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Drosophila Survey of Hokkaido, XV. The Salivary Gland Chromosomes of *Drosophila nigromaculata*^{1, 2)}

By

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(With 1 Text-figure and 1 Table)

Drosophila nigromaculata is one of the *quinaria* species group of the subgenus *Drosophila* (Kikkawa and Peng 1938); it is remarkable for its wide geographical distribution and wild habitats. Its occurrence in Hokkaido has repeatedly been described by Mizuno (1952), Momma (1957), Takada (1957), and Wakahama (1956a, b, 1957).

The chromosomes of *D. nigromaculata* were first reported by Momma (1953, 1954). The diploid complement is characterized by five pairs of rod-shaped elements, three pairs of which are of nearly equal size, being larger than the other two pairs and a pair of dot-like ones. The X chromosome is represented by one of the larger three pairs of rods. The present article deals with some observations of the salivary gland chromosomes of *D. nigromaculata*.

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Material and method: Material for this study was derived from a strain culture established in the author's laboratory. The original female of this strain was collected by the present author at the University Botanical Garden, Sapporo, in June 1960. The method of smear preparation of the gland was described earlier (Toyofuku 1959).

Observations

The chromosome complex of the salivary gland of *D. nigromaculata* consists of five euchromatic strands and one euchromatic dot, as expected from the mitotic condition reported by Momma (1953, 1954). For convenience, they were designated as X, A, B, C, D and E in this paper. The relative length of each euchromatic strand was calculated on the basis of the examination of at least ten cells with the aid of an ocular mikrometer. The mean length of individual arms is as shown in Table 1. The salivary gland chromosomes were observed in fly

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larvae which were descended from a single female caught at the University Botanical Garden, Sapporo, in June of 1960, and were established as a strain after two months' culture in our laboratory. The data for preparing the salivary chromosome map were based on camera lucida drawings of the chromosomes from three to five cells as follows: the morphological characteristics as presented by remarkable bands, lines, dots and other marks such as constrictions and swellings

Table 1. Length of six elements of the salivary chromosomes of *Drosophila nigromaculata*

Element	Mean length	Section
X	146	1-21
A	132	22-40
B	144	41-60
C	148	61-81
D	130	82-99
E	3.5	100

were observed in each chromosomal arm. Then, the six chromosomal arms were divided into one hundred sections, and each section was further subdivided into subsections designated with the letters A, B, C and D. The hundred sections were numbered according to rule in the order starting from the distal end of the X arm, reaching the proximal end of the X, continuing to the distal end of the A arm and so on, as shown in Table 1. The map thus established is to be regarded as standard (Fig. 1).

The X chromosome was obviously identifiable. In males, it is thinner and paler than other chromosomes because of its univalent nature. The mean length of the X is about 146 μ ; it was divided into sections from 1 to 21. The distal region presents a large bulb at about section 6 of map which permits its distinction from other euchromatic parts without any difficulty.

The identification of A chromosome was readily made. The mean length of this chromosome is about 132 μ showing sections from 22 to 40. The segment of section 31 and the proximal end of this chromosome are very characteristic in appearance as is shown in Fig. 1.

The B chromosome was easily distinguishable, because it contains several disc-shaped patterns. It has a length of about 144 μ and is divided into sections from 41 to 60.

The C chromosome, the largest rod-shaped element, was readily identified. It is about 148 μ in length and shows sections from 61 to 81. Sections 63, 68, 69 and the weak point of section 73 are very remarkable in contrast to other parts.

The D chromosome is of rod-shape, shortest in length. There is no characteristic pattern in this chromosome. It shows sections from 82 to 99 and is about 130 μ in length.

