. OF DOGS INFECTED	NO. OF DOGS (%) INFECTED WITH		
		1 sp.	2 spp.	3 spp.
Male	27	15 (55.6)	8 (29.6)	4 (14.8)
Female	20	12 (60.0)	7 (35.0)	1 (5.0)
Total	47	27 (57.4)	15 (31.9)	5 (10.6)

TABLE 3 *Incidence of helminths in dogs*

SPECIES OF HELMINTHS	NO. OF DOGS INFECTED		INCIDENCE (%)		TOTAL
	Male*	Female	Male	Female	
Toxocara canis (WERNER, 1782)	1	1	3.1	3.4	3.3
Toxascaris leonina (LINSTOW, 1902)	0	2	0	6.9	3.3
Ancylostoma caninum (ERCOLANI, 1859)	9	3	28.1	10.3	19.7
Trichuris vulpis (FROELICH, 1789)	16	11	50.0	37.9	44.3
Dirofilaria immitis (LEIDY, 1856)	9	6	28.1	20.7	24.6
Corynosoma sp.	0	1	0	3.4	1.6
Clonorchis sinensis (COBBOLD, 1875)	0	1	0	3.4	1.6
Plagiorchis muris TANABE, 1922	8	4	25.0	13.8	19.7

*: Sex of dogs

Results and discussion

The number of dogs examined and the rate of helminth infection are shown in table 1. The infection rate of male dogs was higher than that of females.

The relationship between the sex of dogs and the number of helminth species is shown in table 2. The majority (57.4%) of the infected dogs was parasitized by only one species. On the other hand, among the dogs infected, 4 of 27 males and one of 20 females were parasitized by 3 helminth species.

Eight species belonging to 8 genera were recovered: 5 species of Nematoda, 2 species of Trematoda and an Acanthocephala. The incidence (%) of these helminths is shown in table 3.

No particular but common species of nematodes were found. *D. immitis* has been already reported by Kobayashi et al. (1970) and Hakodate & Yamashina (1970) in Hokkaido. In Sapporo, however, this nematode indicates only light infection as compared with the infections in other parts of Japan, e.g. Shizuoka Prefecture (Ito et al., 1959).

Three helminths, *Plagiorchis muris*, *Clonorchis sinensis* and *Corynosoma* sp., were found for the first time in Hokkaido. Therefore, the authors would like to describe and discuss these species below.

Plagiorchis muris Tanabe, 1922 (figs. 1 & 2)

Twelve out of 61 dogs (8 of 32 males and 4 of 29 females) were infected by this trematode.

Description: Measurements were based on 5 mature worms.

Body elliptical, covered with minute spines. Body length 2.243~2.535 mm by maximum width 0.676~0.897 mm. Oral sucker subterminal, size 0.179~0.196×0.202~0.231 mm. Acetabulum at anterior one third of body, 0.186~0.248×0.176~0.238 mm. Pharynx well developed, 0.098~0.114×0.091~0.114 mm. Ceca bifurcates at just behind esophagus, extending laterally to posterior end. Testes round, diagonal in posterior half of body, 0.377~0.507×0.338~0.429 mm in size. Ovary pretesticular, dextro-posterior to acetabulum, its shape rounded, size 0.199~0.254×0.215~0.267 mm. Genital pore anterior to acetabulum. Vitelline follicles extend in lateral fields from posterior extremity to nearly posterior end of pharynx. Uterus extends to posterior extremity. Eggs small, size 0.016~0.020×0.030~0.036 mm. Excretory vesicle Y-shaped.

Discussion: *P. muris* was described from rats for the first time by Tanabe (1922) but dogs, bats and sparrows have been also listed as definitive hosts. The first canine case in Japan was recorded by Yoshikawa et al. (1938) in Kobe, and, thereafter, Okabe & Koga (1952) obtained this trematode from dogs of Saga Prefecture, Kyushu. The infection rates recorded by them were 5.7 and 0.6%

respectively. YOSHIKAWA et al. (1940) recognized the seasonal fluctuation of infection rates due to the longevity of this worm and vicissitudes of the intermediate host, e.g. *Chironomus* sp.. They concluded that the highest rate was observed in autumn. In the present paper, the infection rate was very high (19.7%) compared with the above-mentioned, although there was possibly the seasonal influence.

