

Denell, R. E. and B. H. Judd. University of Texas, Austin, Texas. Segregation distortion in *D. melanogaster*; the location of stabilizer of SD.

The SD-72 second chromosome in *D. melanogaster* carries two inversions and at least three genetic elements important to the expression of segregation distortion.

This chromosome has a small pericentric inversion and a distal inversion in the

right arm which is apparently identical with In(2R)NS. The genetic elements include SD, which is located close to the centromere; activator of SD (Ac(SD)), located 0.5-1.0 units to the right of SD, and stabilizer of SD (St(SD)). In an examination of recombination in Sd-72/cn bw females, Sandler and Hiraizumi (1960, Gen. 45: 1269) found only products of an exchange between the locus of cn and the proximal breakpoint of In(2R)NS. Recombinant chromosomes carrying SD Ac(SD) had invariably lost St(SD), and it was concluded that St(SD) was probably located distal to the bw locus, at the tip of IIR.

In an experiment involving matings of single SD-72/cn bw males to cn bw females, 4 of the 78 males tested gave exceptional offspring with brown eye color. All four of these males gave a high proportion of SD-72/cn bw to cn bw progeny; three of them in addition gave a single brown offspring. The fourth male gave the following progeny: 477 SD-72/cn bw ♂♂, 408 SD-72/cn bw ♀♀, 1 cn bw ♂, 1 cn bw ♀, 34 brown (presumed bw/cn bw) ♂♂, and 32 brown ♀♀. From these latter brown offspring, four lines were established and maintained for about a year in mass culture.

It was noted that the origin and behavior of these presumably bw-bearing chromosomes were consistent with the possibility that they arose by a recombinational event in the SD-72/cn bw parental male, and thus carried the SD locus. Therefore, males from each line were made heterozygous with cn bw and test crossed to cn bw females. The results are given in Table I, with the addition of data characterizing the SD-72 line from which these exceptions originated. *k* is given as the proportion SD-72 or brown offspring and sex ratio is expressed as the proportion males.

Table I

Parental ♂♂	No. ♂♂ Tested	<i>k</i>	Progeny Sex Ratio		No. Progeny
			SD* or bw*	cn bw*	
SD-72/cn bw	51	.992	.510	.238	25,807
bw 29-1/cn bw	15	.989	.537	.130	2,026
bw 29-12/cn bw	18	.960	.526	.306	2,771
bw 29-14/cn bw	21	.986	.534	.302	3,029
bw 29-15/cn bw	21	.992	.538	.240	2,983

*These progeny classes are represented by their paternal second chromosome.

The high *k* value associated with each of the brown lines leaves no doubt that each does indeed carry SD. Further, however, these high *k* values are indicative of the presence of St(SD), as well as the other two elements of the segregation distortion system. This conclusion is strengthened by an examination of the sex ratios of the progeny classes representing recovery of bw- and cn bw-bearing second chromosomes. With respect to the work of Hiraizumi and Nakazima (1967, Gen. 55:681), these sex ratios are more characteristic of original-SD than of recombinant-SD lines. The presence of St(SD) is further indicated by the distributions of *k* values for males in each line, given in Figure I. Finally, a cytological examination of the salivary gland chromosomes of bw/cn bw larvae from each line was made, and each bw-bearing chromosome still retains In(2R)NS.

