Summary. The 1980 observations indicate: (1) the mean dispersal distances per day of mycophagous drosophilds among artificial baits was less than the mean distance between baits, and much less than the mean distance between naturally occurring mushrooms; (2) the distribution of dispersal distances for **D.falleni** among baits was strongly leptokurtic (skewed), i.e., many marked adults clustered among the closest baits, while some marked adults dispersed great distances following release; (3) there was temporal variation in the attractivities of individual bait locations; (4) variation in body size parameters was correlated with population density of **D.falleni**; (5) there was no correlation between **D.falleni** body size and dispersal distance (less than 100 m); and (6) **D.falleni** females from the early summer population were mostly mature, while females from late June through late August populations were mostly immature adults.

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Table 3. Seasonal variation in reproductive condition for **D.falleni** The proportion of females for each stage of maturity are listed for each time interval.

Stage of reproductive maturity (females)	5/29-6/15	6/25-27	7/8-11	8/7-13	8/25
Immature ovarioles	0.12	0.63	0.57	0.70	0.59
Mature ovarioles, immature eggs	0.12	0.07	0.03	0.13	0.06
Mature ovarioles, mature eggs	0.76	0.30	0.40	0.17	0.35
	n=26	n=30	n=30	n-23	n=17

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Response of dysgenic and non-dysgenic populations to malathion exposure.

The rapid-invasion hypothesis explains the presence of P-elements in recently sampled **D.melanogaster** strains and their absence in older laboratory strains by proposing that transposable elements of the P-family have recently invaded **D.melanogaster** populations and rapidly increased in frequency (Kidwell 1983). Although positive selection for individuals containing P-elements is not necessary to explain their rapid increase in frequency (Hickey 1982), it is possible that they create an advantage to their host in a manner similar to that caused by selectable genes on a bacterial plasmid.

In particular, Bregliano & Kidwell (1983) suggested that transposable elements may have been involved in the recent increase in the insecticide resistance of Drosophila and other insects. We tested this idea by exposing dysgenic and non-dysgenic laboratory populations of **D.melanogaster** to malathion, a commonly used organophosphorus insecticide. A lab population synthesized from recently (1976) caught flies developed polygenic resistance to malathion when selected under similar conditions (Singh & Morton 1981). The two populations for the present experiment were maintained according to a scheme of reciprocal matings suggested by D. Hickey in which the genetic backgrounds would be similar, except that dysgenesis was induced in one case but not in the other (Figure 1). The P-strain (Harwich) and the M-strain (Canton S) were provided by M. Kidwell, and the experimental populations (in 2 replicates) were grown in 8 oz bottles on a banana food at 24°C (12 hr day - 12 hr night).

The malathion LC_{50} (adults, 24 hr feeding; see Holwerda & Morton 1983) of the Harwich strain (9.7±1.5 μM) was somewhat greater than that of the Canton S strain (6.0±0.6 μM). The LC_{50} of both experimental populations increased during the first 3 generations of equilibration without malathion exposure to values greater than either parental strain (Figure 2). Selection for malathion resistance was begun (generation 0, Figure 2) by splitting the populations in half and including 1 μM malathion in the food of the "selected" replicates. The malathion concentration was increased in 1 μM steps (Figure 2, top) as resistance developed, until by the 8th generation the dysgenic and non-dysgenic populations had diverged, and only the concentration for the non-dysgenic population could be increased. No progeny were obtained at 4 μM from the dysgenic, selected population. The experiment was continued for 2 more generations at different malathion concentrations, then terminated as it was obvious that resistance was increasing more rapidly in the non-dysgenic, selected population. At the 9th generation, samples of flies from each of the

Non-dysgenic population

M♂♂ F1 ♀♀ F2 ♂♂
x → x → x → etc.
P♀♀ M♂♂ P♀♀

Dysgenic population

P♂♂ F1 ♂♂ F2 ♂♂
x → x → x → etc.
M♀♀ P♀♀ M♀♀

Figure 1. Crosses used to produce a population in which P-element induced transpositions were active every other generation (dysgenic, bottom) and another with the same genetic background in which they were not induced (non-dysgenic, top).

