

UNIVERSITY OF QUEENSLAND PAPERS

A Third Race of *Drosophila*
rubida

by
WHARTON B. MATHER

DEPARTMENT OF ZOOLOGY

Volume III

Number 6

FRY

FRY.

QL

1

.U7

v.3

NO.6

1



UNIVERSITY OF QUEENSLAND PRESS
ST. LUCIA

DL

1

U7

v. 3 no. 6

1

Fryer

A Third Race of *Drosophila* *rubida*

by

WHARTON B. MATHER, Ph.D.

Head of the Genetics Laboratory, Department of Zoology,
University of Queensland

Price: Twenty Cents

University of Queensland Papers

Department of Zoology

Volume III

Number 6

UNIVERSITY OF QUEENSLAND PRESS

St. Lucia

20 May 1968

WHOLLY SET UP AND PRINTED IN AUSTRALIA BY
WATSON FERGUSON AND COMPANY, BRISBANE, QUEENSLAND
1968

A THIRD RACE OF *DROSOPHILA RUBIDA*

It has previously been shown (Mather, 1964a) that the *immigrans* group species, *D. rubida* Mather from Northern Queensland and Papua-New Guinea can be divided into two distinct races on the basis of both chromosome inversion differences and sexual isolation. Race A is found in Eastern New Guinea and Race B in New Britain. At Bulolo at some 2,500 feet, a third race, C, has now been discovered, which also has a distinct chromosome inversion pattern and is sexually isolated to various degrees from stocks obtained from a variety of localities in Northern Queensland and Papua-New Guinea. This paper is a report on this new race and its relationship with Race A and Race B.

Materials and methods

As well as the stock from Bulolo the same stocks from Cairns, Port Moresby (Bisianumu), Lae, Madang, Rabaul, and Samarai that were used in the 1964 study have been employed.

The methods used for sexual isolation tests (no choice) are given in Mather (1964a) and for sexual isolation tests (multiple choice) in Strickberger (1962). In the multiple-choice experiment each test was replicated three times and the isolation index (Stalker, 1942) worked out on pooled data. All flies used were aged from 10 to 15 days.

Results

The results are set out in Table 1 from which it will be noted that in the no-choice tests wherever a Bul female is involved the isolation is higher than when a Bul male is used. In some cases the isolation is very high as where Madang, Rabaul, and Samarai males are used. From the results of the multiple-choice tests as summarized by the isolation index it will be noted that both sexes of the Bulolo stock are strongly isolated from Port Moresby, Cairns, Lae, and Samarai, but Bulolo males are weakly isolated from Madang females, and in the case of Rabaul females the isolation index is negative.

TABLE 1
Sexual isolation tests

CROSS	NO CHOICE			MULTIPLE CHOICE	
	FEMALES TESTED	NUMBER INSEMINATED	PERCENTAGE INSEMINATED	FEMALES TESTED	*ISOLATION INDEX
Bul ♂ × Bis ♀	93	93	100	89	.90
Bul ♀ × Bis ♂	84	67	80	89	.84
Bul ♂ × Cai ♀	83	83	100	83	.78
Bul ♀ × Cai ♂	91	60	66	89	.92
Bul ♂ × Lae ♀	70	60	86	87	.95
Bul ♀ × Lae ♂	83	56	67	89	.87
Bul ♂ × Mad ♀	97	89	92	90	.33
Bul ♀ × Mad ♂	93	23	25	81	.85
Bul ♂ × Rab ♀	42	42	100	87	— .22
Bul ♀ × Rab ♂	91	23	25	87	1.00
Bul ♂ × Sam ♀	83	76	91	88	.92
Bul ♀ × Sam ♂	90	16	18	86	.90

$$\text{*Isolation Index} = \frac{\% \text{ Homogamic} - \% \text{ Heterogamic matings}}{\% \text{ Homogamic} + \% \text{ Heterogamic matings}}$$

Thus considering no-choice and multiple-choice experiments together Bulolo flies are isolated from other strains at least in one sex but usually in both. In all crosses the F₁ and F₂ were produced except in the Bulolo X Rabaul crosses where we have failed to produce an F₂.

Discussion

Cairns and Rabaul are monomorphic for inversions except for the small simple IIID, whereas Bulolo, Port Moresby, Lae, and Samarai are polymorphic (Mather, 1963*a*).

In the case of Port Moresby and Bulolo detailed inversion analyses have been made. Thus, in Table 2 samples from Bulolo collected in August 1963 and February 1964 (Mather, 1966*b*), and August 1963, 1964, and 1965 (Mather, 1967) are compared with samples from Bisianumu (Port Moresby) collected in October 1962, February 1963, and May 1963 (Mather, 1964*b*) and May 1963, 1964, and 1965 (Mather, 1967). The inversions recorded are described in a number of papers (Mather, 1961, 1963*b* and *c*, 1966*a*). Inversions IIB and I, D, G, and H have only recently been separated and are here grouped.

Comparing these two stations we see that all the inversions at the two places have different non-overlapping ranges with the minor exceptions of IIIA and B whose ranges overlap. Bulolo is higher for IILA, IIRA, B, and D, IIID, E, H, I, and J and lower for IIRC and IIIA and B. Perhaps the most outstanding feature of the Bulolo population is that it is virtually homozygous for the complex inversion IIRD.

