

## Morphological Survey of Bovine *Setaria* in the Abdominal Cavities of Cattle in Aomori and Kumamoto Prefectures, Japan

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**ABSTRACT.** An epidemiological survey of bovine *Setaria* collected from the abdominal cavities was performed morphologically on the cattle in Aomori and Kumamoto Prefectures, Japan, between August 2005 and July 2006. Fifty *Setaria* worms were collected from the cattle in Aomori Prefecture and 847 from those in Kumamoto Prefecture. Of these worms, 35 were identified as *Setaria digitata*, 14 as *S. marshalli*, and one as *S. labiatopapillosa* in Aomori Prefecture, while 816 were identified as *S. digitata* and 31 as *S. marshalli* in Kumamoto Prefecture.

**KEY WORDS:** Aomori Prefecture, bovine *Setaria*, Kumamoto Prefecture.

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Nematodes of the genus *Setaria* are filarial parasites commonly found in the abdominal cavities of cattle and other ungulates in Japan. The adult parasites are generally considered to be nonpathogenic for cattle, being their normal hosts. However, the transmission of infective larvae through some species of mosquitoes as the intermediate hosts [3] to abnormal hosts, such as goats, sheep and horses, can cause a serious and often fatal neuropathological disorder commonly referred to as ‘cerebrospinal setariosis’ in the hosts.

Aomori and Kumamoto Prefectures, where our examination on the cattle was carried out, are known as the areas of horse production, where equine cerebrospinal setariosis may be caused by the ectopic migration of immature bovine *Setaria* worms, which has a high lethality rate [5, 8, 9]. When central nervous system disorder occurs in horses, a differential diagnosis is required to distinguish setariosis from other diseases, such as West Nile virus infection, Japanese encephalitis, and equine protozoal myeloencephalitis [1, 2, 4, 5, 9]. However, cerebrospinal setariosis cannot be diagnosed in live animals, but only at autopsy.

Although the major species of *Setaria* that causes cerebrospinal setariosis in horses have been considered to be *S. digitata* in Japan [9] and *S. labiatopapillosa* in United States [8], both species of *Setaria* worms have been reported from the cattle in Japan. Therefore, it seems to be important to ascertain which *Setaria* species caused cerebrospinal setariosis. Appropriate diagnostic techniques can be developed, however, there are no epidemiological surveys of bovine *Setaria* species in cattle in Japan since the 1970s [6, 10].

We describe the results of a morphological survey of *Setaria* species obtained from the cattle in Aomori and

Kumamoto Prefectures, Japan, between August 2005 and July 2006.

The *Setaria* worms were collected from the abdominal cavities of the cattle slaughtered in abattoirs and stored at –20°C until use. After thawing, the *Setaria* worms were kept in phosphate-buffered saline to prevent them from drying out. The species were identified by microscopic examination of the morphological characteristics of the anterior and posterior parts of the parasites [7]. We collected seven male and 43 female worms in Aomori Prefecture, and 214 male and 633 female worms in Kumamoto Prefecture, respectively.

The collected worms consisted of three species, *S. digitata*, *S. marshalli*, and *S. labiatopapillosa* (Fig. 1). Although the peribuccal crown at the anterior ends of *S. digitata* and *S. marshalli* were slightly elevated with markedly projected spines, the distance between the dorsal and ventral spines of *S. digitata* was narrow but it of *S. marshalli* was wide. The posterior ends of the females of *S. digitata* and *S. marshalli* was bluntly and roughly furcated, while the posterior end of the male of *S. digitata* had three pairs of precloacal papillae, a single median papilla at just anterior to the cloaca, a pair of papillae adjacent to the cloaca, two median papillae at posterior to the cloaca and two pairs of postcloacal papillae, and it of the male of *S. marshalli* had four pairs of precloacal papillae, a single median papilla at just anterior to the cloaca and about four pairs of postcloacal papillae. One worm collected from Aomori Prefecture, had the peribuccal crown of the anterior end resembled that of *S. digitata*, and the large and circular lateral lips viewed from the lateral side. The posterior end of the female was thin, cone-shaped, and botryoidal with many spiny projections. This parasite was identified as *S. labiatopapillosa*. Morphometric measurements of the collected *Setaria* worms are shown in Table 1. The length of the females of *S. digitata*, *S. marshalli*, and *S. labiatopapillosa* was 75, 93, and 84 mm,

