

Infestations of *Solenopotes capillatus* (Anoplura: Linognathidae) in Hokkaido, Japan

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Abstract: Lice infestations were surveyed in cattle of Hokkaido, the northern island of Japan, and in Aichi and Okinawa Prefectures. This study is the first report of infestations of *Solenopotes capillatus* in Hokkaido. To date, *Solenopotes capillatus* has been believed to be a relatively rare species in Japan. However, in this study, the infestations of this species were more common than *Linognathus vituli* in and outside Hokkaido. Furthermore, we did not find *Haematopinus eurysternus*, which has been known to date as the most common species in Japan.

Key words: Anoplura, bovine ectoparasite, cattle sucking lice, lice in Hokkaido, little blue cattle louse, *Solenopotes capillatus*

INTRODUCTION

Sucking lice feed on the blood of the host throughout their life. Cattle infested with lice often lick their hair and rub their bodies against barn facilities because of chronic pruritus. Eventually, the cattle become restless and suffer production failure such as delayed growth and reproductive dysfunction. Furthermore, lice cause anemia (Shemanchuk et al., 1960) and transmit blood-borne diseases (Fujisaki et al., 1993).

To date, 3 species of cattle sucking lice from the order Anoplura are known to be distributed in Japan. They include (1) *Haematopinus eurysternus* (Nitzsch), a short-nosed cattle louse, (2) *Linognathus vituli* (Linnaeus), a long-nosed cattle louse, and (3) *Solenopotes capillatus* Enderlein, a little blue cattle louse. The most common species known for a long time is *H. eurysternus*. *Linognathus vituli* and *S. capillatus* are rare and distributed in Okinawa Prefecture, the southern island of Japan (Kitaoka, 1979; Fujisaki, 1995;

Kamio, 2000). However, most published information is based on early books (Itagaki and Itagaki, 1965; Kitaoka, 1979), and there are few original reports on cattle sucking lice in Japan (Asakawa et al., 2000). Recently, we encountered an infestation of *S. capillatus* in a dairy herd in Hokkaido, a main prefecture for the dairy industry and the most northern island of Japan. The aim of this study was to record infestations of *S. capillatus* in Hokkaido and two additional areas in Japan.

MATERIALS AND METHODS

From 2007 to 2008, we investigated louse infestations in 291 cattle in 7 towns, the animal hospital of Rakuno Gakuen University and one livestock market in Hokkaido. The cattle examined in the hospital and the market came from many districts including towns outside the 7 towns aforementioned. In the animal hospital, louse infestations were determined as soon as cattle arrived and kept without contact with other cattle.

In addition to Hokkaido, lice infesta-

tions were investigated in 2 prefectures, Okinawa known as an area where *S. capillatus* is distributed (Fujisaki, 1995; Kamio, 2000) and Aichi randomly selected from central Japan. Examinations were performed on 3 cattle from one dairy farm in Aichi, 84 cattle from a livestock market and 14 dairy farms in the southern region of Okinawa's main island.

The breeds of cattle investigated were Holstein-Friesian and Jersey aged one to 63 months. The examination was carried out while a colleague held the head of the cattle during veterinary practice on the farm. The front of the body is commonly infested with sucking lice in cattle (Fujisaki, 1995; Kamio, 2000) so the following areas were examined: jaw, throat, neck, brisket, dewlap and shoulder. In Holstein-Friesian cattle, observations were performed in the white skin-hair areas because it is difficult to find this ectoparasite in the black areas because of the dark color and small size of the insect. The lice were picked from cattle with our fingers and preserved in 70% ethanol for photography and future examination.

We morphologically identified the collected specimens by naked eye and with a stereomicroscope to classify the lice based on the length (Grubbs et al., 2007) and the

following criteria: (1) forelegs smaller and more slender than mid- and hindlegs (all legs similar in shape and size in *H. eurysternus*), (2) head comparatively short and broad (forehead acutely conical and much elongated and hindhead longer than wide in *L. vituli*), and (3) spiracles, marked tubercles projecting from the abdominal segments (Kim et al., 1986; Miller, 1970; Kitaoka, 1979; Fujisaki, 1995).