TABLE 2
Inversion patterns

CHROMOSOME	PORT MORESBY RANGE PERCENTAGE	BULOLO RANGE PERCENTAGE
II +	23.5-49.4	0.0-1.0
LA	0.0-3.1	5.2-16.8
RA	4.9-10.1	26.3-44.3
B, I	10.1-38.2	41.2-48.1
C	19.1-34.1	0.0-1.4
D, G, H	25.9-46.1	98.6-100.0
F	0.0-1.0	—
III +	51.1-72.2	27.1-32.4
A	0.6-5.6	0.0-1.4
B	1.0-6.7	0.0-1.4
D	3.9-9.8	45.8-53.5
E	22.2-41.3	49.6-54.8
F	1.1-10.3	0.0-0.3
H	0.0-1.5	10.8-13.6
I	0.0-1.1	14.6-21.6
J	—	0.0-0.3
Flies scored	633	843

Thus when the samples from Bulolo are compared with those from Port Moresby, Cairns, and Rabaul strong sexual isolation is correlated with very marked inversion frequency differences, leading to the proposition that there is a third race (Race C) of *D. rubida* from Bulolo.

Summary

Both no-choice and multiple-choice sexual isolation tests between strains of *D. rubida* Mather from Bulolo, Port Moresby, Cairns, Rabaul, Madang, Lae, and Samarai together with extensive inversion frequency records from Bulolo and Port Moresby have led to the hypothesis that there is a third race (Race C) of *D. rubida* from the Bulolo area of New Guinea.

Acknowledgments

Acknowledgments are due to Miss Sheridan Butler for technical assistance.

References

- Mather, W. B. (1961). Chromosomal polymorphism in *Drosophila rubida* Mather. *Genetics, Princeton* **46**: 799-810.
- Mather, W. B. (1963a). Patterns of chromosomal polymorphism in *Drosophila rubida*. *Am. Nat.* **97**: 59-63.
- Mather, W. B. (1963b). Notes on the inversions of *Drosophila rubida*. *Drosoph. Inf. Serv.* **37**: 104.
- Mather, W. B. (1963c). Further inversions in *Drosophila rubida*. *Drosoph. Inf. Serv.* **38**: 55.
- Mather, W. B. (1964a). Speciation in *Drosophila rubida*. *Evolution, Lancaster, Pa.* **18**: 10-11.
- Mather, W. B. (1964b). Temporal variation in *Drosophila rubida* inversion polymorphism. *Heredity, Lond.* **19**: 331-34.
- Mather, W. B. (1966a). New inversions in *Drosophila rubida*. *Drosoph. Inf. Serv.* **41**: 125-26.
- Mather, W. B. (1966b). *Drosophila rubida* inversion polymorphism. *Drosoph. Inf. Serv.* **41**: 126-28.
- Mather, W. B. (1967). Inter-yearly fluctuation of *D. rubida* inversion polymorphism. *Drosoph. Inf. Serv.* **42**: 85.
- Stalker, H. D. (1942). Sexual isolation studies in the species complex *Drosophila virilis*. *Genetics, Princeton* **27**: 238-57.
- Strickberger, M. W. (1962). Experiments in genetics with *Drosophila*. London: Wiley.

**A SELECTION OF
UNIVERSITY OF QUEENSLAND PAPERS**

Available from the University of Queensland Press, St. Lucia

<i>Additions to the Drosophila Fauna of Australia</i> , by Wharton B. Mather, Department of Zoology, vol. I, no. 9	30c
<i>D. pararubida: A New Species of Drosophila from New Guinea</i> , by Wharton B. Mather, Department of Zoology, vol. I, no. 11	20c
<i>D. tetrachaeta: A New Species of Drosophila from New Guinea</i> , by D. Angus, Department of Zoology, vol. II, no. 8	10c
<i>Ecological and Life History Studies upon a Large Foraminiferan (Discobotellina biperforata Collins 1958) from Moreton Bay, Queensland. II. Aquarium Observations</i> , by W. Stephenson and May Rees, Department of Zoology, vol. II, no. 12	30c
<i>Branchiostoma moretonensis sp. nov. (Cephalochordata)</i> , by O. E. S. Kelly, Department of Zoology, vol. II, no. 13	20c
<i>D. argentostrata: A New Species of Drosophila from New Guinea</i> , by I. R. Bock, Department of Zoology, Vol. II, no. 14	10c
<i>Ascidians from Northern Australia</i> , by Patricia Kott, Department of Zoology, vol. II, no. 15	40c
<i>Gene Frequency in Laboratory Populations of Drosophila melanogaster</i> , by D. Angus, Department of Zoology, vol. III, no. 1	20c
<i>D. silvestriata: A New Species of Drosophila from New Guinea</i> , by I. R. Bock and V. Baimai, Department of Zoology, vol. III, no. 2	20c
<i>Additions to the Drosophila Fauna of New Guinea</i> , by D. Angus, Department of Zoology, vol. III, no. 3	40c
<i>The Genus Drosophila in New Guinea and Sabah</i> , by Wharton B. Mather, Department of Zoology, vol. III, no. 4	20c
<i>Macquaridrillus: A New Genus of Tubificidae (Oligochaeta) from Macquarie Island</i> . by B. G. M. Jamieson, Department of Zoology, vol. III, no. 5	60c