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Research Note

Parasitic Nematodes of Rodents on the Off-shore Islands of Hokkaido

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Key words: nematodes, *Clethrionomys, Apodemus,* off-shore islands, Hokkaido

A number of studies have dealt with the nematodes parasitizing voles (*Clethrionomys* spp., Microtidae) and mice (*Apodemus* spp., Muridae) on Hokkaido, the northernmost of the four major islands of Japan (Chabaud *et al.*, 1963; Ishimoto, 1974; Asakawa *et al.*, 1983, Asakawa, 1990). In contrast, very little is known concerning the occurrence and distribution of the nematode parasites of the small rodents inhabiting the off-shore islands of Hokkaido.

In the present paper, we report the results of a nematode survey of rodents collected on six of the small off-shore islands, plus our findings on Naka-jima Island, located in the Southwestern part of Hokkaido, in Lake Toya.

In 1990, *C. rufocanus bedfordiae* (Thomas), *C. rex* Imaizumi, *A. speciosus* (Temminck), and *A. argenteus* (Temminck) were collected on Naka-jima, Lake Toya (Coll. date: 10th～13th Jun.), and the following six off-shore islands (Fig. 1): Yagishiri (18th～19th Jun.), Teuri (20th Jun.), Rishiri (11th～13th Jul.), Rebun (14th Jul.), Okushiri (25th and 27th Jul.), and Daikoku (18th and 19th Sep.). Nematodes were fixed and preserved in 10% formalin solution or 70% ethanol, and examined microscopically with lactophenol solution.

Syphacia montana (Fam. Oxyuridae; Site: caecum and colon), *Heligmosomum* (*Paraheligmosomum*) *yamagutii* (Heligmosomidae; small intestine), *Rhabditis* (*Pelodera*) *orbitalis* (Rhabditidae; orbit), *Aonchotheca murissylvatici* (Capillariidae; stomach) and *Trichuris* sp. (Trichuridae; caecum and colon) were obtained from *C. rufocanus,* and *H.* (*P.*) *yamagutii, R.* (*P.*) *orbitalis* and *A. murissylvatici* were obtained from *C. rex,* respectively (Table 1). Hence, most of the nematodes from both voles were the same species.

Especially, *H.* (*P.*) *yamagutii* is common parasitic nematode of both *C. rufocanus* and *C. rex* (syn. *C. montanus*) (*i.e.*, Abe, 1984) on Hokkaido (Chabaud *et al.*, 1963; Ishimoto, 1974; Asakawa, 1990; Asakawa *et al.*, 1983). Since *C.*

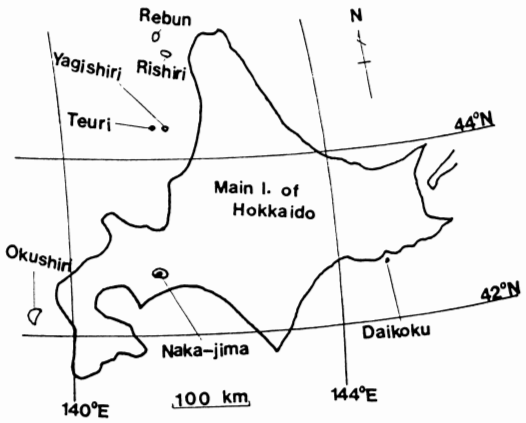

Fig. 1 Map of Hokkaido, Japan, and off-shore islands.

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Table 1 Occurrence of parasitic nematodes in small rodents on the off-shore islands of Hokkaido, Japan

Island	Host	No. infected / No. examined	Parasitic nematode
Naka-jima (in Lake Toya, Hokkaido)	Crb*	2/4	*Syphacia montana*
		4/4	*Heligmosomum* (*Paraheligmosomum*) *yamagutii*
		1/4	*Rhabditis* (*Pelodera*) *orbitalis*
	Aar	74/125	*Syphacia emileromani*
		18/125	*Rictularia cristata*
		2/125	*H.* (*P.*) *yamagutii*
		1/125	*Calodium hepaticum*
Yagishiri	Crb	3/6	*S. montana*
		3/6	*H.* (*P.*) *yamagutii*
		1/6	*R.* (*P.*) *orbitalis*
		1/6	*Trichuris* sp.
Teuri	Crb	5/9	*S. montana*
		1/9	*H.* (*P.*) *yamagutii*
Rishiri	Crb	2/3	*S. montana*
		3/3	*H.* (*P.*) *yamagutii*
		1/3	*Aonchotheca murissylvatici*
	Cre	12/15	*H.* (*P.*) *yamagutii*
		4/15	*R.* (*P.*) *orbitalis*
		1/15	*A. murissylvatici*
	Asp	0/5	
Rebun	Crb	1/4	*S. montana*
		4/4	*H.* (*P.*) *yamagutii*
Okushiri	Asp	66/92	*R. cristata*
		4/92	*Heterakis spumosa*
		33/92	*Eucoleus* sp.
Daikoku	Crb	63/120	*S. montana*
		25/120	*H.* (*P.*) *yamagutii*
		11/120	*Trichuris* sp.