We used the data from infested cattle for which transport histories were available. However, eradication of lice in each farm could not be determined. Furthermore, 3 cattle infested with *S. capillatus* were separately housed in the animal hospital for continuous observations from 2007 to 2008, but quantitative data was not collected.

RESULTS AND DISCUSSION

Lice were readily identified by either the naked eye or with a stereomicroscope. Clusters of *S. capillatus* appear as black spots on the white coat of cattle (Fig. 1A). Cattle infested with sucking lice generally show less scurf than cattle with biting lice. However, the spots are often mistaken for dirt or normal hair color in Holstein-Friesian cattle (Matthysse, 1946). A mi-

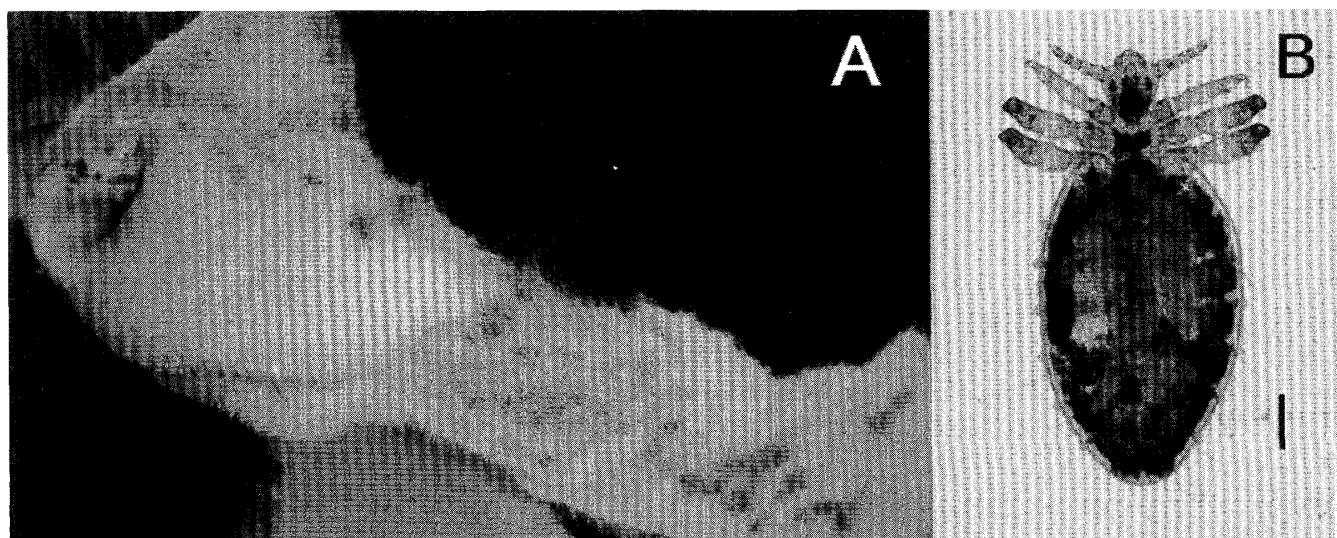


Fig. 1. Black spots formed by *Solenopotes capillatus* on the white coat of the jaw and throat in a heifer (A), and micrograph of *S. capillatus* (B). Bar, 0.2 mm.

Table 1. Locations and number of cattle infested with *Solenopotes capillatus* in Hokkaido, and Okinawa and Aichi, Japan.

