NOTE *Parasitology*

Morphometry on Lancet Flukes Found in Japanese Sika Deer (*Cervus nippon centralis*) Captured in Iwate Prefecture, Japan

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ABSTRACT. Thirty-six flukes were collected from the livers of wild deer (*Cervus nippon centralis*) captured in Iwate Prefecture, Japan, and were served for morphometry. The length and/or the width of the body, suckers, testes, ovary, vitelline glands, cirrus pouch and eggs in the uterus of the flukes were measured. The distance between anterior end of the body and position of the maximal body-width or upper end of the testes were also determined. A remarked morphological characteristic was that the right and left testes did not lie tandem but lined bilaterally. Also the position of the maximal body-width did not always locate in the posterior part of the body of the fluke. The property was in accordance with those for *Dicrocoelium chinensis*.

KEY WORDS: *Dicrocoelium chinensis*, deer, morphology.

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Dicrocoelium spp., known as "lancet fluke" or "small liver fluke", parasitize in the bile ducts and the gall bladder of numerous species of mammals, mainly ruminants (sheep, goat, cattle, buffaloes, roe-deer and camels). Although a little has been reported about the dicrocoeliosis, infections of lancet flukes can cause economic loss in ruminant livestock [4].

Dicrocoelium dendriticum is most frequently present throughout Europe, North Asia (China), Japan and Indo-Malayan region, North Africa, South America, and in some focal points in North America and Australia [5]. As less common species, *D. hospes* has been reported from Africa [2, 3], and *D. chinensis* from China [7].

Species identification for lancet flukes has been under controversy in Japan, although reports on lancet flukes are limited. Presence of two types of *Dicrocoelium*, i.e., the type of *D. dendriticum*, which has morphologically typical testes lining tandem [1, 8] and the type of *D. chinensis*, which has testes lining bilaterally [3], has been suggested for lancet flukes in Japan (personal communication).

In 1990, a number of lancet flukes were obtained from the livers of the Japanese sika deer (*Cervus nippon centralis*) captured in Iwate Prefecture, Japan. This report presents and discusses morphology of the lancet flukes obtained from the Japanese sika deer.

Deer: Wild deer (*Cervus nippon centralis*) captured from a mountain area in southern part of Iwate Prefecture (lat. 39° N and long. 141° E), Japan in 1990, were served for this study. Seven males and 1 female, aged 2 to 6 years old, weighing 35 to 70 kg were necropsied.

Detection of flukes: At the necropsy, whole liver of each deer was removed, and the livers were incised by using a scalpel. Then each liver was soaked in large size petri dishes with tap water and left over night. Flukes emerged onto the bottom of petri dish from livers were collected. The number of fluke was counted, and the flukes were preserved in a 5% formalin solution.

Stain: After removing formalin from the fluke specimens by running water, flukes were stained by the carmine staining with an acetic acid treatment, which is a method for helminth specimens [6].

Morphometry: Each fluke specimen was laid on a slide without mounting or presses, and served for morphological observations and measurements under microscopes. Locations for measurements were indicated with alphabets A to Q in Fig. 1.

Flukes were detected from all livers of 8 deer examined. Totally 36 flukes were obtained. Maximally 11 flukes are found in a deer. The image of flukes is presented in Fig. 2.

Results of morphological measurements are presented in Table 1. The body of flukes were flattened and elongated longitudinally. The mean body length (A; indicated in Fig. 1) was 9.0 mm, and the mean maximal body width (B) was 3.0 mm. The location of the maximal body width was near the middle of the body, and sometimes in front of the middle of the body. Thus, the mean distance between anterior end of the body and location of the maximal body width (C) was 4.2 mm.

The oral sucker was round, and located at anterior end of the body. The mean external diameter (D) of the oral sucker was 439.0 μm. Behind the oral sucker, small round shape pharynx were seen, which followed by the short oesophagus. The intestine was branched out after the oesophagus, extended to the posterior part of the body and terminated at the middle of the posterior part of the body. The ventral sucker was round, and the mean external diameter (E) was 559.6 μm

Bilaterally coupled testes positioned immediately behind the ventral sucker. The mean distance between anterior end

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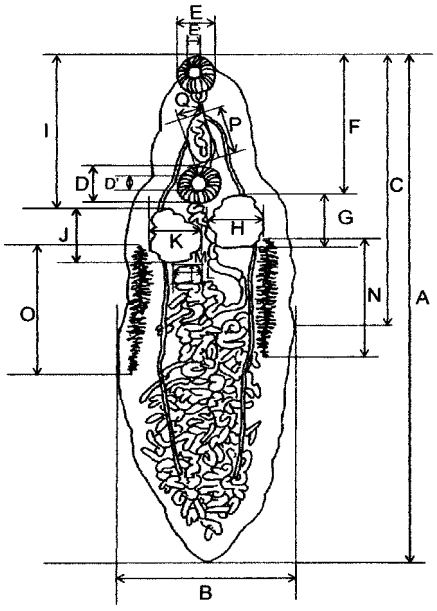

Fig. 1. A schematic figure of the lancet fluke and locations for measurements indicated with alphabets A to Q. The figure is originated from that in Tang & Tang (1978).