McMULLEN (1937) demonstrated experimentally the possibility of human infection of this trematode. OKABE & SHIBUE (1952) clarified that *Neocaridina denticulata* could serve as the second intermediate host, and they also suggested the possibility of human infection. This worm is thought to be non-pathogenic, but occurrence of human infection in Sapporo can be supposed, because of the high rate in dogs.

Clonorchis sinensis (COBBOLD, 1857) (fig. 3)

Fifteen matured *Clonorchis sinensis*, of which body length 11.70~16.38 mm and the maximum width 2.177~2.795 mm, were obtained from the bile duct of one female dog.

Irrespective of extensive epidemiological studies, this trematode has not been found in northern Japan; Aomori and Iwate Prefectures and Hokkaido. RITCHIE et al. (1950, 1954) reported low incidence of clonorchiasis among inhabitants in above-mentioned districts by the fecal examinations, however it was not clear whether they became infected in these areas or in other endemic areas. On the other hand, YAMASHITA & MORI (1954) obtained a negative result through the fecal examination of 160 house dogs in Sapporo.

YOSHIMURA (1965) made a list of 80 species of the second intermediate hosts belonging to 9 families (mainly Cyprinidae) and 46 genera. Zoogeographically, the fauna of Hokkaido is very different from that of other parts of Japan. Common freshwater fishes, which can play the role of the second intermediate host, are also found in Hokkaido. There was no report of the discovery of *Parafossarulus manchouricus japonicus*, the most important first intermediate host in Japan, but Mori (1933) collected *Bithynia ussuriensis* from Lake Tōro, eastern Hokkaido. It is well known that *B. fuchsiana* and *B. longicornis* serve as the first intermediate host of *C. sinensis* in China. Therefore, it is undeniable that the life cycle of *C. sinensis* has been completed in Hokkaido, although no infected place is known in connexion with the present case.

Corynosoma sp. (figs. 4~7)

A pre-adult female worm was recovered from the small intestine of a female dog.

Description: Body club-shaped, length 3.4 mm and maximum width 1.4 mm,

thickened anterior like an inflated bulb, hind-trunk narrow cylindrical. Trunk spines in fore-trunk, extending from anterior extremity to about middle of trunk, more conspicuous on ventral surface than dorsal. Proboscis sheath double. Proboscis, length 0.68 mm, maximum width 0.36 mm. Proboscis spines in 22 longitudinal rows, 11 spines in each row. Genital spines unrecognizable.

Discussion: Few reports about acanthocephalans from the dog are known in Japan. OKABE & KOGA (1952) found an immature acanthocephalan from one of 365 stray dogs of Saga Prefecture, Kyushu, southern Japan, but this worm was not identified because of its immature stage. In the review by VAN CLEAVE (1953), *Corynosoma semerme* (FORSELL, 1904) and *C. strumosum* (RUDOLPHI, 1802) from the dog were recorded as the accidental infection in North America.

The present specimen is probably *C. strumosum*, because trunk spines are observed on only the anterior portion.

This is the first description of *Corynosoma* from the dog of Japan.

ACKNOWLEDGEMENTS

The authors wish to express their gratitude to Prof. J. YAMASHITA and Ass. Prof. M. OHBAYASHI of this Department for their kind direction and review.

Mr. Y. GOTÔ, the Head of the Station of the Environment Sanitation, Sapporo, made available the stray dogs, and Mr. K. ITÔ, Matsugae Junior High School, Otaru City, gave them helpful suggestions about the water snails of Hokkaido. For these contributions, the authors express their cordial thanks.

