Angus, D.S. University of Queensland, Brisbane, Australia. The relationship of two sibling species within the quadrilineata species group of Drosophila.

In 1964 during a cytological analysis of D. tetrachaeta two flies (a male and a female) from Brown River, near Port Moresby were detected that, although morphologically identical with D. tetrachaeta, were very different as regards inversions present. In 1966 eight flies (three females and five males) were examined from Cairns which were cytologically similar to and would freely cross with the Brown River flies. Cultures established from Brown River and Cairns would not hybridise with D. tetrachaeta from Brown River beyond F_1 pupae. On this evidence a sibling species to D. tetrachaeta viz. D. pseudotetrachaeta was described (Angus 1967).

It is the purpose of this paper to describe as far as possible the specific inversions of D. pseudotetrachaeta and to record the degree of sexual isolation from D. tetrachaeta.

Sexual isolation tests between the two species were carried out by confining 10 sexually mature flies of one sex with 10 flies of the opposite sex and strain and examining the female tract for sperm after 10 days. Giant chromosome preparations were made by the acetic-lactic-orcein method (Strickberger 1962).

The very high sexual isolation between the two species is apparent from the table. Salivary chromosomes from hybrid larvae always show very poor pairing (Figure 1). However, five simple and one complex inversions have been detected in relation to the standard strain of D. tetrachaeta (Figure 2). The limits of the inversions in relation to the D. tetrachaeta map (Angus 1968) are IIA 9.0-11.3, IIIA 3.6-6.3, IIIB 11.0-chromocentre, IVA 3.5-4.9, IVB 14.6-chromocentre, VA 11.0-21.6. This last inversion is complex.

