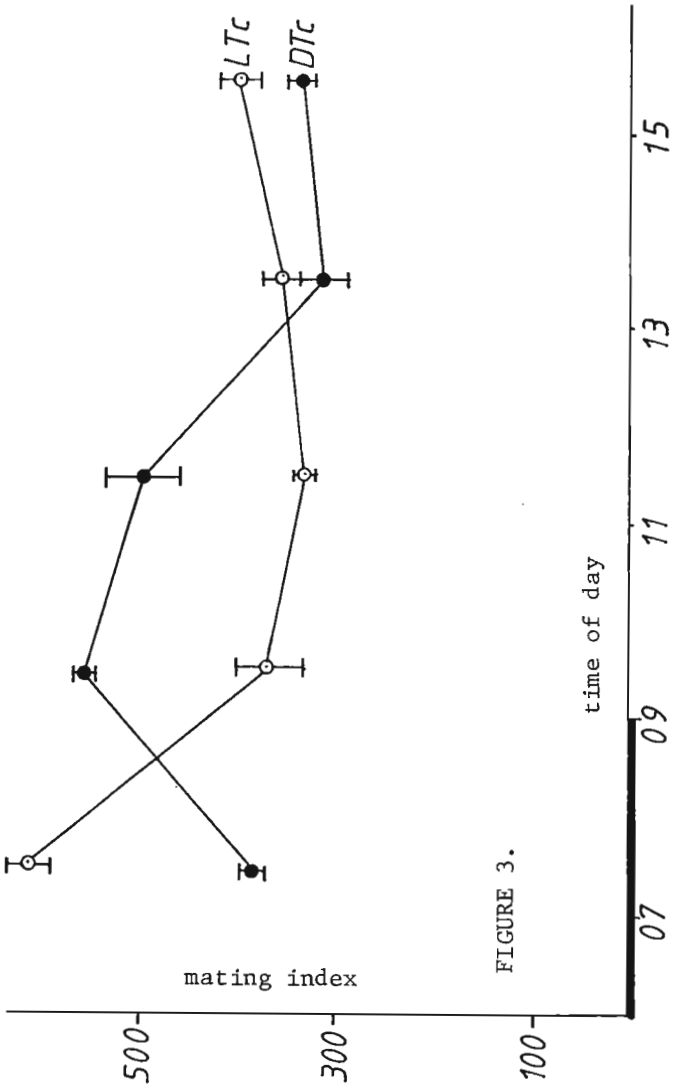

FIGURE 3.

Figures 1-3. Mean changes in mating propensity depending on the time of day at which observations were carried out for each derived "dark" line and its "light" control. Dark lines are denoted DORS (dark Oregon-RS); DTp (dark Tokyo-p); DTc (dark Tokyo-c). Light lines are LORS (light oregan-RS); LTp (Light tokyo-p); LTc (light Tokyo-c).

two of their aging to allow entrainment of mating rhythm. This allowed completion of one L:D cycle prior to experimentation. Observations of matings were carried out in the light.

The mating rhythm for each line was determined by measuring their mating propensity (Spiess et al. 1966), at two-hourly intervals during the light phase. For each time period, 20 four day old males, and 20 four day old females were introduced into a mating chamber similar to that designed by Elens & Wattiaux (1964), under constant conditions at a temperature of 20°C. The number of matings per five minutes interval was scored during a thirty minute observation period. This was repeated about 8 times for each line. Mating propensity was estimated as an average index of mating speed (Spiess et al. 1966). Mating propensity results were used to construct a mating activity rhythm for each line and its control as shown on Figures 1, 2 and 3.

Each dark population and the stock population from which it was derived have distinct rhythmicities. This data is relevant in multiple-choice experiments where crosses are performed between the light and dark-derived populations after 24 years of isolation. Such experiments may be used to calculate time periods when an estimation of the isolation index will be unlikely to be influenced by different mating propensities of the two populations.

