Scanning electron microscopy of black flies

II. The hairs on dorsal cuticles of abdominal segments of larvae of 6 species from Japan

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Abstract: The hairs on dorsal cuticles of the 6th and 7th abdominal segments of black fly larvae of 6 species belonging to Genera *Prosimulium* and *Simulium* are described and illustrated with the aid of a scanning electron microscope. The scanning electron micrographs are useful in distinguishing some, but not all, species.

The hairs on the abdomen of black fly larvae from Japan are generally not sclerotized and rather minute, unlike those of some African species (Crosskey, 1960), therefore it is not easy to observe them in detail with conventional light microscopes. In the first report of this series (Matsuo *et al.*, 1974), the hairs on dorsal cuticles of the 6th and 7th abdominal segments of 8 species of black fly larvae from Japan were for the first time described and illustrated with the aid of a scanning electron microscope. The features described were useful in distinguishing some, but not all, species and seemed to have a taxonomic value among closely related subgenera.

In this 2nd report of this series the hairs on dorsal cuticles of the 6th and 7th abdominal segments of 6 additional species from Japan, *Prosimulium* (*Prosimulium*) *kanii*, *Prosimulium* (*Prosimulium*) *kiotoense*, *Simulium* (*Eusimulium*) *konoii*, *Simulium* (*Eusimulium*) *mie*, *Simulium* (*Gomphostilbia*) *ogatai* and *Simulium* (*Wilhelmia*) *takahasii*, are described with the aid of a scanning electron microscope. The specimens were collected from fields in Japan. The methods followed those used in the 1st report of this series (Matsuo *et al.*, 1974).

RESULTS

The characters of the hairs on dorsal cuticles of the 6th and 7th abdominal segments for distinguishing the larvae of 6 species of the present report and 8 species of the 1st report of this series (Matsuo *et al.*, 1974) are presented in Table 1.

Prosimulium (*Prosimulium*) *kanii* Uemoto, Onishi et Orii, 1973

Japanese name: Kani-obuyu.

Figs. 1-3.

Hairs on dorsal cuticle of 6th and 7th abdominal segments: barely visible at 300× magnification, long and short single hairs clearly recognizable at 1,000×, both hairs slender and pointed; long hairs 28-48 micron long; short hairs 5-16 micron long; 11-20 short and 0-2 long hairs present on 0.1 mm² of surface area; at more than 2,000× minute hairs visible, single, broad and pointed, some dully pointed, 2-3 micron long; 0-2 minute hairs present on 0.1 mm² of surface area; in some specimens 2 minute hairs arise from a socket, slender and pointed, 4-5 micron long.

Source of larvae: Collected from Himuro, Kyoto Prefecture, March 1974.

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Table 1 Hairs on dorsal cuticle of 6th and 7th abdominal segments in black fly larvae of 14 species from Japan

Species	Single hairs ¹⁾							Branched hairs (No. branches)
	long	short		minute				
	pointed, slender	pointed		pointed		blunt	forked	
		slender	broad	slender	broad			
<i>P. (P.) kanii</i>	+ ²⁾	+	—	±	+	—	—	—
<i>P. (P.) kiotoense</i>	+	+	—	—	+	—	—	—
* <i>P. (P.) yezoense</i>	+	+	—	—	—	—	—	—
<i>S. (E.) konoii</i>	+	+	—	—	—	—	—	+ (2-6)
<i>S. (E.) mie</i>	+	+	—	±	—	—	—	—
* <i>S. (E.) subcostatum</i>	+	+	—	—	—	—	—	—
* <i>S. (E.) uchidai</i>	+	+	—	—	—	—	—	—
<i>S. (Go.) ogatai</i>	+	+	—	—	—	—	—	+ (2-5)
* <i>S. (Go.) omutaense</i>	+	+	—	—	—	—	—	+ (2-10)
* <i>S. (Go.) shogakii</i>	+	+	—	—	—	—	—	+ (2-7)
<i>S. (W.) takahasii</i>	+	+	—	—	—	—	—	+ (2-5)
* <i>S. (Gn.) bidentatum</i>	+	+	—	—	+	—	—	—
* <i>S. (O.) aokii</i>	+	+	+	—	—	—	—	—
* <i>S. (S.) quinquestriatum</i>	+	+	—	—	+	+	+	—

1) Single hairs are divided into long, short and minute ones in each species. According to the species, long hairs vary from 20 to 80 microns, short hairs from 5 to 30 microns and minute hairs from 2 to 8 microns.

2) + = present; — = absent; ± = present in some specimens.

* From 1st report of this series (Matsuo *et al.*, 1974).

***Prosimulium (Prosimulium) kiotoense*
Shiraki, 1935**

Japanese name: Miyako-obuyu.

Figs. 4-6

Hairs on dorsal cuticle of 6th and 7th abdominal segments: barely visible at 300× magnification, long and short single hairs clearly recognizable at 1,000×, both hairs slender and pointed; long hairs 28-58 micron long; short hairs 5-20 micron long; 10-22 short and 0-3 long hairs present on 0.1 mm² of surface area; at more than 2,000× minute hairs visible, single, broad and pointed, sometimes dully pointed, 2-3 micron long; 0-2 minute hairs present on 0.1 mm² of surface area.