*Abbreviations of host names. Crb, *Clethrionomys rufocanus bedfordiae;* Cre, *C. rex;* Aar, *Apodemus argenteus;* Asp, *A. speciosus.*

rufocanus was found on Naka-jima, Yagishiri, Teuri, Rishiri, Rebun, and Daikoku; and *C. rex* on Rishiri (Ota, 1984), this nematode species is present wherever the voles are found.

The common nematodes parasitizing the Japanese *Apodemus, viz., Rictularia cristata* (Rictulariidae; stomach and small intestine), *Heterakis spumosa* (Heterakidae; caecum and colon), *Eucoleus* sp. (Capillariidae; stomach), *Syphacia emileromani* (Oxyuridae; caecum and colon), and *Calodium hepaticum* (Capillariidae; liver) were obtained from the mice inhabiting the small islands except for Rishiri. However, the recovery of *H.* (*P.*) *yamagutii* from *A. argenteus* seems to be an accidental case, probably due to sharing of habitats with voles.

On the other hand, *Heligmosomoides kurilensis* (syn. *H. kobayashii*) (Fam. Heligmosomidae) was not obtained from *A. speciosus,* although the nematode is a common parasite of *A. speciosus* on Hokkaido (Chabaud *et al.*, 1963; Ishimoto, 1974; Asakawa and Ohbayashi, 1986). *A. argenteus* on Hokkaido harbours *Heligmosomoides desportesi* (Chabaud *et al.*, 1963; Asakawa & Ohbayashi, 1986), but this nematode species was not recovered from rodents on Naka-jima.

Although the genera *Heligmosomoides* and *Heligmosomum* belong to the same family, nematodes of the former genus were not recovered on any of the off-shore islands.

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Research Note

A Case Report of Bolus Intestinal Obstruction due to Massive Infection with *Ascaris lumbricoides*

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Key words: *Ascaris lumbricoides*, intestinal ascariasis, acute abdomen, ileus

Ascariasis used to be the commonest parasitic disease in Japan and over 60% of the nation had been suffered from infection with this intestinal nematoda in late 1940s (Yamaguchi, 1988). In accordance with the improvement of general public health conditions and by effective mass examination and treatment, ascariasis had become rather a rare parasitic disease. However, sporadic cases, especially biliary ascariasis with acute abdomen (Kisu *et al.*, 1989), are still reported from various places of Japan. In addition, heavily infected cases are also sporadically seen in the rural areas (Kojima *et al.*, 1978; Katada *et al.*, 1991; Nishiyama *et al.*, 1991) mainly due to delayed improvement of sanitary system. Here we report such a typical case of bolus intestinal obstruction caused by massive infection with *Ascaris lumbricoides*.

The patient is a 3.5 year-old boy, born and grown in Shiiba-Village, Miyazaki Prefecture, and is living together with his two elder sisters (5 and 7 year-old), parents, grand parents, and a grand ant. His father is a hunter and his whole family are engaged in vegetable farming and had used human excreta as fertilizer until 5 years ago. He has a past history of asthmatic bronchitis with eosinophilia (Löffler's syndrome) in Feb. 1991.

On the evening of July 9, 1991, he suddenly complained of abdominal pain, vomiting, soft stool, and fever. Next day he was admitted to the regional hospital because acute colitis was suspected. Physical examination revealed that he was a normal proportioned boy 95 cm tall and weighed 13.0 kg, had dried skin, and appeared unhappy. The throat was moderately injected. The abdomen was slightly distended and was diffusely but mildly tender. The bowel sound slightly decreased. Laboratory data showed slight dehydration and inflammation; ketone body (±) in urine, WBC 12,600/mm^3 (Eo <1%), ESR 30 mm/60 min, CRP (++). Occult blood was negative by stool examination. Other laboratory data were within normal range. By plane abdominal roentgenography (Fig. 1a) multiple linear shadows were noted on upper right abdomen. His abdominal symptoms did not improve after dripping of antibiotics, and he vomited one white worm of about 25 cm length on July 12. On July 13, plane abdominal roentgenogram (Fig. 1b) revealed multiple niveau together with multiple linear shadows. Since bolus intestinal obstruction due to ascaris lump was suspected at this stage, he was transferred to the emergency ward of the Miyazaki Prefectural Hospital.

