SHORT COMMUNICATION

POLYMORPHISM FOR A SUPERNUMERARY SEGMENT IN NATURAL POPULATIONS OF MECOSTEHTUS MAGISTER (ORTHOPTERA)

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Some species of Acrididian grasshoppers are polymorphic with respect to the presence of supernumerary segment on certain of the standard autosomes (cf. Shaw 1970). For example, in Chorthippus parallelus (Hewitt and John 1968, 1970, John and Hewitt 1969, Westerman 1969), Stethophyma gracile, and S. lineatum (Shaw 1970) some natural populations are composed of a variety of distinct karyomorphs; “non-segmented” or “basic” homozygotes with no supernumerary segment, “segmented” homozygotes with a supernumerary segment on both homologues, and heterozygotes with a supernumerary segment on one member of a homologous pair. Such a polymorphism has been found in natural populations of Mecostethus magister Rehn (2n♂ = 22 + XO). Cytological examination was carried out using 62 males collected at three localities in northern Kyushu; Nokonoshima (a small island in Fukuoka Pref.) in 1971, Tofuroato (Fukuoka Pref.) in 1962, and Kiyama (Saga Pref.) in 1971. The testes were fixed with a mixture devised by Newcomer (1953) and stained with iron-acetocarmine or alcoholic hydrochloric acid-carmine (Snow 1963).

The autosomes of M. magister consist of two pairs of large (L), seven pairs of medium (M), and two pairs of small (S) members, all telocentric and with large procentric heterochromatic blocks (Fig. 1). The X-chromosome is also telocentric and entirely heterochromatic (Fig. 1). One of the medium sized autosomes, the M₉, is distinct from the others because of being almost heterochromatic except for a short intercalating euchromatic segment (Fig. 1). The two smallest chromosomes, S₁₀ and S₁₁, are distinguishable from each other by their sizes (Figs. 1 and 3). Each bivalent has a chiasma localized to the region near the procentric heterochromatic block, with an additional one in some bivalents which is located distally (Figs. 1 and 3).

Two kinds of S₁₁ were found in M. magister, one with a procentric heterochromatic supernumerary segment and the other without it. Therefore, karyomorphs were of three kinds; BB (homozygote for non-segmented S₁₁; Figs. 1 and 3), SS (homozygote for segmented S₁₁; Fig. 4), and BS (heterozygote; Figs. 2 and 5). The frequencies of the karyomorphs in the three populations are shown in Table 1.

In the Tofuroato and Kiyama populations the segmented S₁₁ predominated, while in the Nokonoshima population it was the non-segmented S₁₁ that predominated, the
Fig. 1–5. Chromosomes of primary spermatocytes of *M. magister*.

1. Diplotene of karyomorph SS showing two supernumerary segments (arrows) in S_{11} bivalent.
2. Diplotene of karyomorph BS showing a single supernumerary segment (arrow) in S_{11} bivalent. 1, 2. \( \times 1000 \).
3–5. MI showing S_{11} bivalents of karyomorph SS, BB, and BS, respectively. \( \times 750 \).

Table 1. Frequencies of karyomorphs in natural populations of *M. magister*

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of karyomorph</th>
<th>Total males</th>
<th>Freq. of S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BB</td>
<td>BS</td>
<td>SS</td>
</tr>
<tr>
<td>Nokonoshima</td>
<td>Obs.</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Exp.*</td>
<td>6.3</td>
<td>5.5</td>
</tr>
<tr>
<td>Tofuroate</td>
<td>Obs.</td>
<td>—</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Exp.*</td>
<td>0.9</td>
<td>9.2</td>
</tr>
<tr>
<td>Kiyama</td>
<td>Obs.</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Exp.*</td>
<td>0.8</td>
<td>5.4</td>
</tr>
</tbody>
</table>

*Hardy-Weinberg distribution.*
frequencies of segmented S₁, being 0.838, 0.767, and 0.308, respectively. In each population the frequencies of the three karyomorphs approximated to a Hardy-Weinberg distribution (Table 1).

In a population of Stethophyma grossum from Spain polymorphic with respect to supernumerary segment on S₁ Shaw (1971) reported that the frequencies of the karyomorphs also conformed to the Hardy-Weinberg distribution. In Chorthippus parallelus, the frequencies of the supernumerary segment on M₇ and S₈ chromosomes are different among different populations (Hewitt and John 1968, Westerman 1969). The frequencies of S₈ karyomorphs conform to the Hardy-Weinberg distribution, while those of M₇ karyomorph show an excess of homozygotes (Hewitt and John 1968, 1970, Westerman 1969, John and Hewitt 1969).

In certain species of Stethophyma (Shaw 1970, 1971) and in Ch. parallelus (Hewitt and John 1968, Westerman 1969, John and Hewitt 1969) supernumerary segments increase mean cell chiasma frequency. Using males of M. magister from the Nokonoshima population mean cell chiasma frequencies of 12.25 (BB), 12.34 (BS), and 12.00 (SS) were obtained. No obvious correlation between chiasma frequency and the supernumerary segment occurs in the population. To confirm this and to analyse the variation in the frequency of supernumerary segment among populations of this species further study is clearly desired.

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LITERATURE CITED