Remarks: The hairs of this species are similar to those of *P. (P.) kanii* described in this paper. This species from Japan was formerly misidentified as *Prosimulium hirtipes* (Uemoto *et al.*, 1973).

Source of larvae: Collected from Hirogawara, Kyoto Prefecture, April 1972.

***Simulium (Eusimulium) konoii*
(Takahasi, 1950)**

Japanese name: Kono-hososune-buyu.

Figs. 7-8

Hairs on dorsal cuticle of 6th and 7th abdominal segments: well developed; numerous hairs visible at 100× magnification; branched hairs and long and short single hairs recognizable at more than 300×; branched hairs 2-6 branched, each branch slender and pointed, 5-26 micron long; long single hairs 40-55 micron long, short single hairs 15-25 micron long, both hairs slender and pointed; more than 80 branched hairs, 3-8 short single hairs and 0-3 long single hairs present on 0.1 mm² of surface area.

Remarks: Only this species of the four

Fig. 1-3. *P. (P.) kanii*, (1) $\times 1000$, long and short single hairs, (2) $\times 8000$, minute single hair, (3) $\times 10000$, two single hairs arising from a socket. Fig. 4-6. *P. (P.) kiotoense*, (4) $\times 1000$, short and minute single hairs, (5) $\times 1000$, long and short single hairs, (6) $\times 5000$, minute single hair.

Fig. 7-8. *S. (E.) konoii*, (7) $\times 300$, long and short single hairs and branched hairs, (8) $\times 1000$, long and short single hairs and branched hairs. Fig. 9-10. *S. (E.) mie*, (9) $\times 300$, long single hair partially covered with dust and short single hairs, (10) $\times 1000$, long and short single hairs. Fig. 11. *S. (Go.) ogatai*, $\times 300$, long and short single hairs and branched hairs. Fig. 12. *S. (W.) takahasii*, $\times 1000$, long single hairs and branched hairs.

belonging to subgenus *Eusimulium* described in this series has branched hairs on dorsal cuticle of abdominal segments of larvae and has larval antenna with secondary annulation on the second segment.

Source of larvae: Collected from Jozankei, Hokkaido, June 1974.

***Simulium (Eusimulium) mie*
Ogata et Sasa, 1954**

Japanese name: Mie-tunomayu-buyu.
Figs. 9-10

Hairs on dorsal cuticle of 6th and 7th abdominal segments: barely visible at 300× magnification; long and short single hairs clearly recognizable at more than 500×, both hairs slender and pointed; long hairs 27-45 micron long, short hairs 11-16 micron long; 0-2 long and 18-35 short hairs present on 0.1 mm² of surface area; in some specimens, minute hairs recognizable, single, slender and pointed, about 2.5 micron long.

Source of larvae: Collected from Oharano, Kyoto Prefecture, November 1973.

***Simulium (Gomphostilbia) ogatai*
(Rubzov, 1962)**

Japanese name: Ogata-tunomayu-buyu.
Fig. 11

Hairs on dorsal cuticle of 6th and 7th abdominal segments: well developed; numerous hairs visible at 100× magnification; branched hairs and long and short single hairs recognizable at more than 300×; branched hairs 2-5 branched, each branch slender and pointed, 5-15 micron long; long single hairs 50-66 micron long, short single hairs 15-22 micron long, both hairs slender and pointed; more than 80 branched hairs, 4-9 short single hairs and 0-3 long single hairs present on 0.1 mm² of surface area.

Remarks: All three species, this species, *S. (Go.) omutaense* and *S. (Go.) shogakii*, belonging to subgenus *Gomphostilbia* described in this series have numerous branched hairs on dorsal cuticle of abdominal segment of larvae and have numerous hairs on katepisternum of adults.

Source of larvae: Collected from Himuro, Kyoto Prefecture, October 1974.

***Simulium (Wilhelmia) takahasii*
(Rubzov, 1962)**

Japanese name: Uma-buyu.
Fig. 12

Hairs on dorsal cuticle of 6th and 7th abdominal segments: well developed; numerous hairs visible at 300× magnification; branched hairs and long and short single hairs recognizable at more than 500×; branched hairs 2-5 branched, each branch slender and pointed, 3-9 micron long; long single hairs 22-39 micron long, short single hairs 5-8 micron long, both hairs slender and pointed; 1-10 short single hairs, 0-2 long single hairs and more than 100 branched hairs present on 0.1 mm² of surface area.

Remarks: In having branched hairs, this species is similar to *S. (Go.) ogatai*, *S. (Go.) omutaense*, *S. (Go.) shogakii* and *S. (E.) konoii* described in this series, but the branched hairs are generally shorter in this species. This species from Japan was formerly misidentified as *S. (W.) salopiense* (Takahasi, 1973).

Source of larvae: Collected from Makino, Shiga Prefecture, October 1974.

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摘 要

**ブユの走査電子顕微鏡的研究 第2報
日本産6種幼虫の腹部背面毛**

日本産ブユ6種幼虫の腹部第6, 7節背面毛を走査電

子顕微鏡で観察し, その形態を記述した. そして既報種を含め日本産14種の幼虫について腹部第6, 7節背面毛の異同を表記した.