Pfriem, P. University of Tübingen, Germany (FRG). Eclosion time and progeny size of twelve D.obscura group species in relation to different temperature.

The D.obscura species group (subgenus Sophophora) can be divided into two subgroups on the basis of morphological traits; the obscura subgroup and the affinis subgroup. Lakovaara and Keränen (1980) have shown recently by using allozyme differences that the obscura subgroup can be further divided into the pseudoobscura subgroup and the obscura subgroup. By evaluating distance matrices the authors further found that the pseudoobscura subgroup is more related to the affinis subgroup than to the obscura subgroup s.str. To obtain additional information about the relationship between the D.obscura group species we have tested the fitness pattern of twelve species in terms of eclosion time and progeny size at different temperatures.

From laboratory strains of twelve obscura group species vials each containing ten females and ten males (all about ten days old) were kept at 18°C for five days. Five females of each of the cultures were then transferred to a new vial with standard wheat medium and allowed to lay eggs at 23, 18 or 14°C. The females were discarded when the first larvae appeared, respectively. Daily counts of hatching flies were made subsequently from those cultures in which all females survived. Laboratory strains from the following species were used in the experiment: (1) subgroup obscura s.str.: D.subobscura, D.obscura, D.tristis, D.subsilvestris (all derived from natural populations near Tübingen in 1978), D.ambigua (Austria 1973), D. bifasciata (Norway 1975): (2) subgroup pseudoobscura: D.pseudoobscura, D.persimilis, D.miranda; (3) subgroup affinis: D.affinis, D.algonquin, D.azteca (the latter six species, all common to the Nearctic region, were kept in our laboratory since 1980). For comparison a laboratory strain of D.melanogaster (Sicily 1978) was also tested.

Ranges and means of eclosion time are given in Table 1. The values in the table base on counts of three cultures at each temperature. Mean progeny sizes are given in Table 2. The mean eclosion time, as expected, increases with the decrease of temperature (Table 1), however the correlation observed is not linear; the average increase in eclosion time from 18 to 14°C is nearly twice that from 23 to 18°C (average mean eclosion time at 23°C: 20.0d, 18°C: 31.8d, 14°C: 50.8d). Further, at all temperatures the time for eclosion is longer for the obscura group species than for D.melanogaster. If the time elapsed from the transfer of the females to the appearance of the first offspring fly is used for comparison the averages are for the obscura species: 15.0d, 22.3d, 40.5d and for D.melanogaster: 11d, 14d, 36d at 23, 18 and 14°C, respectively. The species of the obscura group most similar to D.melanogaster at all three temperatures is D.subobscura. The eclosion pattern of the affinis group species differs markedly from that of all the other species in two ways. First, there exists a rather narrow range of eclosion time for the three affinis species (Table 1). This phenomenon is more pronounced at 23 than at 18°C and 14°C. Second, the average size of progeny per culture is the lowest one observed (Table 2). Average range of eclosion time and progeny size appear

Table 1. Eclosion time (in days) for D. obscura group species at 23, 18 and 14°C.

Species	Range of ecolosion time			Mean eclosion time					
	23°C	18°C	14°C	23°C		18°C		14°C	
	min-max	min-max	min-max	$\bar{x}$	s^2	$\bar{x}$	s^2	$\bar{x}$	s^2
subo	14 - 35	21 - 56	31 - 57	20.9	(7.41)	36.5	(31.47)	40.1	(11.54)
obsc	15 - 31	22 - 45	38 - 60	20.1	(5.55)	32.6	(14.35)	46.0	(15.85)
tris	16 - 35	21 - 35	43 - 63	22.8	(12.11)	28.1	(5.21)	52.9	(5.35)
subs		23 - 42	38 - 68			29.6	(9.77)	50.3	(32.33)
ambi	15 - 32	21 - 45	37 - 56	21.7	(7.90)	30.3	(14.76)	53.6	(7.79)
bifa	16 - 34	23 - 57	40 - 61	22.0	(12.30)	35.6	(27.36)	50.5	(6.60)
pseu	14 - 35	24 - 63	42 - 84	22.2	(8.47)	42.4	(21.94)	59.5	(37.84)
pers	15 - 32	23 - 63	42 - 64	19.7	(5.26)	35.0	(33.40)	52.5	(15.12)
mira	16 - 29	24 - 41		21.0	(4.10)	30.3	(10.84)		
affi	15 - 21	21 - 31	43 - 61	16.6	(1.06)	24.7	(3.16)	55.3	(6.16)
algo	15 - 27	22 - 42	41 - 65	17.1	(2.29)	29.4	(12.71)	45.2	(8.84)
azte	14 - 23	23 - 39	50 - 61	16.0	(1.57)	26.9	(8.16)	52.6	(3.34)

Table 2. Progeny size per five females of the various D.obscura group species at 23, 18 and 14°C.