References: Elens, A.A. & J.M. Wattiaux 1964, DIS 39:118-119; Kilias, G., S.N. Alahiotis & M. Pelecanos 1980, Evolution 34:730-737; Spiess, E.B., B. Langer & L.D. Spiess 1966, Genetics 54:1139-1149.

Harper, A.A. & D.M. Lambert. Auckland University, New Zealand. Disruptive selection for homogamy in mutant strains of Drosophila melanogaster.

Selection for increased homogamy in the mating of two mutant Drosophila melanogaster strains was conducted according to experimental procedures of Koopman (1950). Two laboratory mutant strains of D. melanogaster were used. Orange (or^{49h}), in which the phenotype is distinguished by bright orange eye colour and purpleloid (pd) which has a maroon eye colour. The progeny of an orange/purpleloid heterogamic mating are phenotypically the red of wild type.

Selection experiments (of two lines A1 and A2) were maintained at a temperature of 25±1°C and in a constant LD12:12 cycle. The virgin flies, collected within six hours of eclosion, were all aged for three to four days before mating. A glass bottle (300ml) was used as a mating chamber. Fifty virgin females and fifty virgin males of each mutant strain were mated.

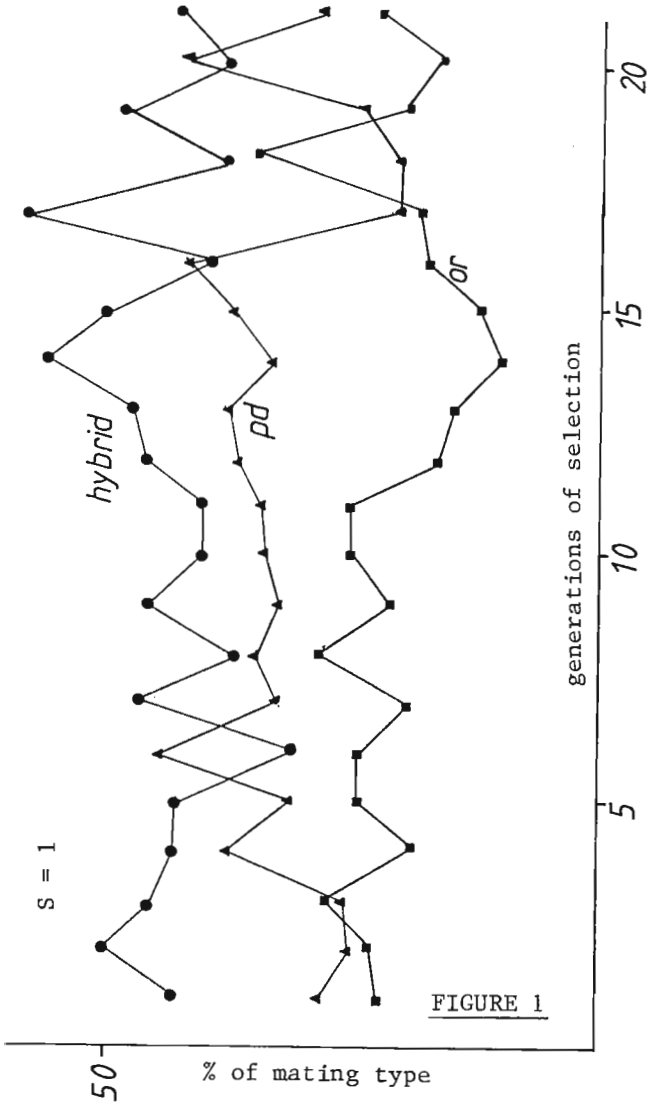

FIGURE 1

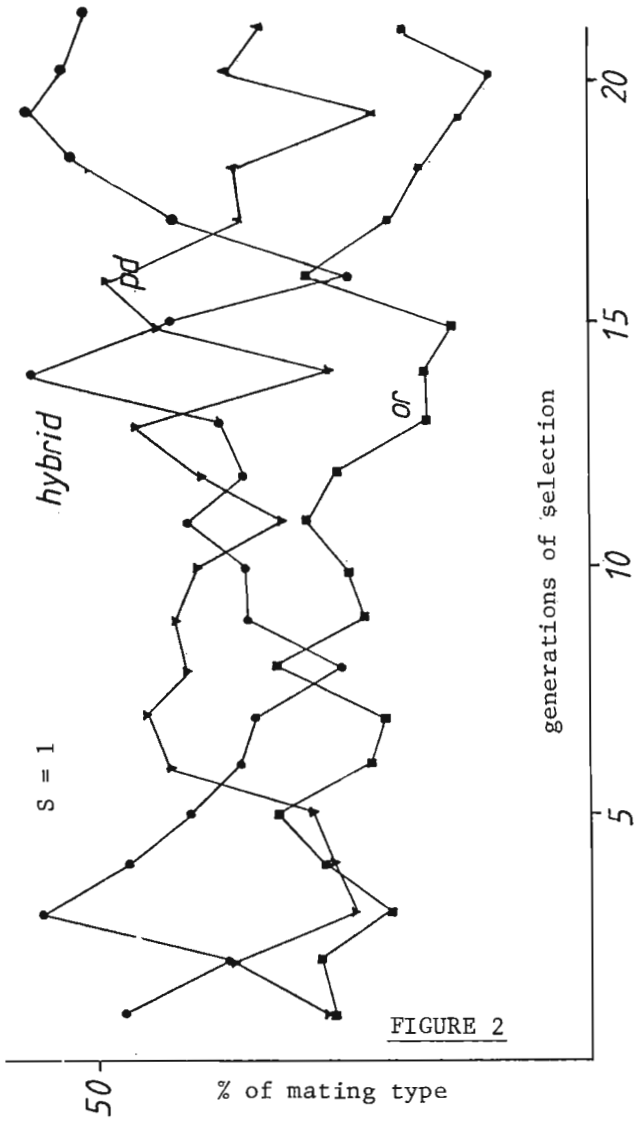

FIGURE 2

Figures 1 & 2. Resultant progeny for each generation of selection in lines A_1 (Figure 1) and A_2 (Figure 2).

The flies were introduced without etherisation through a funnel placed in the opening. The funnel was then removed and the entrance sealed with a moist cottonwool plug to prevent dessication of the flies. The bottle was placed on its side with overhead lighting, on a white surface to minimise shadows. After 8 to 10 hours approximately, the