NOTES AND COMMENTS

NATURAL SELECTION FOR A METRICAL TRAIT IN A POPULATION OF DROSOPHILA MELANOGASTER

R. J. KILLICK*

Department of Genetics, University of Birmingham

1. INTRODUCTION

BARNES (1968) has shown that in artificial populations of *Drosophila melanogaster* derived from crossing two inbred lines, equilibrium levels of sterno-pleural chaeta number are attained which are associated with maximum fitness. His results substantiate Thoday's (1958) view that this character is not neutral but is under natural selection.

2. MATERIALS AND METHODS

Two long inbred lines of *D. melanogaster*, Oregon and 6 C/L, were crossed reciprocally. Twenty-two males and 22 females of each of the reciprocal F_1s were put in a population cage, identical to that described by Barnes (1968), and the resulting population maintained at 25° C. All subsequent work was carried out at this temperature. The mean number of sterno-pleural chaetæ of the population was estimated at intervals of five weeks by allowing the flies to lay eggs on the surface of four yeasted food tubes inserted into the cage for six hours. The tubes were then withdrawn and the medium transferred to the standard *Drosophila* bottles where the eggs developed under relatively non-competitive conditions. A random sample of 100 male and 100 female progeny was scored on each occasion.

3. RESULTS

Fig. 1 shows the changes in (*a*) the estimated population mean, averaged over sexes, and in (*b*) the estimated variance of the population respectively. The life-cycle of flies under cage conditions has been estimated at between 14 and 23 days (Barker, 1962) so that, on average, one to three generations elapsed between successive samples.

To investigate the genetical architecture of this character in Oregon and 6 C/L these lines were crossed and the reciprocal F_1s, two reciprocal F_2s and four reciprocals of each of the back-crosses to the two parents were raised along with the parental lines. Sixty male and 60 female progeny were scored from each of these 14 generations. The mean of Oregon was 22·716 and of 6 C/L was 34·016. The F_1 mean was 28·820 and the F_2 had a mean of 28·216 and a variance of 15·128. Using the method described by Cavalli (1952) it was possible to describe the differences among the generation means by four paramers; m, the general mean; d_s, the additive effect of the sex chromosome; d_a, the additive effect of the autosomes and h_a, the potence effect of the autosomes. The values for there parameters estimated separately for the sexes are shown in table 1. For the male progeny the potence is

---

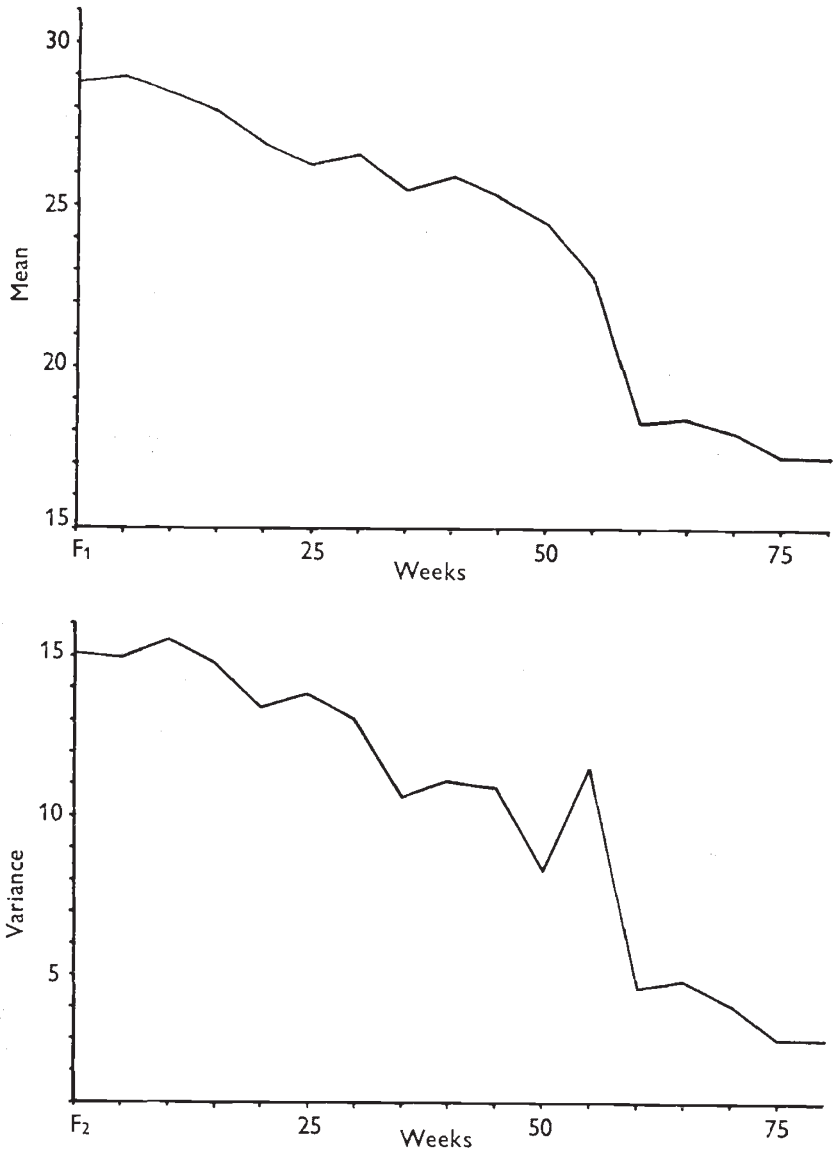* Present address: Scottish Plant Breeding Station, Pentlandfield, Roslin, Midlothian.

