

NOTES AND COMMENTS

TEMPORAL VARIATION IN *DROSOPHILA RUBIDA* INVERSION POLYMORPHISM

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1. INTRODUCTION

It has been shown previously (Mather, 1961, 1963a) that the frequencies of the inversions found in the tropical Australasian species *D. rubida* vary extensively over its known range. It has also been shown (Mather, 1963b) that at two stations only 20 miles apart sampled at the same time there are significant differences in the frequencies both between the two stations and between sexes within the stations.

The purpose of this paper is to report an investigation of inversion frequencies at various times of the year.

2. MATERIALS AND METHODS

Material was collected from fermenting banana baits at Brown River and Bisianumu, two stations 20 and 25 miles respectively from Port Moresby, Papua and separated by 20 miles. Collections were made from Brown River in August 1962 and Bisianumu in October 1962. Both stations were sampled in February and May 1963.

The material was analysed by mating males and despermated females from the wild against a standard strain and scoring seven larvæ from each mating against a photographic map (Mather, 1961).

Salivary chromosomes were prepared by the method given in Strickberger (1962).

3. RESULTS

The results are set out in tables 1 and 2. It should be noted that when comparisons were made between Oct. (or Aug.) and Feb., Feb. and May and Oct. (or Aug.) and May only certain inversions showed significant differences in frequency. These are indicated.

Particular attention should be drawn to the following results.

1. At Bisianumu inversions II RB and II RD in males are at significantly lower frequencies in October and May than in February.
2. At Brown River inversion II RB in males is at a significantly lower frequency in August and May than in February.

4. DISCUSSION

The reason why there should be marked cyclic changes in the frequency of certain inversions at different times of the year is presumably that the adaptive values of the inversions are different at these times. In turn, the

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TABLE 1
Bisianumu

Chrom. II	October 1962 (per cent.)		February 1963 (per cent.)		May 1963 (per cent.)	
	♂	♀	♂	♀	♂	♀
Standard . . .	36.4	44.4	29.4	23.5	44.1	47.2
LA . . .	0	0	1.0	2.9	0.9	2.2
RA . . .	5.7	8.3	8.3	9.8	5.4	10.1
B . . .	15.9	19.4	31.9	38.2	12.7	14.6
	←		←		←	
C . . .	34.1	25.0	27.0	28.4	28.9	23.6
D . . .	27.3	27.8	41.7	46.1	26.5	25.9
	←		←		←	
F . . .	0	0	0	1.0	0	0
Chrom. III						
Standard . . .	55.7	72.2	53.4	52.9	54.9	55.1
A . . .	2.3	2.8	2.5	3.8	3.4	5.6
B . . .	3.4	2.8	2.5	1.0	3.4	6.7
D . . .	9.1	5.6	9.8	4.8	4.4	4.5
E . . .	39.8	22.2	36.8	41.3	32.4	36.0
F . . .	1.1	2.8	7.4	3.8	10.3	5.6
	←		←		←	
H . . .	0	0	1.5	1.0	0	1.1
I . . .	1.1	0	0.5	0	0	0
Flies scored . .	44	18	102	51	102	44

N.B. Arrows indicate differences significant at the 5 per cent. level.

TABLE 2
Brown River

Chrom. II	August 1962 (per cent.)		February 1963 (per cent.)		May 1962 (per cent.)	
	♂	♀	♂	♀	♂	♀
Standard . . .	60.0	59.0	53.4	47.8	68.2	64.3
II LA . . .	0	0	1.1	2.2	0	0
II RA . . .	1.7	4.0	4.6	8.9	2.4	3.2
B . . .	4.2	5.0	8.6	13.3	6.0	6.3
	←		←		←	
C . . .	15.8	21.0	24.1	25.6	13.7	19.0
D . . .	22.5	17.0	21.8	24.4	17.0	14.3
F . . .	0	0	0	0	0	0
Chrom. III						
Standard . . .	63.3	46.0	54.6	44.6	56.8	55.5
A . . .	3.3	4.0	5.7	2.2	2.4	2.3
B . . .	0.8	6.0	4.6	3.3	3.3	3.1
D . . .	2.5	2.0	6.3	2.2	4.5	4.7
E . . .	25.0	35.0	35.6	45.7	31.0	31.3
	←		←		←	
F . . .	7.5	15.0	5.1	8.7	8.0	10.2
H . . .	1.7	0.0	0.0	2.2	0.9	0.0
I . . .	0.0	0.0	0.9	0.0	1.2	0.8
Flies scored . .	60	50	87	44	168	63

N.B. Arrows indicate differences significant at the 5 per cent. level.

most obvious component of the environment that varies is rainfall, for whereas February is in the middle of the wet season May and August or October are respectively at the beginning and end of the dry season. On the other hand temperatures are fairly uniform throughout the year.

Of the species that have been extensively analysed for inversion polymorphism the pattern of temporal change would appear to resemble that of the temperate north American species, *D. pseudoobscura* (Dobzhansky, 1943, 1947, 1948, 1952; Koller, 1939).

The pattern of variation in the other well-analysed North American species *D. robusta* appears to vary from population to population. Carson and Stalker (1949) found no cyclic seasonal fluctuation in Missouri but Levitan (1951*a, b, c*) found such fluctuation in a New Jersey population. In *D. rubida* the inversion III F differs in behaviour in the populations from Bisianumu and Brown River.

The tropical species of *Drosophila* so far most analysed is *D. willistoni* from South America (da Cunha, Burla and Dobzhansky, 1950; Townsend, 1952; da Cunha and Dobzhansky, 1954) but here there is no evidence that the inversion frequency variations are seasonal and cyclic. This is not surprising as the regions sampled have a remarkably uniform climate.

Thus *D. rubida* as regards temporal variation in inversion frequency would appear to resemble *D. pseudoobscura* and *D. robusta* more closely than *D. willistoni*.

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CANALISATION AND THRESHOLD EFFECT OF THE EXTRA SCUTELLAR PHENOTYPE IN *DROSOPHILA MELANOGASTER*

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Payne (1918), Rendel (1959) and Fraser (1963) observed that the number of scutellar bristles in *Drosophila* is controlled by a polygenic system. Rendel (1959) and Fraser (1963) further consider that development is canalised at four bristles so that the infrequent wildtype flies with more or less than four bristles are caused by segregation of the scutellar genes producing combinations with a summed action of more or less than four bristles. Fraser (1963) described such variation as due to "genetic leakage" of the canalised genotype. During the analysis of the genetic variability in the natural population of *D. melanogaster* from Kulu Valley such a leakage has been found in the progenies of thirteen females out of a small sample of thirty-nine females inseminated in nature.

Selection for higher number of scutellar bristles yielded some very interesting results. It was carried on for nine generations (table 1) after which the individuals became sterile. During the first seven generations, ten females with the highest number of bristles and inseminated by unknown males were selected and mass cultured in each generation. In the subsequent generations the selection was extended to both the parents through pair mating. From the numbers of offspring of the pairs in the eighth and ninth generation it became evident that the sterility did not suddenly develop at the ninth generation. In the eighth generation three out of a total of nine crosses yielded comparatively low numbers of progeny and still lower fertility was shown by as many as four out of a similar set of nine crosses in the ninth generation.

A glance at table 1 reveals that though the selection raised the bristle number up to eight in the second generation, it failed to produce individuals