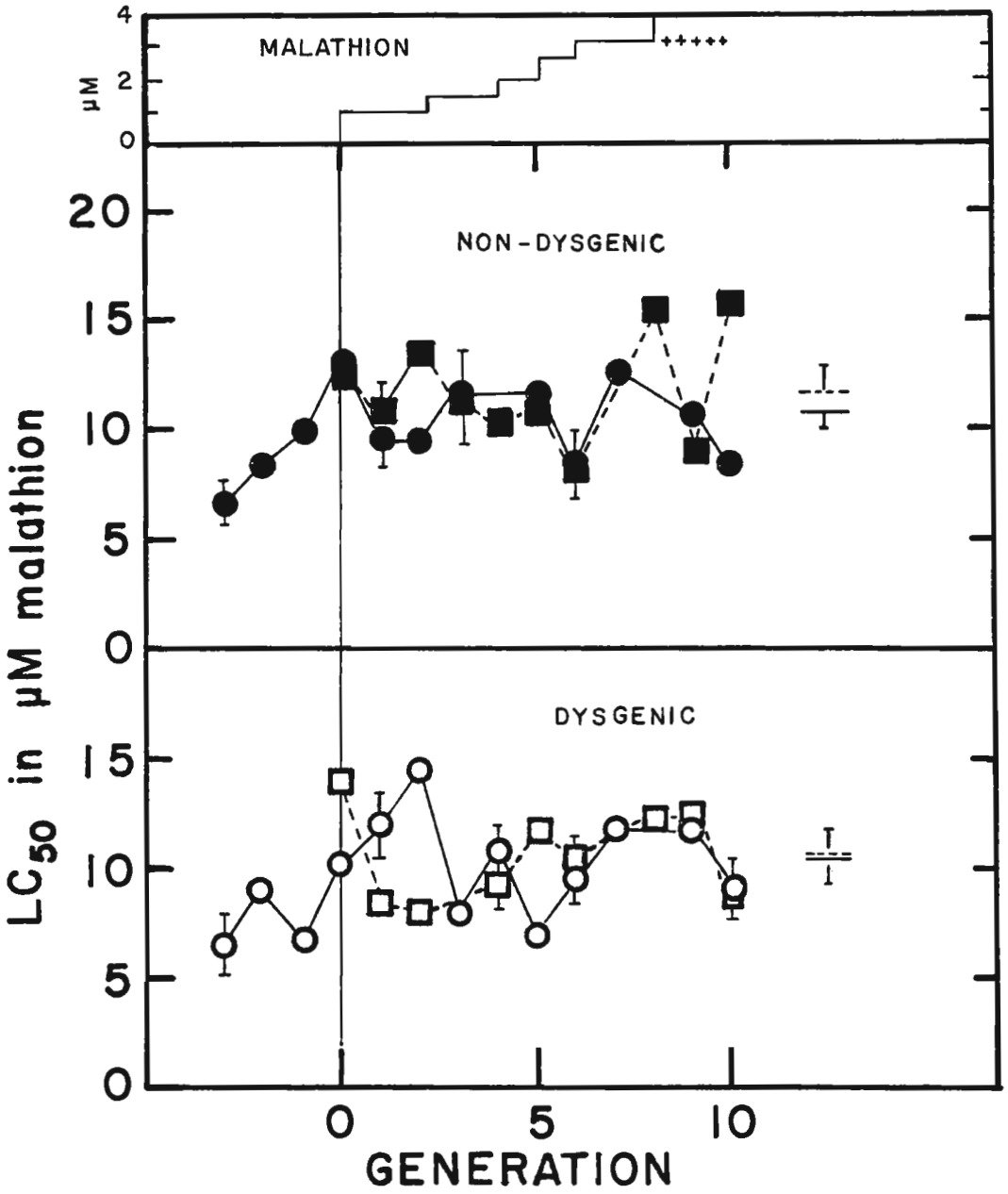

Figure 2. Adult malathion resistance of non-dysgenic (solid) and dysgenic (open) populations. Each generation consisted of one in the series of crosses given in Figure 1. Selection was begun at generation 0, and the initial malathion concentration is indicated at the top. At generation 8 the two populations diverged; +++ indicates that the concentration remained at 3 μM in the dysgenic population. The resistance of the selected part of each population is indicated by the squares and dotted lines, the unexposed part by the circles and solid lines. The lines and standard error bars at the right side of the figure indicate the average LC_{50} of each population over the course of the experiment.