The E chromosome was characterized by section 100, being a minute dot-like element. It is about 3.5 μ in length. The detection of the E chromosome

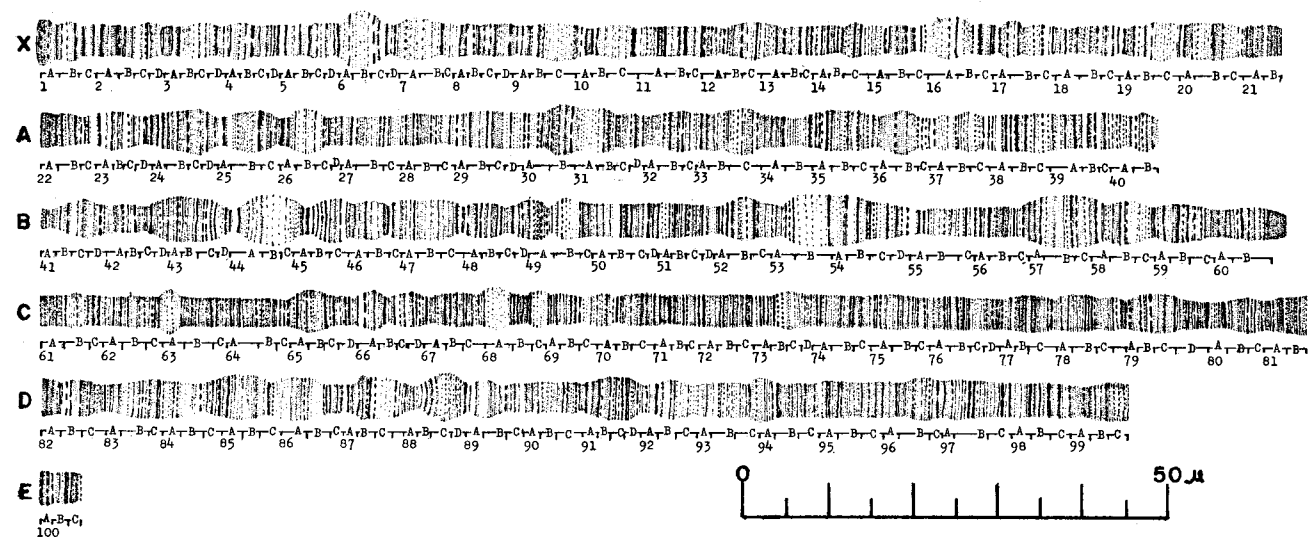


Fig. 1. The salivary gland chromosomes of *Drosophila nigromaculata*.

is very difficult, because it is extremely small in size and is usually included in a chromocenter.

With the exception of the X and the E, no morphological correspondence was observable between the salivary gland chromosomes and the mitotic chromosomes.

Remarks

The salivary chromosomes are important and useful in studying the evolution of the chromosomal apparatus in the genus *Drosophila* and in other flies. The types of rearrangements involved in chromosomal changes may become evident if both salivary gland nuclei and originally ganglionic or gonadal metaphase chromosomes are examined.

Drosophila nigromaculata is one of the common drosophilids in Hokkaido. Usually they were obtainable from about various kinds of grasses, fungi and fermenting fruits. Many plants seem to serve as suitable breeding and feeding sites for this species (Momma 1957, Suzuki 1955, Takada 1957, Toyofuku and Kimura 1960, 1961). However, it should be mentioned that it is very difficult to maintain culture strains of this species under laboratory condition. It has been possible to maintain only a few generations in laboratory culture. Further it is very remarkable that various types of chromosomal polymorphisms have been observed in natural populations of *D. nigromaculata*. The details will be given in another paper with some critical remarks on the nature of chromosomal polymorphism with special reference to the standard salivary chromosome map. In the present study was presented a standard chromosomal map prepared for the salivary gland chromosomes of this species, with a hope to contribute to evolutionary features of *Drosophila*.

Summary

The salivary gland chromosomes of *Drosophila nigromaculata*, a common species in Hokkaido, were described in this paper. The salivary chromosome complement consists of five rod-shaped strands and one dot-like element. Based on the observations of morphological characteristics of six salivary chromosome-arms, a standard chromosome map was prepared.

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