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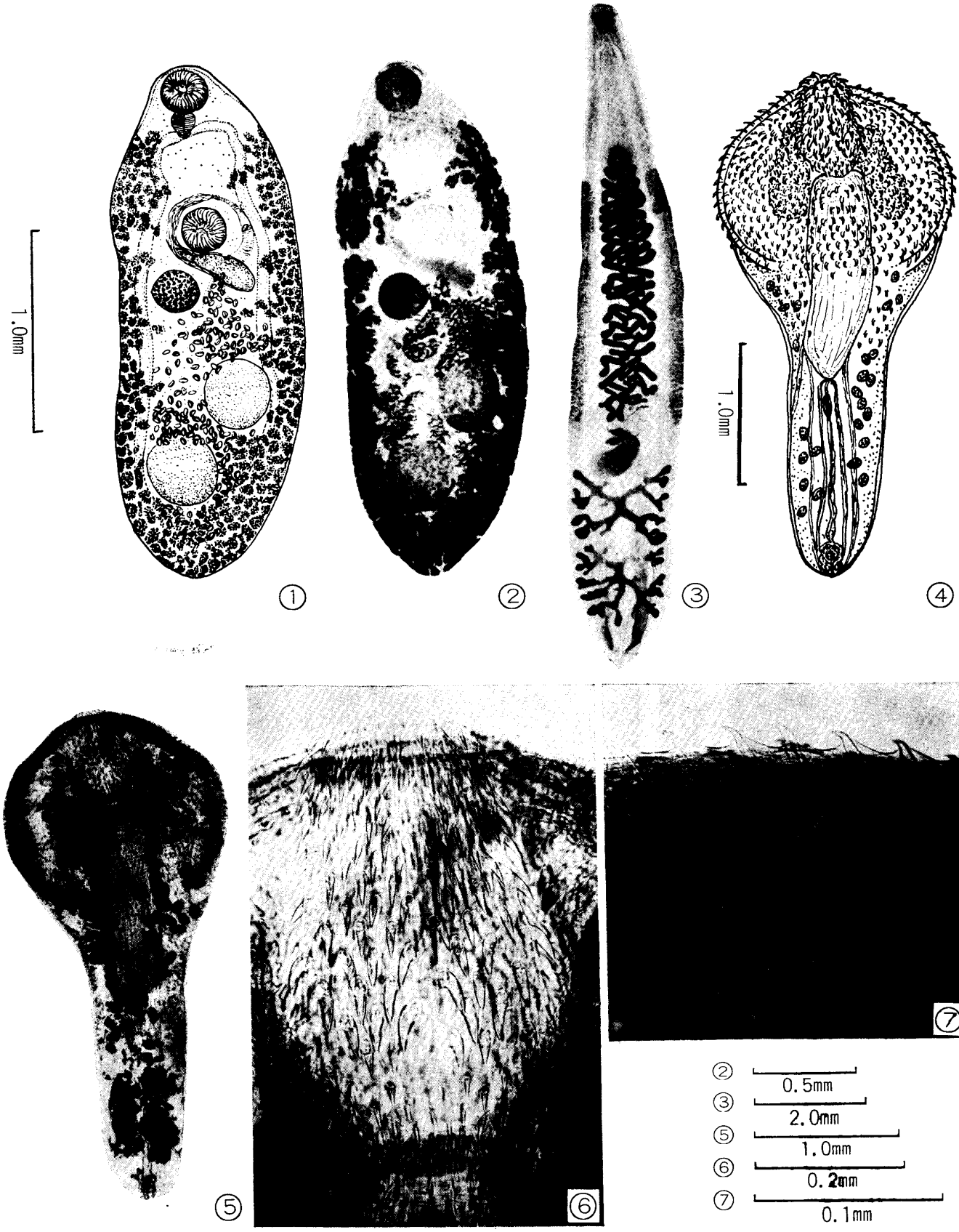
EXPLANATION OF PLATE

Preparations were stained by Delafield's hematoxylin.

Fig. 1 *Plagiorchis muris*, ventral view
Fig. 2 *Plagiorchis muris*, ventral view
Fig. 3 *Clonorchis sinensis*, ventral view
Figs. 4~7 *Corynosoma* sp.
Fig. 4 Ventral view
Fig. 5 Ventral view
Fig. 6 Proboscis
Fig. 7 Trunk spines at the anterior extremity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