Table 1. Malathion resistance of populations after 9 generations.

Population	Tested gener.[a]	Egg-to-pupa-survival (μM) 0	1	2	3	Adult LC_{50} (μM)[b]
Non-dysgenic Control	2(1C)	0.88	0.44	0.01	<0.002	10.8 (±1.0)
Non-dysgenic Selected	1(0)	0.17	0.07	0.33	0.21	Not Done
	2(1C)	0.86	0.46	0.36	0.19	11.5 (±0.8)
	2(1M)	0.63	0.64	0.48	0.27	>25
Dysgenic Control	2(1C)	0.91	0.20	<0.01	<0.002	14.1 (±0.8)
Dysgenic Selected	1(0)	0.51	0.61	0.38	0.02	Not Done
	2(1C)	0.73	0.62	0.32	0.08	12.9 (±1.0)
	2(1M)	-----Not Done -----				14.1 (±1.0)

a=After 9 generations (see Fig. 1) flies were allowed to mate among themselves and progeny tested after the number of generations indicated. Thus (0)=selected flies which were directly exposed to insecticide (4 μM for non-dysgenic selected, 3 μM for dysgenic selected) laid eggs onto banana food; (1C)=second generation tested after growth for one generation on banana food; (1M)=2nd generation tested from survivors after growth for one generation on banana food containing 3 μM malathion.
b=Standard error is bracketed.

4 populations and 2 replicates were removed from selection and allowed to mate among themselves for 2 additional generations (grown on either malathion-containing or normal banana food). Eggs and adults were tested for malathion resistance (Table 1).

The following points can be made from this data: (1) the selection populations were polymorphic for resistance as expected since they were being mated each generation to susceptible, unexposed flies. (2) Egg-to-pupa survival increased more rapidly than adult survival (changes in the latter were not significant). (3) Eggs laid by selected flies which had been reared on malathion-containing food survived poorly, even though they were not subsequently exposed to malathion. Egg viability was lower for the non-dysgenic, selected population (17%) than for the dysgenic, selected population (51%), perhaps because the former had been exposed to the greater malathion concentration (4 μM vs 3 μM). Paradoxically, egg survival from non-dysgenic flies was better on 3 or 4 μM malathion than on 0 or 1 μM. (4) After growth on normal food for one generation, egg survival (3 μM) for the non-dysgenic population was greater than that of the dysgenic. (5) LC_{50} values for adults two generations removed from selection were not significantly different (selected vs non-selected); however, if a generation of selection intervened, the non-dysgenic, selected flies were more resistant. These results indicate that the non-dysgenic population responded more rapidly to malathion selection than the dysgenic. Why this should be so is not clear, but the outcome was inconsistent with the hypothesis that insecticide resistance will increase more rapidly for a population in which P-element transposition is active.

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The influence of parental age to sex ratio on their **Drosophila melanogaster** progenies.

In experimental populations of **D.melanogaster** the influence of parental age to the secondary sex ratio of their progenies has been studied.

In all experiments the males have been individually crossed to a number of virgin females. After 48 hr they were removed and each female was separated to a 20 cc vial where progenies were grown under noncompetitive conditions (13% yeast medium plus agar and sugar, 25°C). Four types of crosses have been made (Table 1). At the beginning of the experiment, young parents were 1-3 days and old ones 21-23 days of age. There were ten replications, but only those where males have inseminated four or more females (4-8) were taken in account. The sex ratios among the progenies of individual females were quite variable. This implies that both sexes are contributing equally to the sex ratio of their progenies.

The influence of parental age has been studied in all crosses (n=142) which have been divided into three groups: (1) Young males were crossed to young (A) and afterwards to old females (B). (2) Young males were crossed to young females (A), and aged together with other females, to be crossed (when more than 20 days old) to young virgin females (C). (3) A separate group of males were aged (together with females) and crossed (when 21-23 days old) to separately aged virgin females (D).