After laparotomy by mid-line incision, small amount of ascites was detected and two

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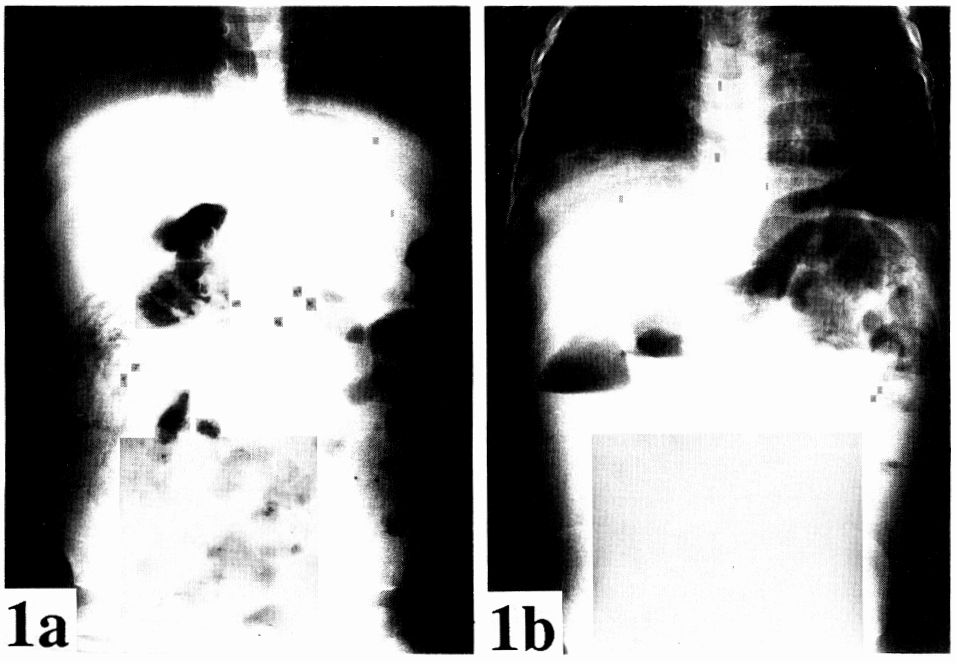

Fig. 1 Plane abdominal roentgenogram.
Note multiple linear shadows on upper right lateral abdomen in Fig. 1a taken on the day of admission and multiple niveau together with multiple linear shadows in Fig. 1b taken 3 days after admission.

obstructed sites, one 30 cm distal from Treitz's ligament and the other 50 cm proximal from ileocecal junction, were identified. The obstructed sites were strongly distended so that purgation by milking was impossible. Therefore, about 3 cm longitudinal incision was made at the each site and the mass of parasites were removed. About 60 worms were recovered from the jejunum and about 30 worms from ileum. All parasites (Fig. 2) were immersed in buffered formalin and brought to the Department of Parasitology, Miyazaki Medical College, for parasitological examination. After surgical treatment, he was treated with 360 mg of pyrantel pamoate and 3 additional worms were expelled out on July 17. Clinical course was favorable and he was discharged from the hospital on July 25. Since ascariasis sometimes concentrated within a family (Morishita, 1953), stool examination was carried out for the family members of the patient and his two sisters were positive for *Ascaris* eggs. They were effectively treated with pyrantel pamoate.

Based on the morphological characteristics, the parasites were identified as *Ascaris lumbricoides*. Their number and the length were summarized in Table 1. In addition to 47 females and 44 males examined, one worm was vomited before surgery and three worms were purged by anthelmintic treatment, which were kept aside as the sample specimen and not measured. Thus, a total of 95 worms were recovered so far from the patient. The average size of 47 female worms was 24.3 ± 3.6 cm (mean $\pm$ SD) with the range of 14.9–29.6 cm, while that of 44 male worms was 17.0 ± 2.8 cm (mean $\pm$ SD) with the range of 8.8–21.1 cm. As shown in Fig. 3, the size distribution of both males and females showed biphasic pattern.