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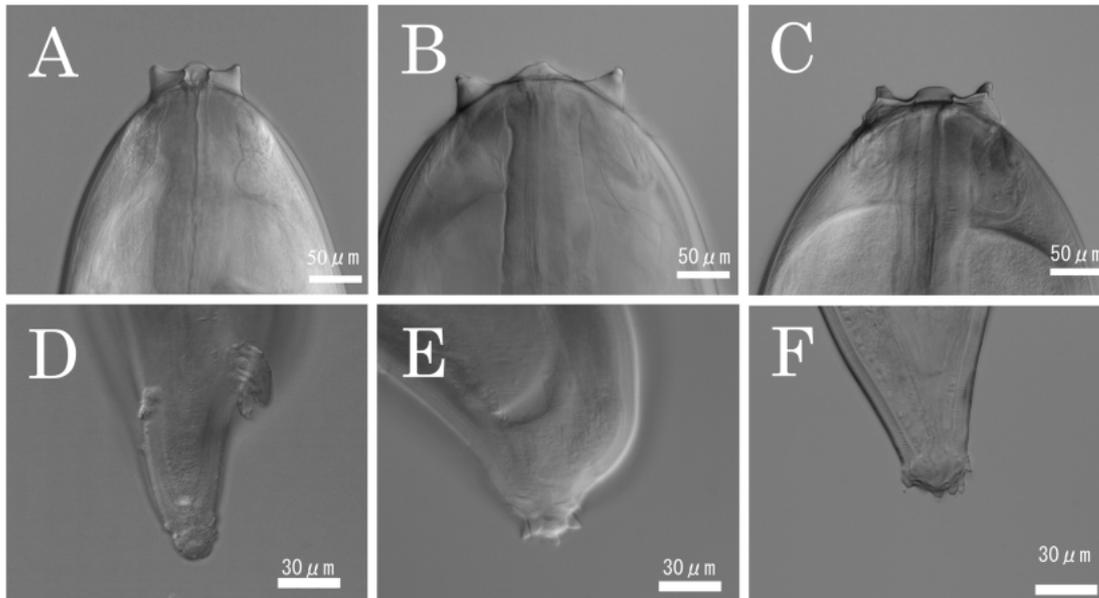


Fig. 1. Photomicrographs of the anterior parts (A-C) and the posterior parts (D-F) of female *Setaria* worms. A, D. *Setaria digitata*; B, E. *Setaria marshalli*; C, F. *Setaria labiatopapillosa*.

Table 1. Measurements of three species of *Setaria* in the cattle from Aomori and Kumamoto Prefectures

	Sex	No. of worms	Length (mm)		Width (mm)	
			Range	Average (M ± SD)	Range	Average (M ± SD)
<i>S. digitata</i>	female	20	65–90	75 ± 7	0.62–0.73	0.68 ± 0.04
	male	20	35–43	39 ± 2	0.38–0.41	0.40 ± 0.01
<i>S. marshalli</i>	female	20	72–110	93 ± 11	0.62–0.78	0.69 ± 0.05
	male	3	48–58	52 ± 5	0.44–0.46	0.45 ± 0.01
<i>S. labiatopapillosa</i>	female	1	84		0.70	

and the width was 0.68, 0.69 and 0.70 mm, respectively. The males of *S. digitata* and *S. marshalli* were 39 and 52 mm in length, and 0.40 and 0.45 mm in width, respectively.

The results of the survey are shown in Table 2. Of the total number of *Setaria* worms collected from each region, the incidence of *S. digitata* was 70.0% (35 of 50) in Aomori Prefecture and 96.3% (816 of 847) in Kumamoto Prefecture, and it of *S. marshalli* was 28.0% (14 of 50) in Aomori Prefecture and 3.7% (31 of 847) in Kumamoto Prefecture. *S. labiatopapillosa* was comprised 2.0% (1 of 50) of the worms collected from Aomori Prefecture.

Our examination shows that *S. digitata* is the most prevalent *Setaria* species in the cattle in both prefectures. When the results for Aomori Prefecture were compared with those for Kumamoto Prefecture, the frequencies of *S. marshalli* and *S. labiatopapillosa* in Aomori Prefecture were high. Yoshikawa *et al.* [10] reported that a total of 148 *Setaria* worms collected from the cattle in Aomori Prefecture in 1976, all worms were identified as *S. digitata*. This suggests that the frequencies of *S. marshalli* and *S. labiatopapillosa* have increased during the past 30 years in Aomori Prefec-

Table 2. Species and number of the bovine *Setaria* worms collected from Aomori and Kumamoto Prefecture

	<i>S. digitata</i>		<i>S. marshalli</i>		<i>S. labiatopapillosa</i>	
	male	female	male	female	male	female
Aomori	6	29	1	13	0	1
Kumamoto	211	605	3	28	0	0

ture. In both Aomori Prefecture and Kumamoto Prefecture, *S. digitata* and *S. marshalli* were markedly predominant, although their frequencies were slightly different. One *S. labiatopapillosa* worm was found among the 50 specimens collected from Aomori Prefecture, but not detected in the 847 specimens from Kumamoto Prefecture.

Both Aomori and Kumamoto Prefectures are known as horse production areas, where equine cerebrospinal setariosis may be caused by bovine *Setaria*. We found *S. digitata* to be the most prevalent *Setaria* species in the cattle in these areas. Since cerebrospinal setariosis caused by *S. digitata* has been reported in the Japanese horses [5, 9], it seems that this species is the main cause of equine cerebrospinal setar-

iosis in Japan. Further study is necessary to establish a diagnostic technique for equine cerebrospinal setariosis.

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