Place	Year	Month	Number of infested cattle			(Linognathus vituli)	Breed
			Cow	Heifer	Calf		
Hokkaido Prefecture*							
Chitose, Ishikari	2007	February		7		3	D ^{a)}
	2008	April		1			D
		July		1			D
Ebetsu, Ishikari	2007	February	1		1		D, J ^{b)}
		May		1	4		D
		June		11	5		D, J
		October			1 ^{c)}	1 ^{c)}	D
Yuni, Sorachi	2007	April			1		D
Teshio, Rumoi	2007	July		3			D
Ozora, Abashiri	2008	March	1				D
Shikaoi, Tokachi	2008	April		1 ^{c)}		1 ^{c)} +2	D
Oshamanbe, Oshima	2008	April		11			D
Biratori, Hidaka	2008	July		1			D
Aichi Prefecture*	2008	March		1			D
Okinawa Prefecture**	2008	June	8	1			D

* Town of birth and raising for infested cattle until the present examination.

** Six of nine cattle were raised all their lives in Okinawa, the other three were transferred from Hokkaido (details in the text).

^{a)} Holstein-Friesian. ^{b)} Jersey. ^{c)} Both *S. capillatus* and *L. vituli*.

Haematopinus eurysternus was not found.

crograph of this species is shown in Fig. 1B.

The locations and number of cattle infested with *S. capillatus* and *L. vituli* are shown in Table 1. The locations in Hokkaido were towns where the infested cattle were kept throughout their life or until transport to the animal hospital or market. Infestations with *S. capillatus* and *L. vituli* were confirmed in 8 and 3 towns in Hokkaido, respectively. Both species were confirmed in 3 towns. The geographical locations where infested cattle were raised is shown in Fig. 2. Oshamanbe is the most southern, Teshio is the most northern, and Ozora is the most eastern locations where *S. capillatus* was confirmed.

Moreover, this species was also confirmed in 9 cattle in Okinawa and one in Aichi. Six infested cattle were raised in Okinawa throughout their lives. The other 3 cattle were transferred from Hokkaido, and one of them lived as a calf

in Okinawa. The infested heifer from Aichi was locally fed throughout her life.

A total of 66 cattle were infested with sucking lice. *Solenopotes capillatus* and *L. vituli* were found in 61 (Table 1) and 7 cattle, respectively. There were only 2 cattle infested with both species. We could not find *H. eurysternus*, which is known as the most common species in Japan (Kitaoka, 1979; Kamio, 2000). Because there were few original reports on the geographical distribution of cattle sucking lice until now in Japan, an explanation for the absence of *H. eurysternus* is not possible at this time.

We confirmed that *S. capillatus* is common in various areas of Hokkaido and also in Aichi and Okinawa. *Solenopotes capillatus* infests the skin of cattle throughout their life and cannot survive off the host for more than 2 days (Matthysse, 1946), because it strongly depends on the host for nutrition and is highly host-specific. Since *S. capillatus*