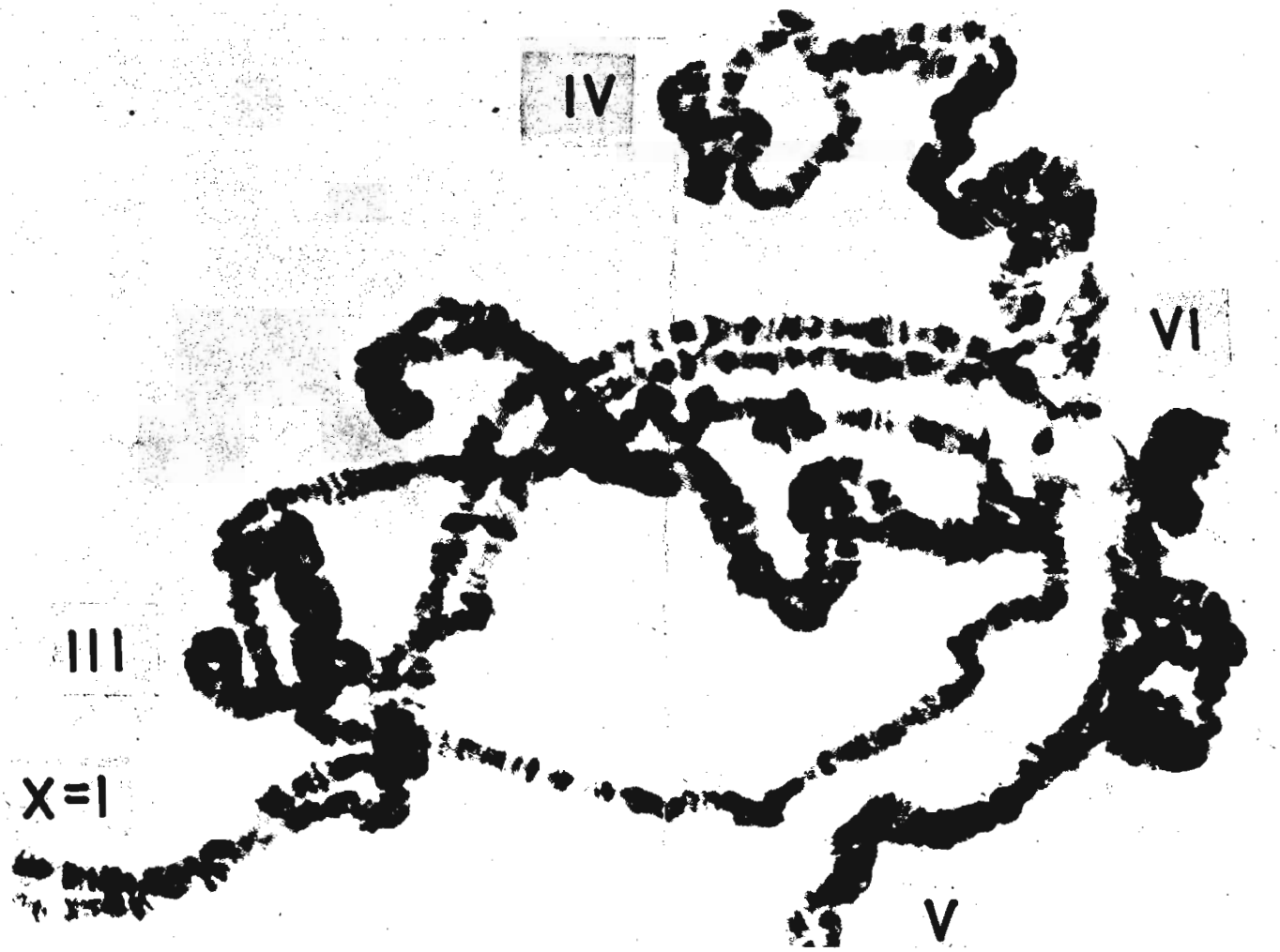

Figure 1

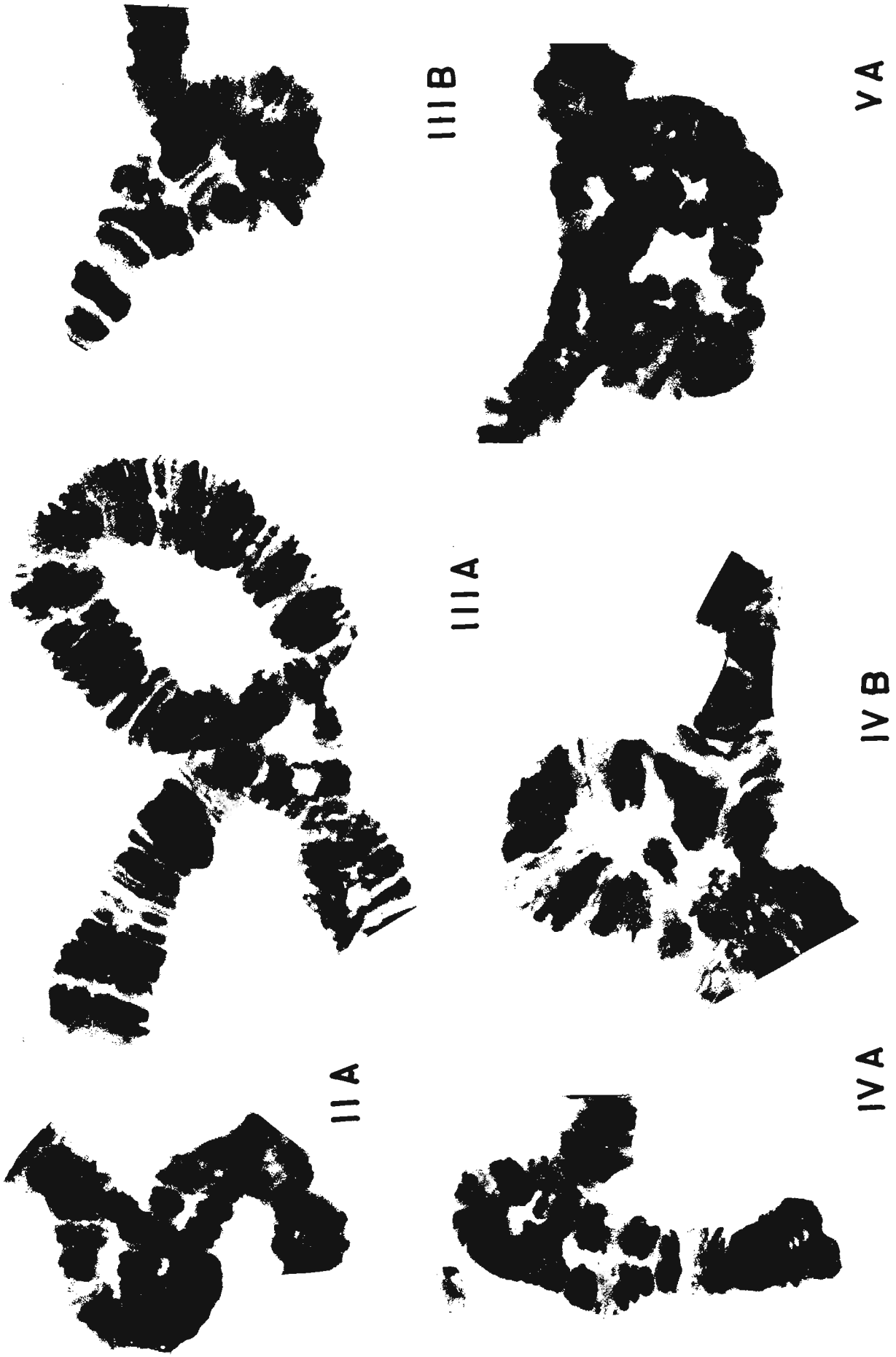

Figure 2

In the Australian region the situation found in the quadrilineata species group where these two cytologically differentiated sibling species have been detected contrasts with the situation in D. rubida where four geographical races have arisen by various isolating mechanisms and are characterised by different inversion patterns (Mather 1963, 1964, 1968 a and b).

SEXUAL ISOLATION TABLE

Females	Males	Females Tested	Number Insem.	% Insem.	Comment
D. pseudo.(Cairns)	D. tet.(Brown R.)	101	0	0	
D. tet.(Brown R.)	D. pseudo.(Cairns)	92	2	2	F_1 larvae
D. pseudo.(Brown R.)	D. tet.(Brown R.)	76	7	9	F_1 larvae
D. tet.(Brown R.)	D. pseudo.(Brown R.)	77	2	3	

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References: Angus, D. 1967. Additions to the D. fauna of New Guinea. Pap. Dep. Zool. Univ. Qd, 3: 31-42. Angus, D. 1968. Chromosomal polymorphism in D. tetrachaeta. J. Hered. 59: 289-296. Mather, W.B. 1963. The races of D. rubida. Proc. XI Int. Congr. Genet., The Hague, 1: 161-162. Mather, W.B. 1964. Speciation in D. rubida. Evol. 18: 10-11. Mather, W.B. 1968(a). A third race of D. rubida. Pap. Dep. Zool. Univ. Qd, 3: 75-77. Mather, W.B. 1968(b). Evolution in D. rubida. Proc. XIIth Int. Congr. Genet. Tokyo. 1: 332. Strickberger, M.W. 1962. Experiments in Genetics with D. New York: John Wiley and Sons.

Faltus, F. and H. Oberlander. Brandeis University, Waltham, Massachusetts. Ecdysone induced differentiation of pulsating regions in genital imaginal disks after culture in vivo. (1)

Although the genital disks of D. melanogaster have been cultured for years in the abdomens of adult flies without differentiating, Nöthiger and Oberlander (2) have found that male genital disks from mature larvae regularly form pulsating regions after being cultured in young flies for two weeks. They showed that injected ring glands increased the percentage of disks which pulsate, and suggested that ecdysone was responsible. Since the ring gland is a composite gland it was necessary to test the effect of ecdysone directly.