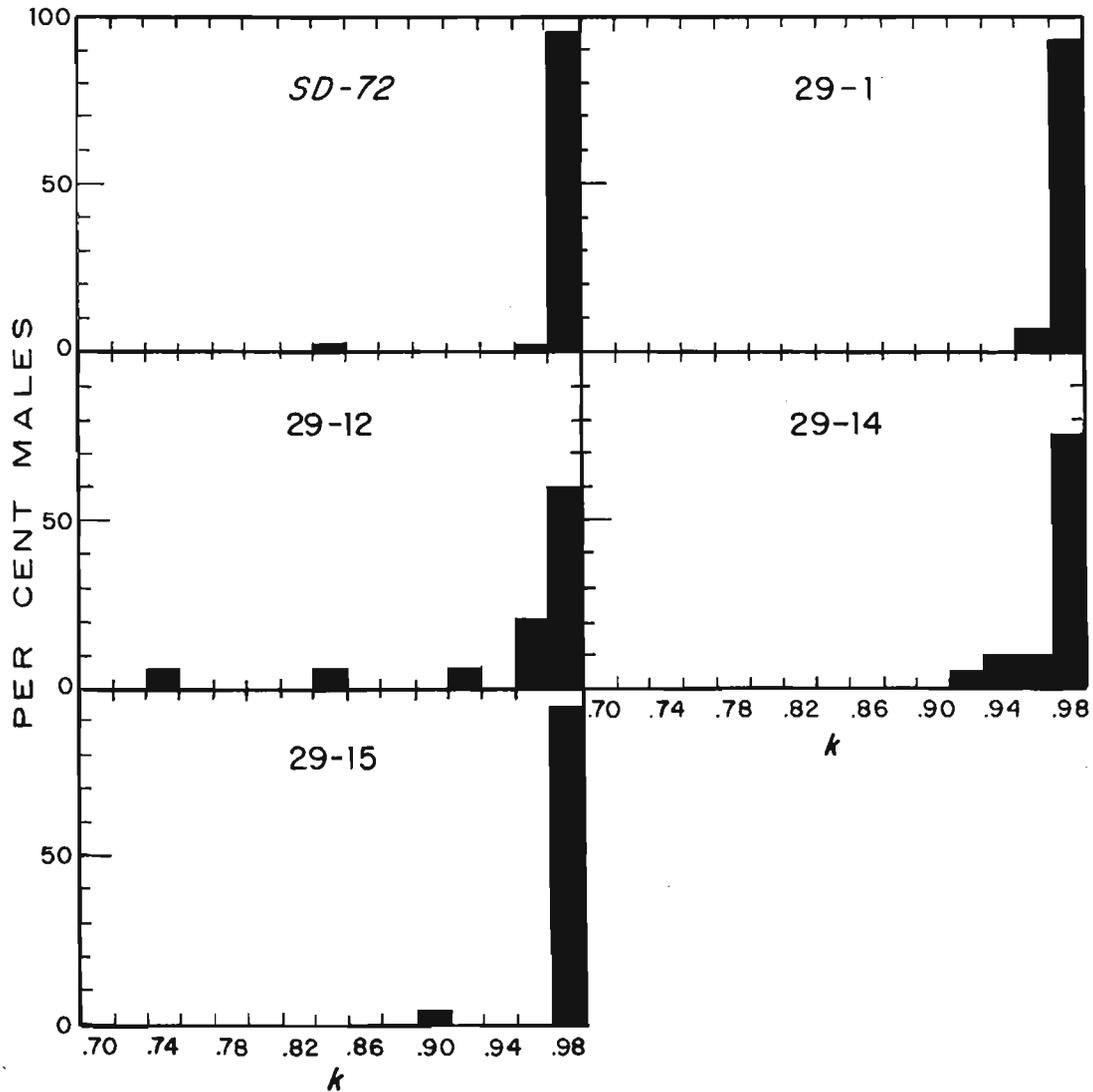
These observations can most satisfactorily be explained by a pre-meiotic recombinational event in the four SD-72/cn bw parental males, yielding brown exceptions either as a cluster or singly. This rate of spontaneous crossing over seems rather high, especially since In(2R)NS greatly reduces the rate of recombination in the right arm of II. However, the four events can most easily be attributed to individual events, and an explanation in terms of recombination seems preferable to one in terms of mutation at the bw locus.

The occurrence of a recombinational event implies, in the case of the exceptions tested, that the exchange occurred distal to In(2R)NS and to St(SD), but proximal to the bw locus. This limits the position of St(SD) to the region on a salivary map from 56F, the

distal breakpoint of the inversion, to 59E, the position of *bw*. It should be noted that although all four of the established brown lines would be expected to be equivalent, line 29-12 shows somewhat less distortion than the other three. This deviation is probably due to a further modification of SD action during the time in which the four lines were maintained separately in mass culture.

Figure I

The frequency distribution of *k* values from males heterozygous for *SD-72*, or a *bw*-bearing derivative of *SD-72*, and *cn bw* by *cn bw* females.



(This investigation was supported in part by PHS Training Grant No. GM 00337 and PHS Research Grant No. GM 12334 from the National Institute of General Medical Sciences.)