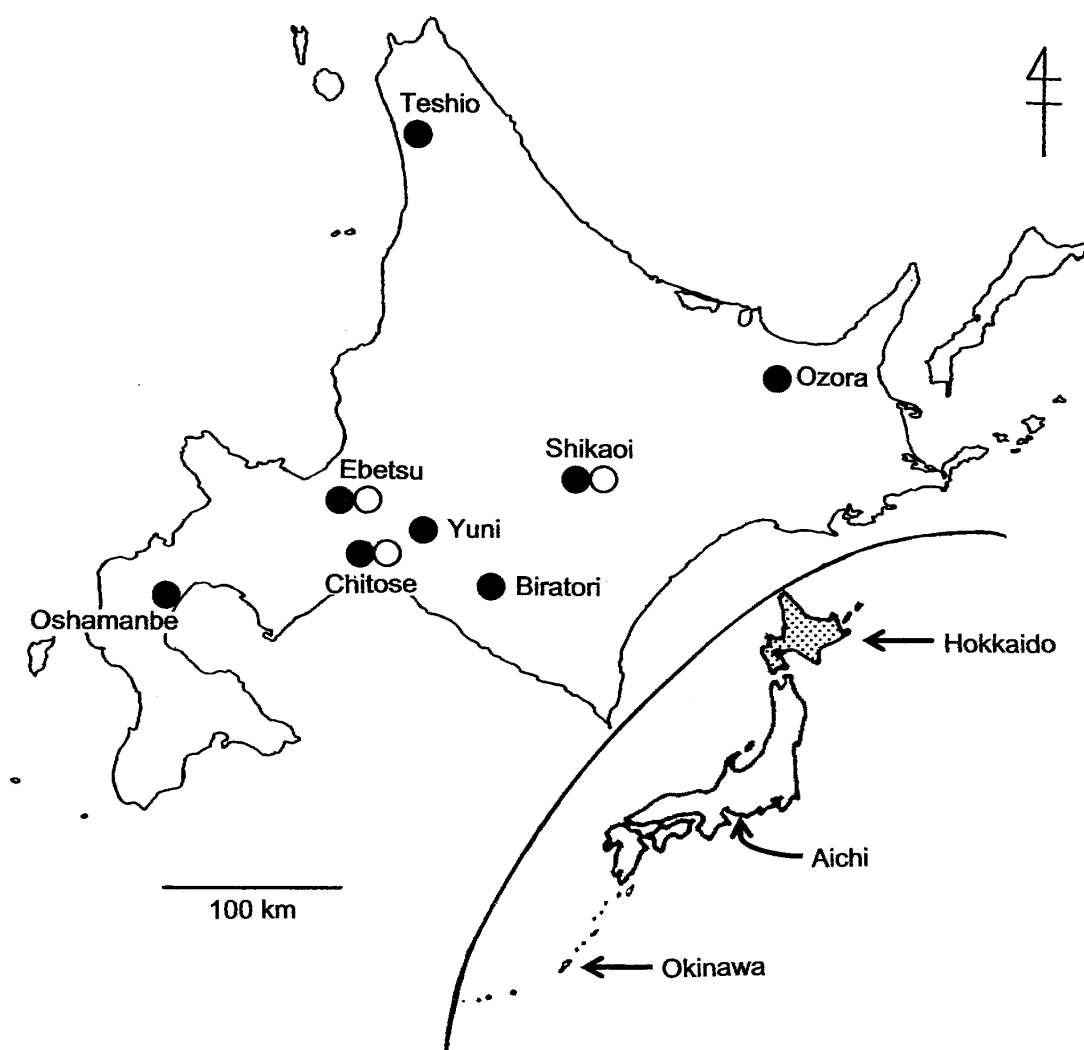


Fig. 2. Map showing the geographical distribution of cattle lice in Hokkaido. Filled circle is *Solenopotes capillatus* and open circle is *Linognathus vituli*. *Haematopinus euryternus* was not found.

can be easily transmitted by skin contact, the finding of one positive case suggests widespread infestation in the herd. Cattle born or raised in Hokkaido, particularly Holstein-Friesian, are transferred all over Japan through livestock markets and other circulation routes. This study indicates that *S. capillatus* may have a wide distribution from the southern to the northern areas of Japan.

Lice populations on cattle are generally higher during the rainy season and winter, but lower in summer (Kamio, 2000). However, the continuous examination of the 3 cattle infested with *S. capillatus* showed little variation in the population throughout the year. Therefore, populations of *S. capillatus* in housed

cattle show less seasonal variation, and the present study reveals actual infestations of *S. capillatus* in Hokkaido.

Besides chronic pruritus, sucking lice pose a risk for transmission of pathogens via the blood. Indeed, experimental transmission of *Theileria orientalis*, the causative agent of bovine piroplasmiasis, by *L. vituli* has been shown (Fujisaki et al., 1993). *Solenopotes capillatus* has the same food habits and belongs to the same family, so it may also carry the same diseases. Considering how common and wide spread *S. capillatus* is in Japan, active control of this lice as well as other parasites is greatly desired in cattle production.

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