Research Note

Sexual mosaics in two blackfly species (Diptera: Simuliidae) collected from Shizuoka Prefecture, Japan

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Abstract: Sexual mosaics were found in four adult Japanese blackflies, *i.e.*, one *Simulium aokii* (Takahasi, 1941) and three *S. bidentatum* (Shiraki, 1935), all collected from a cattle shed in Shizuoka Prefecture. They were classified into two categories, *i.e.*, bilateral and antero-posterior types of gynandromorph.

Introduction

In insects, sexual mosaicism—the appearance of morphological features of both sexes in the same individuals—is known to occur. Such sexually mosaic individuals can be classified either as gynandromorphs (a mixture of genetically male and female cells) or intersexes (only cells of a single genotype)

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(Brust, 1966).

In family Simuliidae (Diptera), sexual mosaicism has been reported to occur in several different species, *i.e.*, *Simulium sou-brense* Vajime and Dunbar, 1975 in Ivory Coast (Dang and Peterson, 1979), and *S. damnosum* Theobald, 1903 (complex) in West Africa (Cheke and Garms, 1985). Recently, Hadi and Takaoka (1993) reported eight cases of sexual mosaics in three Japanese blackfly species, *i.e.* *S. arakawae* Matsumura, 1921, *S. bidentatum* (Shiraki, 1935) and *S. aokii* (Takahasi, 1941) collected from Oita in Kyushu. Here, we report four cases of sexual mosaics found in two Japanese blackfly species collected from Shizuoka Prefecture, Japan.

Materials and methods

All specimens were collected at a cattle shed in Ono, Shuzenji Town, Shizuoka Prefecture. These specimens were identified according to descriptions given by Takaoka (1976). As in most other blackfly species, sexually dimorphic characters in the two blackfly species mentioned below were evident, being chiefly recognized in the eye facets, frons, antennae, mandibles and maxillary lacinia on the head; in the scutal pattern of the thorax; in the subcosta of the wings; in the claws of legs; in the tergites and sternites of the abdomen; and in the genitalia. Wing length represents the distance from arculus to the wing tip. In three of the four specimens described here, sexually dimorphic characters of the thorax, legs and/or abdomen were not clearly divided, showing a mixed type with the character of either sex more dominant.

Description of the sexual mosaics

Table 1 shows the descriptions of the four sexually mosaic individuals.

No. 1. *Simulium aokii*: The body length was about 3.0 mm and wing length was about 2.8 mm. Collected on February 21, 1993 in the morning from Sano cattle shed in Shizuoka, by using a CO₂ trap.

This fly appeared to be almost bilateral gynandromorph, showing a male phenotype

Table 1 Descriptions of four sexual mosaics of blackflies collected from Shizuoka Prefecture, Japan.

No.	Species	Head		Thorax		Leg		Wing		Abdomen		Genitalia	
		L	R	L	R	L	R	L	R	L	R	L	R
1.	<i>S. aokii</i>	F	M	F	M	F	M	F	M	X	M	M	M
2.	<i>S. bidentatum</i>	F	F	X	X	M	M	M	M	M	M	M	M
3.	<i>S. bidentatum</i>	F	F	F	F	F	F	M	M	M	M	M	M
4.	<i>S. bidentatum</i>	F	F	X	X	M	X	F	F	M	M	M	M

* L, left; R, right; M, male; F, female; X, mixed phenotype (see detailed descriptions in the text).

Fig. 1 Scutal pattern of sexually mosaic blackflies.

a: *Simulium aokii*, No. 1; b: *S. bidentatum*, No. 2; c: *S. bidentatum*, No. 4.

on the right side of the head, thorax (Fig. 1-a), legs and wing, and a female phenotype on the left side. With one exception, abdominal segments 6 to 9 including genitalia were of male character.

No. 2. *Simulium bidentatum*: The body length was about 3.4 mm and wing length was about 2.6 mm. Collected on April 24, 1993 in the afternoon from Sano cattle shed in Shizuoka, by using an aspirator.

This fly appeared to be antero-posterior type of gynandromorph. It had a female head and male abdomen including genitalia. The thorax showed an unusual male scutal pattern, having a silver iridescent longitudinal line medially (Fig. 1-b). The legs and the wings were of male character.

No. 3. *Simulium bidentatum*: The body length was about 3.2 mm and wing length was about 2.6 mm. Collected on December 26, 1992 in the afternoon from Sano cattle shed in Shizuoka, by using a CO₂ trap.

This fly appeared to be antero-posterior type of gynandromorph, as in No. 2. The thorax showed a normal female scutal pat-

tern. The legs were of female character. The wings were as in No. 2.

No. 4. *Simulium bidentatum*: The body length was about 3.6 mm and wing length was about 3.0 mm. Collected on February 21, 1993 in the morning from Sano cattle shed in Shizuoka, by using an aspirator.

This fly appeared to be antero-posterior type of gynandromorph, as in Nos. 2 and 3. The thorax showed an irregular scutal pattern consisting of one narrow black longitudinal line and two lateral black spots on silvery iridescent surface (Fig. 1-c). The scutellum was of male character on the right side and female character on the left side. The legs were of male character, except for the foreleg on the right side being of female character. The wings were of female character.

Remarks. The distinction of gynandromorphs into two types, bilateral and antero-posterior, is the same as in the previous paper (Hadi and Takaoka, 1993). In this paper, the former type was found in one specimen of *S. aokii* (No. 1) and the latter type in the three specimens of *S. bidentatum* (Nos. 2-4).

Gynandromorphism of blackflies is relatively rare as reported by several authors, i.e., Wolf and Peterson (1959) found six (0.002%) gynandromorph among 300,000 *S. venustum* complex collected by sweeping in Canada, Fredeen (1970) found 18 (0.04%) sexual mosaics among 41,638 *S. arcticum* females in Canada, and Dang and Peterson (1979) found one (0.02%) gynan-

dromorph in over 5,000 reared and wild caught specimens of the *S. damnosum* complex in West Africa. In our study, these sexual mosaic individuals represented 0.02% (3/14,932 *S. bidentatum*) and 0.02% (1/4,354 *S. aoki*) of the total collected from June 1992 to May 1993. However, the actual incidence rate of sexual mosaicism may be much lower, because males and gravid females, both of which were very rare in the cattle shed, were not included in our material.

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摘 要

静岡県下で採集されたブユ2種に見いだされた雌雄モザイク個体について

静岡県の牛舎で採集されたキアシツメトゲブユ成虫3個体, アオキツメトゲブユ1個体に見いだされた雌雄モザイクについて記載した。前者では3個体ともに雌雄形質がおおむね前後に, 後者では左右に分かれていた。