Band, H.T. Michigan State University, East Lansing, Michigan. Four decades of natural selection.

Darwinian natural selection typically implies directional selection. To date reported instances of genetic changes brought about by directional selection pressures exerted by climatic changes have been rare. In biology, man is still considered to be the primary agent effecting environmental changes (Crow, 1971). As noted by Lamb (1966) between World War I and World War II it was widely believed that climate was static except on the geological time scale. This was the period of classical genetics and the development of classical mathematical population genetics, which was incorporated into population ecology.

The study of the South Amherst, Mass. D. melanogaster natural population now emerges as the study of a population in a slowly changing climate. Regular shifts in decade averages for daily temperature range in summers (Band, 1971) reflect a trend toward more days in the wider range categories.

	1930's	1940's	1950's	1960's
Narrow (2-20°F)	334	289	261	225
Intermediate (21-25°F)	243	254	248	234
Wide (26-44°F)	343	377	411	461

Periods of genetic changes reflecting changes in lethal and semilethal frequencies are: 1938-1946, 1947-1961, 1962-1966, post-1966. In the first, second chromosome lethal and semilethal frequencies fluctuated around 48.8%, in the second around 33-34%; the third was marked by increased developmental homeostasis and resistance of le + sle frequency to decline followed by plunge to 16-17%. Post-1966 le + sle frequency has been rising. The number of days in the different temperature range categories in the different periods in summers are given in Table 2.

Table 2. Mean number of days in different temperature range categories in the different periods of genetic changes in the Amherst D. melanogaster population.

	1930-1946	1947-1961	1962-1966	1966-1969
Narrow	32	26	19	25
Intermediate	25	25	21	24
Wide	35	41	52*	43

*P<05 that significantly more days are in the wide range category. This is the case for all 5 summer.

Heterozygotes containing drastics have been found to have higher viability in narrow temperature ranges (Band, 1963; Oshima, 1969), those free of drastics to have higher viability in wide range conditions (Band, 1963, 1969). The behavior of the population 1962-1966 has provided an example of genetic homeostasis and population adaptation to a more severe climate (Band, 1971). The environmental data thus give support to the hypothesis that selection can be disruptive within summers, directional over the longer term (Band, 1971). They also provide further evidence that such recessive deleterious variants may actually be adaptive in heterozygous condition, hence are maintained in the population in response to the dynamic environment.

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