Recent epidemiological survey revealed that the incidence of ascariasis in Japan was less than 0.01% (Tei, 1990). Still, sporadic cases of ascariasis with various complications, most of which were biliary ascariasis, have been reported

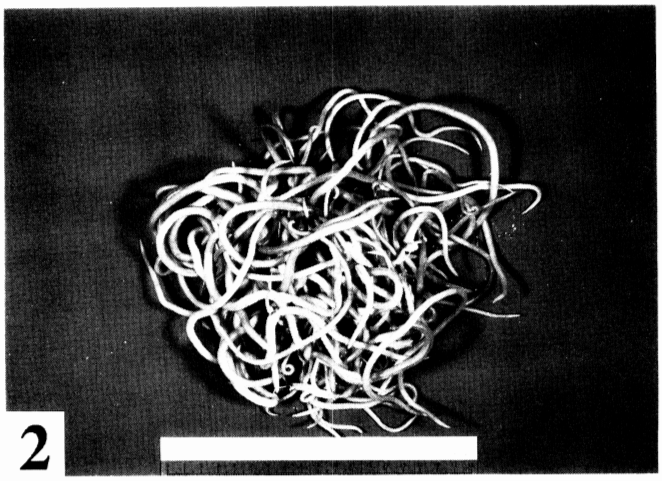

Fig. 2 A mass of *Ascaris lumbricoides* worms removed from the intestine of the patient.

Table 1 *Ascaris lumbricoides* recovered from the patient

	Number	Size	
		range	mean ± S.D.
Female	47	14.9–29.6 cm	24.3 ± 3.6 cm
Male	44	8.8–21.1 cm	17.0 ± 2.8 cm
Expelled	3		
Vomited	1		
Total	95		

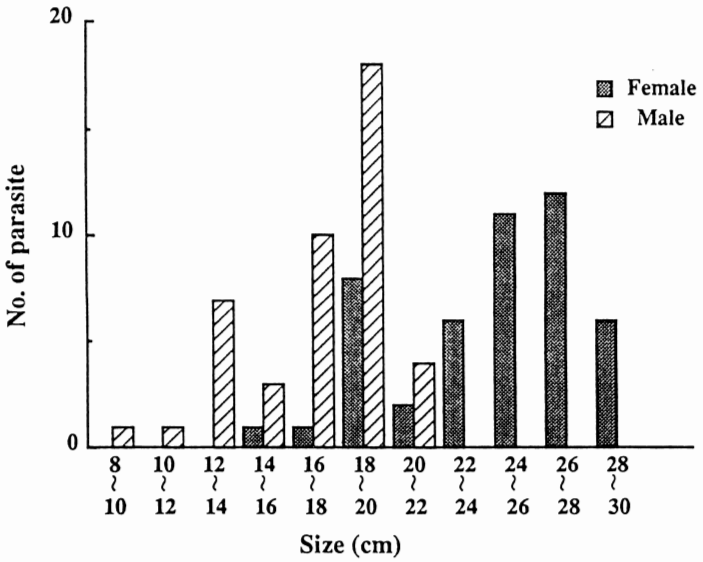

Fig. 3 Size distribution of the parasites.

(Kisu *et al.*, 1989). As the complication of ascariasis, ileus is relatively a minor one even in an endemic era (Maki, 1961). As far as we could gather so far, bolus intestinal obstruction caused by massive infection with *A. lumbricoides* has never been reported during recent 12 years except only one case of spastic ileus case caused by a single worm infection (Matsumura *et al.*, 1989).

The patient reported here suffered from asthmatic bronchitis with eosinophilia (Löffler's syndrome) about 5 months before the onset of abdominal symptoms, indicating that he has had mass infection of the parasite at that stage. Pulmonary complication is commonly observed in an early stage of heavily infected ascariasis (Yoshida, 1991).

In the present study, the size distribution of both male and female worms recovered from the intestine of the patient showed biphasic pattern. According to Morishita (1953), male worms of over 14 cm and female worms of over 20 cm are assumed as fully mature adults. In this respect, the first peak observed in the present study corresponds to immature worms while the second peak corresponds to mature worms. Such biphasic pattern indicates that the patient reported here has had at least two sets of bulk infestation.

In conclusion, the occurrence of such a case indicate that clinicians as well as parasitologists should remind ascariasis as the causative of acute abdomen.

This case was reported orally in the 3rd National Insurance Local Health Care Conference of Miyazaki Prefecture in Oct. 1991, and a part of the results was submitted for publication in the Stomach and Intestine (Tokyo).

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