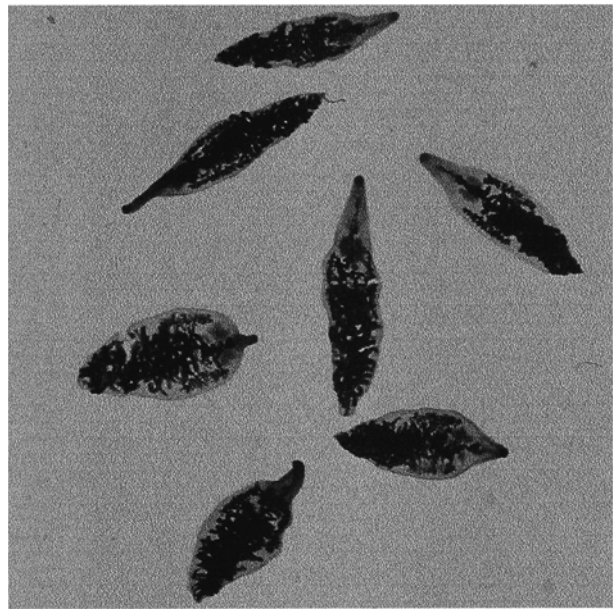

Fig. 2. Image of some flukes detected from the liver of Japanese sika deer (*Cervus nippon centralis*) in Japan.

Table 1. Morphometry on *Dicrocoelium* sp. collected from the liver of Japanese sika deer (*Cervus nippon centralis*) captured in Iwate Prefecture, Japan

Body/organs	Items		Unit	Range (n=36) Minimum	Range (n=36) Maximum	Mean[b)]	95% Confidence limits Lower	95% Confidence limits Upper
Body	Length	A[a)]	mm	6.5	11.0	9.0	8.6	9.3
	Width	B	mm	2.5	3.5	3.0	2.9	3.1
	Distance from ATE[c)] to the maximal body-width	C	mm	3.0	5.0	4.2	4.0	4.4
Oral sucker	Internal diameter	D	μm	116.2	290.5	183.8	172.1	195.4
	External diameter	D	μm	373.5	557.6	439.0	426.3	451.8
Ventral sucker	Internal diameter	E	μm	282.2	464.8	352.2	335.8	368.5
	External diameter	E	μm	464.8	664.0	559.6	545.5	575.1
Testis (left)	Distance from ATE[c)] to the upper end of the testis	F	mm	1.6	2.9	2.3	2.2	2.4
	Length	G	μm	480.7	1295.8	920.8	858.9	982.7
	Width	H	μm	334.3	1128.6	675.8	621.7	729.8
Testis (right)	Distance from ATE[c)] to the upper end of the testis	I	mm	1.7	2.9	2.3	2.2	2.4
	Length	J	μm	710.6	1358.5	987.2	934.7	1039.7
	Width	K	μm	209.1	1045.0	688.5	635.6	741.4
Ovary	Length	L	μm	188.1	397.1	279.6	261.0	298.2
	Width	M	μm	271.7	606.1	437.7	412.4	463.1
Vitelline gland (left)	Length	N	mm	1.1	3.1	2.1	2.0	2.3
Vitelline gland (right)	Length	O	mm	1.2	3.0	2.2	2.0	2.3
Cirrus pouch	Length	P	μm	215.8	664.0	410.4	376.6	444.2
	Width	Q	μm	124.5	290.5	205.4	191.0	219.8
Eggs in the uterus	Long diameter		μm	39.9	52.5	46.2	45.3	47.1
	Short diameter		μm	25.2	31.5	26.6	26.1	27.1

a) Locations for measurements indicated in Fig. 1
b) Arithmetic mean.
c) Anterior end of the body.

of the body and each left (F) and right (I) testis was 2.3 mm. The testes were slightly lobular, and the mean lengths of left (G) and right (J) testes were 920.8 and 987.2 μm, respectively. The mean widths of left (H) and right (K) testes were 675.8 and 688.5 μm, respectively.

The ovary showed elliptic shape and located on the backward of the testes. The mean length (L) and the mean width (M) of the ovary were 279.6 and 437.7 μm, respectively.

The vitelline glands lied chiefly in the lateral regions of the body, the mean length of left vitelline glands (O) was 2.1 mm and right one (N) was 2.2 mm. Cirrus pouch appeared elliptic shape, which situated at the branch of the intestine. The mean length (P) and width (Q) of the pouch were 410.4 and 205.4 μm, respectively.

Most of the space behind the ovary was filled by the many folds of the uterus. The numerous eggs in the uterus were deep brown in colour, and the mean size of the eggs was 46.2 by 26.6 μm.

The most frequently present species *D. dendriticum* has the testes lining tandem, and has the position of the maximal body-width behinds the middle part of the body [1, 8]. *Dicrocoelium hospes* reported from Africa has also the testes lining tandem or slightly oblique [3].

In the present morphometry for lancet flukes, 2 distinct morphological characteristics were remarked in comparison with those have been reported on *D. dendriticum* or *D. hopes*. First, testes lie bilaterally, and second the position of the maximal body-width of the fluke was not always behind the middle part of the body of flukes in the present study.

Fluke specimens might slightly expand in the process of the stain, and also some extents of morphological variation were seen among flukes in the present study. However, the location of the testes and the position of the maximal body-width observed in flukes in this study were clearly different from those of *D. dendriticum* [1] or *D. hospes* [3], and were well accordance with those of *D. chinensis* reported from China [7]. Thus, the present morphometry concluded that the flukes collected from the Japanese sika deer were *D. chinensis*, and this study first reports the existence of *D. chinensis* in Japan.

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