The northernmost subarctic drosophilid fauna is characterized by the relative richness in species number of the following taxa: Chymomyza, Scaptomyza, the obscura group (Nos. 28-33) and the virilis group (Nos. 41-45). It is noteworthy that the southernmost antarctic drosophilid fauna is monopolized by Scaptomyza (Brencic & Dobzhansky 1957). The relative percentages of the four chorological elements, calculated by excluding unidentified species, are as follows: Palaearctic (19 spp., 40.4%), Nearctic (12 spp., 25.5%), Holarctic (11 spp., 23.4%) and Cosmopolitan (5 spp., 10.6%). The relatively high percentage of Holarctic elements suggests that the intercontinental faunal exchange, possibly across Beringia, repeatedly occurred until relatively recent times in the northernmost subarctic region.

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Figure 1. Structure of the normal X chromosome (a) and the rearrangements pn2a and pn2b (b). Numbers designate complementation groups for the region which has been studied earlier through saturation by lethals (Gvozdev et al. 1975). The shaded rectangle denotes the heterochromatin right arm of the X chromosome. The arrow shows the direction in which gene inactivation proceeds.

complementation groups 1 (Pgd), 2 (wap), 3, 4 (pn), 7 (groups 5 and 6 were not analyzed, as the corresponding lethals had been lost) of the 2D-F region were localized in the right arm, and complementation groups 8 to 12 in the left arm (Figure 1).

In the In(1LR)pn2a and In(1LR)pn2b inversions the 2D-F region is divided into two units, each finding itself close to the XR heterochromatin (Figure 1), which is known to cause the position effect for euchromatic genes that have been moved to it. Indeed, one observes a strong position-effect inactivation of the genes in the right arm of the inversions, while the left-arm genes are not inactivated.

The inactivation of the Pgd gene in the pn2a rearrangement is sharply enhanced by the removal of the Y chromosome. In the females the Pgd gene activity in In(1LR)pn2a is about 50% of the normal level, as assessed by the 6PGD activity in crude extracts. The Pgd gene activity in X0 males amounts to 25% of the normal level. The heterochromatic Y chromosome, which is known to suppress position-effect inactivation, normalizes the Pdg gene is observed in the pn2b rearrangement: in males it comes to only 15% of the normal level. The inactivation of the pn gene is also stronger in the pn2b rearrangement.

The inactivation of genes corresponding to complementation groups 2, 3, 7 sharply reduces the viability of females that carry the inversions in a heterozygote with lethals for those groups. Their viability does not exceed 3% of the normal value. The inactivation is stronger in the case of the pn2b inversion.

The above results show, within the accuracy of the methods used, that the two rearrangements have the same structure but differ considerably in the intensity of the position effect. The causes of the difference in inactivation intensity are not clear. This difference might be due to autosomal modifiers. However, the difference in the position effect intensity persists when the 1A-2DE region, associated with heterochromatin, is transferred to another genotypic environment. This result suggest that the factors responsible for the difference are linked to the centromeric regions of the rearrangement.