The wild stock "sevelen" of D. melanogaster was used in these experiments as both donor and host. The animals were reared on standard food (maize, sugar, agar and yeast) at 25°C. Larval donors were used 117-120 hours after egg laying, and adult hosts were used one day after emergence.

Whole male genital disks were injected into adult flies and examined after two weeks. In one experiment one half of the adult hosts were injected with 6×10^{-4} ug of ecdysone (3) dissolved in 10% alcohol, while the controls were injected with an equal volume (0.003 ul) of 10% alcohol. Of 38 surviving experimental hosts 55% contained pulsating disks, while only 35% of 43 surviving controls did so. The difference between these two groups was significant within 90% confidence limits according to the binomial probability model.

A second experiment in which the experimented hosts received 6×10^{-4} ug ecdysone on days one and five resulted in the following: 88.5% of 26 surviving experimented hosts contained pulsating disks, but only 37.5% of 24 control hosts did so. This was significant within 99% confidence limits.

Presumably a single dose was less effective because of hormone inactivation. However, even the double dose of ecdysone was sufficiently low to support the conclusion that pulsating regions in cultured male genital disks differentiate in response to the action of residual ecdysone in the adult host. It is thus unnecessary to consider an ecdysone independent mechanism of differentiation to explain the origin of the pulsating regions.

(1) Supported by grant No. GB-7992 from the National Science Foundation. (2) Nöthiger, R. and Oberlander, H., 1967, J. Exp. Zool. 164: 61-68. (3) The ecdysone used in these experiments was generously provided by Dr. John Siddall (Zoecon Corporation).