Species	23°C	18°C	14°C	Average
subo	189.7±70	312.7±26	129.0±52	210.4±38
obsc	205.7±20	333.0±37	85.7±23	208.1±38
tris	62.7± 6	117.3±16	149.0±64	109.7±23
subs		128.0±43	60.7±20	87.6±24
ambi	194.7±22	163.7±32	147.3±67	168.6±23
bifa	94.0±19	296.0±39	156.3± 3	182.1±32
pseu	173.0±24	258.3±15	323.0±57	251.4±28
pers	137.0±17	188.0±28	208.3±35	177.8±17
mira	84.0±32	79.0±23		82.2±18
affi	32.0±12	24.0±15	13.5± 5	24.4± 7
algo	43.7± 9	64.7±16	41.0±17	49.8± 8
azte	89.7± 3	53.3± 8	57.0	69.4± 8

to be correlated with each other and a regression analysis using the data from individual cultures (not given here) gives a high significant correlation ($r=0.763$ with 33 d.f., $p<0.001$).

The differences between the subgroups obscura s.str. and pseudoobscura are less drastic. However, for the species of the pseudoobscura phylade the minimum eclosion time at 18°C starts later than for all the other species tested (Table 1). The average values are 23.7±0.3 days for the pseudoobscura species and 21.9±0.3 days for the other species. Further, for the species D.pseudoobscura and D.persimilis the average size of progeny per culture increases with decreasing temperatures; progeny sizes of almost all other species are lower at 14 than at 18°C (Table 2).

In conclusion it can be said that the ecologically relevant characters "mean progeny size" and "minimum eclosion time" at 18°C can be used to subdivide the species of the D.obscura group in subgroups which correspond with those derived from allozyme variation studies.

References: Lakovaara, S. & L.Kerännen 1980, Genetika(Yugos.) 12:157-172.

Portin, P., M. Eramaja & E. Luoma-aho. University of Turku, Finland. Test of the effect of the Y chromosome on quantitative characters of Drosophila melanogaster.

The Y chromosome of Drosophila melanogaster is wholly heterochromatic and is believed to be genetically nearly completely 'inert'. It is known to carry only the bobbed gene which is the locus of rRNA-genes, and also a number of genes necessary for male fertility.

In spite of the 'inertness' of the Y chromosome the addition of extra Y to the chromosome complement of D.melanogaster females or males in many cases almost completely suppresses variegation of euchromatic genes which have been moved in the proximity of heterochromatin by structural rearrangements of chromosomes (Schultz 1939). Mather (1944) also suggested that the Y chromosome contained polygenes that could affect the expression of quantitative characters such as number of sternopleural chaeta. The evidence for this was based on the observation that the mean number of sternopleural chaeta was different in stocks which were presumed to differ only in their Y chromosome.

In the present study Mather's hypothesis was tested by comparing the mean numbers of sternopleural chaeta and chaeta in the last abdominal sternite in females and males of D. melanogaster carrying or not carrying and extra Y chromosome. The presence of the extra Y in the chromosome complements was verified by making use of the suppressive effect of the extra Y on variegation. In $(1)w^{m4}/In(1)w^{m4}/Y$ females (XXY-females) and $In(1)w^{m4}/Y/Y$ males (XYY-males) have wild-type eyes while $In(1)w^{m4}/In(1)w^{m4}$ females (XX-females) and $In(1)w^{m4}/Y$ males (XY-males) have mottled eyes. XX- and XXY-females as well as XY- and XYY males were picked up from an $In(1)w^{m4}$-stock in which an extra Y chromosome was segregating. Two independent experiments were made. In both of them the numbers of sternopleural bristles as well as the number of bristles in the last abdominal sternite were counted in at least 30 XX- and XXY-females and 30 XY- and XYY-males.

The mean numbers of sternopleural bristles and bristles of the last sternite in XXY- and XX-females as well as in XYY- and XY-males in the two experiments are given in Table 1. As appears from the table, there were no significant differences in the bristle numbers between XXY- and XX-females or XYY- and XY-males. Thus the results suggest that the extra Y chromosome has no effect on the numbers of sternopleural bristles or bristles of the last sternite.