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A new pericentric inversion in a natural population of *Drosophila robusta*.

Pericentric inversions should not persist in natural populations because of their predicted effects on gamete production in heterokaryotypes. Should recombination occur within the span of a pericentric inversion, heterozygotes should be semi-sterile because half of the gametes produced will contain duplications and deficiencies. Though pericentrics are much less frequently observed in natural populations than paracentrics, particularly in *Drosophila* species, their predicted depression of fitness in heterozygote females has not been confirmed (Coyne *et al.,* 1993). Furthermore, pericentric inversions have been implicated in chromosomal evolution (Patterson and Stone, 1952), but they remain less studied than paracentric inversions (Powell, 1997). In fact, northern populations of *Drosophila robusta* harbor considerable polymorphism for a pericentric inversion of the third chromosome, 3L-R, reaching frequencies of up to 60% in some populations. Two other pericentrics observed in natural populations involving the second chromosome have been recovered in single individuals only (Carson, 1958; Levitan, 1992).

Figure 1.

A previously undescribed pericentric inversion was observed in the karyotype of a wild-caught female *D. robusta* and her offspring from a population sampled near Mill Creek, Scott County, Arkansas (Etges, 1996). This new gene arrangement is labeled 2LR-3, and includes about 25% of the proximal section of the left arm and almost the entire right arm of chromosome two (Figure 1). This photograph shows the karyotype 2L/2LR-3 from the testcross progeny of the wild female. The indicated breakpoints of 2LR-3 (①) occur at the approximate borders of regions E and F on the left arm and in region S of the right arm (Levitan, 1992). The chromocenter (②) in this preparation is evident with the second chromosome arms to the right, the third chromosome at the top left (with the small, fourth, dot chromosome next to its centromere), and the X chromosome at the left-bottom in this photomicrograph. This gene arrangement persisted in lab culture for some time, but an effort to recover it from nature again has not yet been made. It would appear that pericentric inversions occur at low frequency in *D. robusta* populations, yet just one has risen to high frequencies in nature. Further study of the fertility effects of 3L-R will hopefully shed light on the fitness consequences of this widespread pericentric inversion.

References: Carson, H.L., 1958, Adv. Genet. 9: 1-40; Coyne, J.A., W. Myers, A.P. Crittenden, and P. Sniegowski 1993, Genetics 134: 487-496; Etges, W.J., 1996, Evolution 50: 2095-2100; Levitan, M., 1992, In: C.B. Krimbas and J.R. Powell (eds.). *Drosophila Inversion Polymorphism.* CRC Press, Inc., Boca Raton. pp. 221-338; Patterson, J.T., and W.S. Stone 1952, *Evolution in the Genus* Drosophila. New York, MacMillan Co.; Powell, J.R., 1997, *Progress and Prospects in Evolutionary Biology: the* Drosophila *Model.* Oxford Univ. Press, New York.

Llopart, Anna, and Montserrat Aguadé. Departament de Genètica, Facultat de Biologia, Universitat de Barcelona. Spain. A new naturally occurring inversion in *Drosophila subobscura*

The species *Drosophila subobscura* is characterized by a very rich inversion polymorphism affecting its five acrocentric chromosomes (A, J, U, E and O). In this species, like in many others, there is some clustering of inversion breakpoints, for example, in bands 64B and 64C for inversions E_2, E_3, E_4, E_5, E_9 and E_{17} of the E chromosome. Also, differences have been observed in the frequencies of short, medium and long-sized inversions in natural populations. In particular, short inversions tend to be rare and endemic, generally known from only one population sample and present at very low frequency. Natural selection has been proposed to explain the observed patterns. In this sense, Krimbas and Powell (1992) concluded in their review of *Drosophila* inversion polymorphism that moderately sized inversions were favored as a result of a trade-off between positive and negative effects of the length of inversions. Long inversions could more easily capture advantageous haplotype combinations but they could also lose them more easily due to their higher rate of double crossovers. On the other hand, short inversions, in addition to possible physical problems in their origin, would have a lower probability of capturing favorable sets of alleles but, if that were the case, they could maintain them more efficiently.

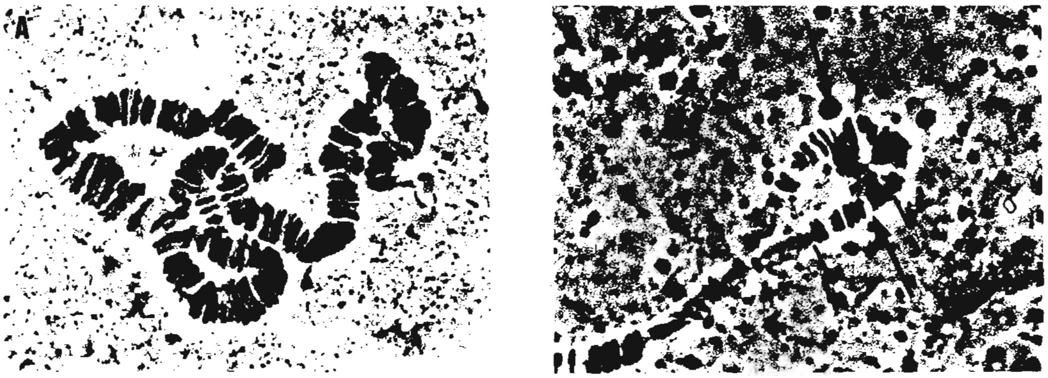

Figure 1. (A) Polytene A chromosomes from a heterokaryotypic (A_{st}/A_{9+2}) female larva. The most centromeric part of the two homologous chromosomes is unpaired; (B) Detail of the inversion loop in a heterokaryotypic female larva. Inversion breakpoints are indicated by an arrow and lines show limits between chromosome sections.

Selective explanations have also been proposed to explain the strong linkage disequilibrium observed between certain non overlapping inversions. Sperlich and Feuerbach-Mravlag (1974), for example, pointed out that the absence of the A_{1+2} arrangement in natural populations of *D. subobscura* was not caused by the inhibition of recombination in doubly heterozygous females (A_1/A_2) due to mechanical reasons but by epistatic interactions.

Until 1993, a total of 67 inversions had been reported in *D. subobscura* (Krimbas, 1993), with eight of these inversions located in the sexual (=A) chromosome. These eight inversions, however, produce only 11 different gene