

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.

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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.

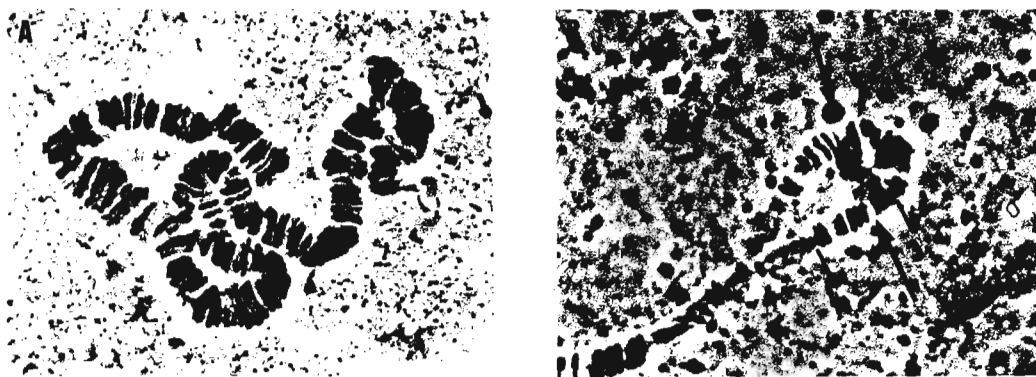


Figure 1. (A) Polytene A chromosomes from a heterokaryotypic (A_{st}/A_{9+2}) female larva. The most centromeric part of the two homologous chromosomes is unpaired; (B) Detail of the inversion loop in a heterokaryotypic female larva. Inversion breakpoints are indicated by an arrow and lines show limits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

arrangements of natural origin and occurrence: A_{st} , A_1 , A_2 , A_{2+3} , A_{2+4} , A_{2+6} , A_{2+3+6} , A_{2+3+5} , $A_{2+3+5+7}$ (SR), A_{2+5+7} , A_{2+8} . The new inversion, A_9 , was detected in the progeny of a male that had been crossed to females from a laboratory strain that carried the A_{st} chromosomal arrangement (Figure 1A and 1B). This male, which also carried the A_2 inversion, belonged to an isofemale line recently established from a natural population captured in Bizerte (Tunisia). Inversion A_9 was only present in this male from a total of forty-nine lines studied. Most probably A_9 is a recently arisen inversion as it was not detected by Jungen (1968) in his extensive survey of chromosomal inversion polymorphism (more than 550 sexual chromosome analyzed) in Tunisian populations of *D. subobscura*.

The breakpoints of the new inversion are located in sections 1B and 3B on the Kunze-Mühl and Müller map (1958), respectively. The 1B breakpoint of A_9 is very close, if not coincident, to the proximal breakpoints of inversions A_5 and A_7 which would support the nonrandom distribution of inversions along chromosomes. A_9 is the shortest inversion described in the A chromosome. Also, when we compare A_9 to the autosomal inversions of *D. subobscura*, only J_5 , E_{14} , E_{20} and O_{24} are shorter.

In the process of obtaining a homokaryotypic line for A_9 from the progeny of the initial male (A_{st}/A_{9+2} females and A_{st}/Y males), both recombinant classes (A_2 and A_9) were found. This result indicates that, at least under laboratory conditions, crossover between the A_9 and A_2 inversions is not physically inhibited. As expected, the homokaryotypic females for the new inversion (A_9/A_9), as well as the hemizygote males, did not show any viability problems and grew satisfactorily at 18° and 13°C.

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Cerda, Hugo¹ and Antonio Fontdevila². ¹ Simón Rodríguez University Pest Control Laboratory, Apartado Postal (P.O. Box) 47.925, Caracas 1041-A, Venezuela; ² Universitat Autònoma de Barcelona, Departament de Genètica i de Microbiologia, Bellaterra, Spain. Evolutionary Divergence of *Drosophila venezolana* (*martensis* Cluster, *buzzatii* Complex) on Gran Roque Island, Venezuela.

Introduction

The *martensis* cluster (*buzzatii* complex, *repleta* group) comprise a group of four species which emerge from cacti endemic to northern South America (Ruiz and Wasserman, 1992). The species are *D. martensis* (Wasserman and Wilson, 1957), *D. starmeri* (Wassermann, Koepfer and Ward, 1973), *D. uniseta* (Wassermann, Koepfer and Ward, 1973), and *D. venezolana* (Wasserman, Fontdevila and Ruiz, 1983).

D. venezolana was the last species described.

Throughout its distribution it has a $2e^7$ chromosomal pattern. This species is symorphic, and phylogenetically closely related to *D. starmeri* (Cerda and Benado, 1986; Fontdevila and Ruiz, 1983; Ruiz and Fontdevila, 1981). This species has been reported in arid zones of Venezuela, mainly in Falcon State and some small arid coastal zones of Central and Eastern Venezuela, where it feeds on cacti of the *Opuntia* genus (Cerda, *et al.*, 1996; Benado, 1989). On Gran Roque island, the largest island of the Los Roques archipelago, 120 km north of the coast of Venezuela's Federal District, *D. venezolana* is the only species of the *martensis* cluster and breeds and feeds in all the cacti on the island, including *Stenocereus griseus*, *Opuntia wentiana*, and *Melocactus amoenus* (Benado, 1989).

This paper reports the results of a preliminary analysis of chromosomal polymorphism, abdominal band pattern, eye color, and reproductive isolation of *D. venezolana* of Gran Roque, in comparison with the continental populations of *D. venezolana*.

Material And Methods

Location of the Study: *Drosophila* individuals were collected in February 1984 using fermented banana and beer as bait, on Gran Roque island (11° 58' 33" N, 66° 40' 37" W).

Chromosomal Polymorphism and Reproductive Isolation: Polytene chromosomal polymorphism of 22 larvae reared in David medium (1959) was analyzed using acetic orceine staining.