

Mange, A. P. University of Massachusetts, Amherst, Mass. Larval density versus sex ratio in *D. melanogaster*.

This note summarizes the results of two comparable experiments done at different times. All flies were Canton-S raised at 25° on cornmeal-molasses-yeast-agar food in 25 x 95 mm shell vials and aged

5-7 days at the time of egg laying. To be brief, the methods and definitions of competitive level (which differed slightly) are given for the second experiment only.

**Methods.** Vials contained 10.0 cc of food dispensed accurately by a Brewer automatic pipetter. Groups of 50, 100, 150, or 200 pairs were transferred hourly to fresh food. This procedure yielded 48 vials containing a widely varying number of eggs (from 11 to over 1000) all laid within a period of several hours. The sex distribution of the offspring was tallied twice a day from the first eclosion (9th day) to exhaustion of the vials (45th day for the most tardy fly).

**Definition of larval competitive level.** For each vial, the average time of eclosion,  $T$ , was plotted against the total number of offspring per vial,  $N$  (see Figure 1). As indicated, an arbitrary division of these points into five levels of competition was made. (Histograms of the average number of flies emerging per day for each of these five levels were similar in shape, but shifted progressively on the time axis. All histograms were somewhat skewed to the left.) The following tabulation compares some characteristics of the five groups:

Competitive level	Number of vials	Total flies	Average flies per vial	Average time to eclosion	Percent males
weak	14	712	51	9.8 days	52.4
moderate	13	2,716	209	11.7 days	46.9
strong	6	2,065	344	14.6 days	50.2
very strong	11	5,737	522	18.7 days	49.3
overwhelming	4	1,549	387	21.6 days	38.5

**Sex ratio of the five competitive levels.** Figure 2 summarizes the changes that occurred in sex ratio as a function of competitive level for both experiments. Although the results of the two experiments are very similar, no simple relationship between sex ratio and competitive level seems to exist. No significant differences in sex ratio exist for any corresponding pair of points except in the overwhelming category ( $P = .02$ ) but these points are both considerably depressed. The over-all sex ratios in the first experiment (49.42% male,  $N = 5,285$ ) and the second (47.81%,  $N = 12,779$ ) are just significantly different ( $P = .05$ ). This might suggest some cultural change over the two experimental time periods. The general parallelism exists despite this change -- whatever its cause.

The observed sex ratio changes with competitive level, while irregular, appear repeatable and are significant. The pooled sex ratio for the two experiments for moderate competition is significantly lower than weak competition ( $P = .005$ ), and the strong level is significantly higher than moderate ( $P = .003$ ). These ups and downs suggest multiple causes for the changing sex ratio -- perhaps differing food requirements and differing vulnerability to toxic waste products for the two sexes. The effects of varying densities on sex ratio in *Drosophila* species have not been fully investigated. Morpurgo, et al. (1955, DIS 29:145), for example, suggest that more male than female larvae die under crowded conditions, but Jones and Barker (1966, Genetics 53:313) report the opposite. A review of crowding effects on sex ratio in diverse species is provided by Anderson (1961, Oikos 12:1).

The results presented here suggest that degree of crowding should be considered in experiments involving sex ratio in *D. melanogaster*.

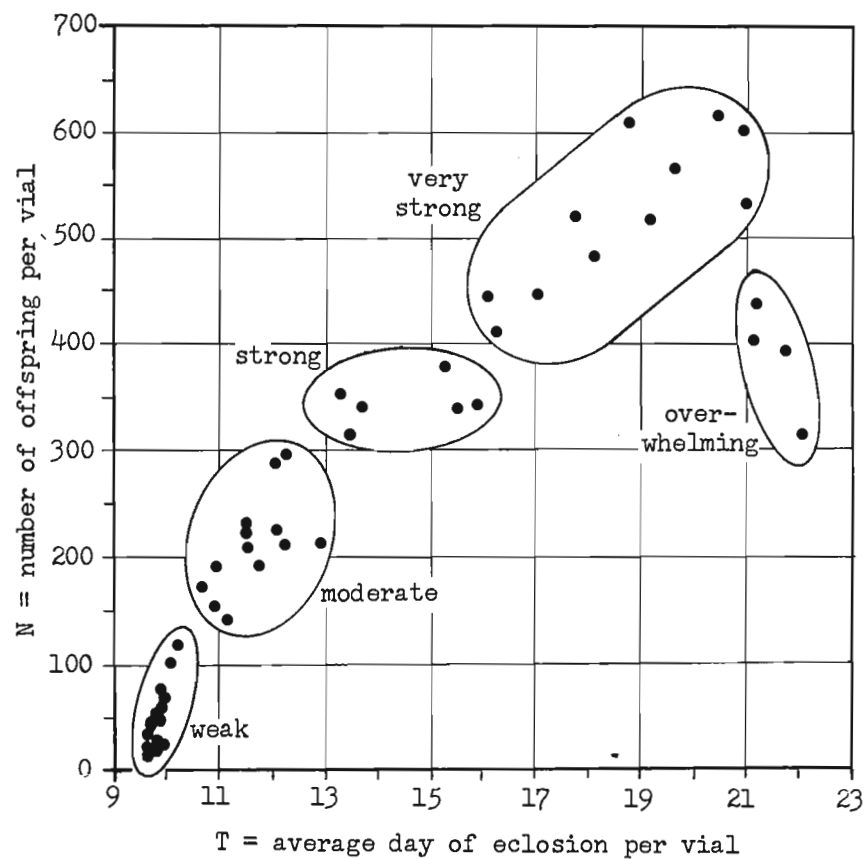


Figure 1. Assignment of the 48 vials into five levels of larval competition. (Second experiment only)

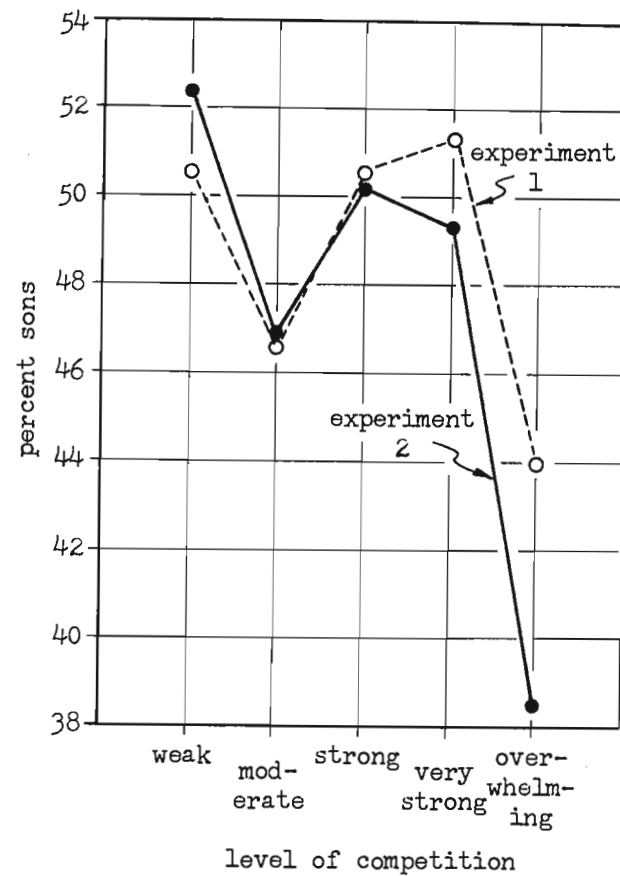


Figure 2. Sex ratio versus competitive level.