flies were etherised. Preliminary experiments indicated that this was a suitable time period for mating in which 90 to 100 percent of the females became inseminated, but with negligible levels of double insemination. Males were then discarded and females were placed singly in food vials where they laid their eggs and their progeny developed.

Phenotypically wild-type progeny were from heterogamic matings, i.e., hybrids. As there was complete selection against the hybrids (s=1), fifty of each sex of each mutant were taken from the progeny of homogamic matings and used for the next generation. Each generation took 14 to 16 days to complete.

The results of 21 generations of selection are illustrated in Figure 1 (line A1) and Figure 2 (line A2), which show the percentage of progeny for each genotype in each generation. No clear preferences for homogamy among the orange and among the purpleloid individuals were detected. The percentage of hybrid progeny fluctuated considerably each generation and there was no observable decreasing trend in numbers. In both selection lines at generation 21, while hybrid individuals constituted 48% and 49% of the population, purpleloid individuals

made up 29% and 32%, and orange individuals were only 23% and 19% of the total. The high number of heterogamic matings in the population at generation 21, is not supporting evidence that selection has increased homogamic tendencies. However, a significant difference is apparent between the total matings for each strain.

Reference: Koopman, K.F. 1950, Evolution 4:135-148.

Harper, A.A. & D.M. Lambert. Auckland University, New Zealand. Modified experiments which select for homogamy in mutant strains of Drosophila melanogaster.