FIG. 1.—(a) (upper)—change in population mean with time.   (b) (lower)—change in population variance with time.

TABLE 1

	Males	Females
m	$27 \cdot 86 \pm 0 \cdot 14$ ***	$28 \cdot 88 \pm 0 \cdot 08$ ***
d_s	$1 \cdot 34 \pm 0 \cdot 14$ ***	$1 \cdot 81 \pm 0 \cdot 27$ ***
d_a	$4 \cdot 01 \pm 0 \cdot 20$ ***	$4 \cdot 22 \pm 0 \cdot 31$ ***
h_a	$0 \cdot 49 \pm 0 \cdot 23$ *	—
	$\chi^2[10] = 17 \cdot 85$ N.S.	$\chi^2[11] = 15 \cdot 07$ N.S.

N.S. = Not significant.   * = 5-1 per cent.   *** = 0·1 per cent.

small compared with the additive genetical effects; for the female progeny an adequate fit is obtained when no potence is specified so the character is under predominantly additive genetical control.

Returning to the results from the population cage, it is clear that some factor has caused the population mean to fall well outside the parental range, whilst at the same time the variance has declined. At any given time there are approximately 2000 flies in the cage so random genetic drift may be discounted. Mutation is very unlikely to produce such a rapid change. This suggests that natural selection has been responsible for reducing the population mean to an optimal level. That this level is so far away from the F_1 mean (which has maximum heterozygosity) demands an explanation other than heterozygote advantage.

A similar population ot 18° C. is currently being studied and considerable interest attaches to the outcome.

4. REFERENCES

BARKER, J. S. F. 1962. The estimation of generation interval in experimental populations of *Drosophila*. *Genetical Research, 3*, 388-404.
BARNES, B. W. 1968. Stabilising selection in *Drosophila melanogaster.* *Heredity, 23*, 433-442.
CAVALLI, L. L. 1952. An analysis of linkage in quantitative inheritance, in *Quantitive Inheritance*, H.M.S.O., 135-144.
THODAY, J. M. 1958. Homeostasis in a selection experiment. *Heredity, 12*, 401-415.

THE CONSEQUENCES OF CROSSING-OVER IN PERICENTRIC INVERSIONS IN ACROCENTRIC CHROMOSOMES

P. E. BRANDHAM
Jodrell Laboratory, Royal Botanic Gardens, Kew, Surrey

1. INTRODUCTION

THE meiotic events associated with heterozygosity for a paracentric inversion are by now very well known (Brown and Zohary, 1955; Darlington, 1965; Kreft, 1969), and the formation of a dicentric chromatid bridge with an accompanying acentric fragment at AI is the most familiar occurrence. Other events, which are usually less common, are (i) the formation of a chromatid loop and an acentric fragment, (ii) a double bridge with two fragments, and (iii) two loops with two fragments (Brandham, 1969). On the other hand, when an inversion is pericentric no bridges or loops are formed at AI; instead, chromatids are produced carrying certain deletions and duplications which, unless precise measurements are made, would be morphologically difficult to detect in metacentric chromosomes. When there is a marked difference in arm length of the original chromosomes duplicate/deletion chromatids produced by crossing-over in a pericentric inversion are clearly recognisable as small or large metacentric chromatids. These can, under certain circumstances suggest that iso-chromosomes have