Selection for homogamy in which progeny from heterogamic matings are discarded is a case in which these individuals have an artificially lowered fitness. Under these conditions, changes in frequencies of the homogamic individuals may be modelled according to the population genetical process of heterozygote disadvantage (Li 1955). With heterozygote disadvantage there is an unstable equilibrium and the frequency of either homozygote goes to 0 or 1, depending on the initial frequency. This outcome is not observed in previous experiments where heterogamic matings suffer a disadvantage because parity of numbers between the two pure strains is artifically maintained(Paterson 1978). Modified experiments which allowed this alternative outcome to act were conducted.

The Koopman (1950) experimental procedure which selects for an increase in homogamic matings was redesigned. The relative proportions of progeny types each generation were used to determine initial parental numbers for the following generation. Consequently, equal numbers were not necessarily returned each generation. Two mutant strains, orange (or^{49h}) and purpleloid (pd) were used. Under selection, individuals of each mutant strain were progeny from heterogamic matings. Where the two strains mated heterogamically, individuals were wild type (red eye) due to inter-allelic complementation. This provided an accurate means to determine progeny types throughout the duration of the experiment. Experiments were conducted

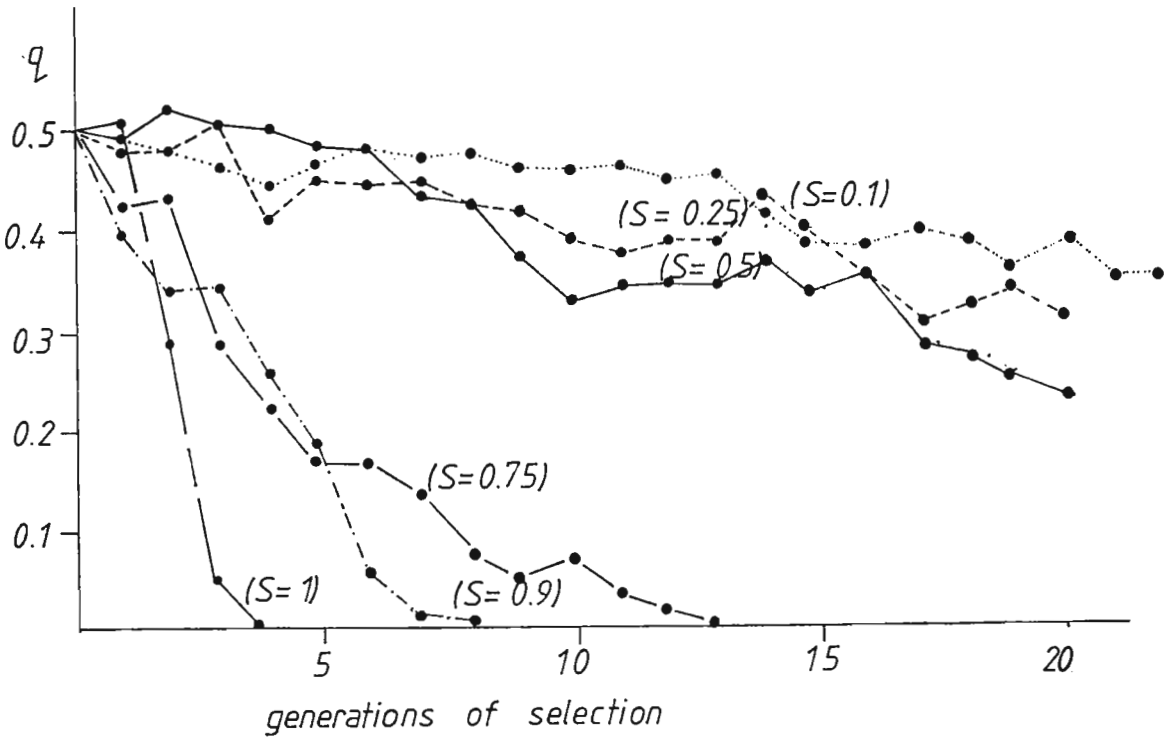

Figure: Summary graph of the change in frequency of allele q causing the heterozygote disadvantage. Selection coefficients for the heterozygotes are indicated.