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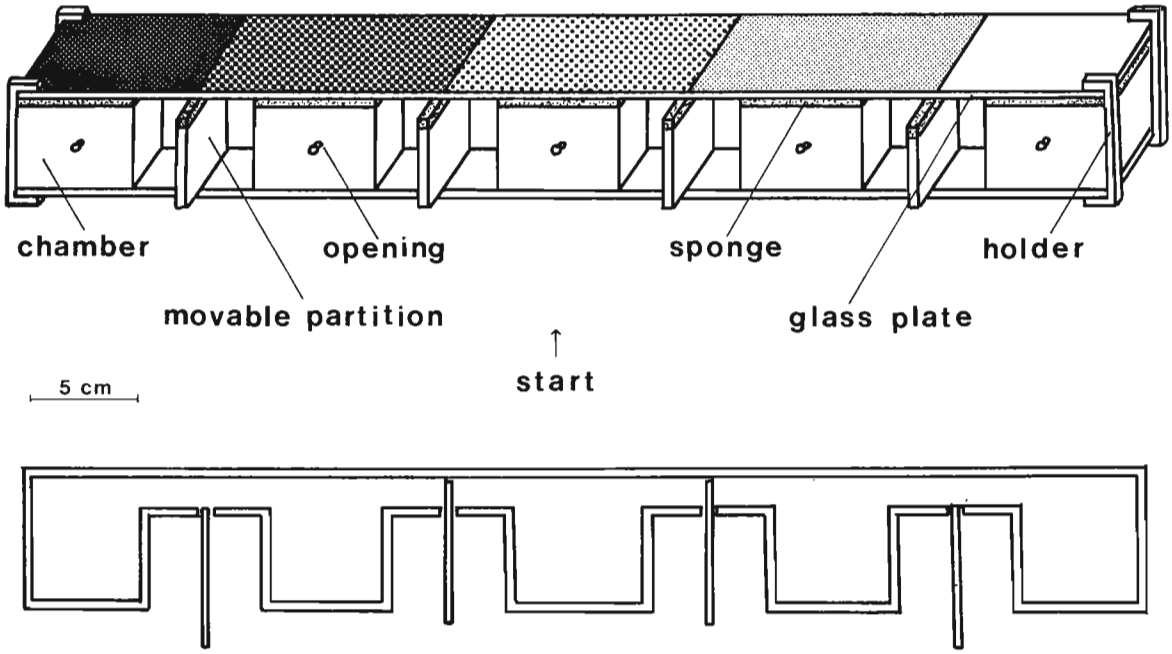
Maze for the study of phototaxic behavior in Drosophila.

In 1971 we described in DIS a maze in which it is possible to regulate, observe and measure the phototaxic behavior of Drosophila flies in laboratory conditions. It was composed of five interconnected chambers each lighted by different light intensity. The phototaxic behavior of each individual was measured by the light intensity of the chamber in which that individual was at the end of the test. By using somewhat modified version of this maze, we succeeded in completing a very successful selection of D. subobscura individuals for preference of "low" (30-300 lux), "medium" (1300-3200 lux) and "high" (6500 lux) light intensities. In such a way we obtained three laboratory strains of D. subobscura which were very different regarding their distribution in this maze (Kekić and Marinković 1974). The modified maze which we want to describe now, although not basically different from the previous two, makes a study of phototaxic behavior faster and easier to a great extent.



The maze is composed of five 5 x 5 x 2 cm chambers, which are connected by 5 x 1 x 2 cm corridors (see diagram). In the middle of each corridor there is a movable partition by which we can permit or stop the free movement of Drosophila individuals between chambers. In each of the chambers there is an opening through which it is possible to manipulate flies in the chamber (to introduce, to etherize, etc.). This part of the maze is made out of wood. The maze is covered by an 0.5 cm glass plate, fastened by holders. As light sources, the 20 W neon tubes are used, and gradient of light intensity is realized by the paper cover of different thickness which is put on the glass plate.

As all students of phototaxic behavior of Drosophila well know, their behavior is always to a great extent a function of the experimental procedure. In our experiments, using the following procedure, we noticed a high percentage of repetition. At the beginning of the experiment we introduced about 100 individuals in the middle ("start") chamber of the maze. At that time the corridor partitions were closed. After 15 minutes the corridors were opened and in the following hour a free movement through the maze was permitted. After one hour the partitions between chambers were closed and the flies etherized and counted.

In Table 1 the distribution of several Drosophila species is shown, when the light intensity was the same in each chamber (0 or 300 lux).

It can be seen that at 300 lux the distribution of all individuals, regardless of species, is uniform, and that at 0 lux the distribution is normal, with more or less positive excess. [See table on following page.]

Table 1. The distribution of Drosophila species in a maze when the light intensity was the same in each chamber (300 or 0 lux).

Species	Chamber I	II	III	IV	V	N
300 lux						
D. funebris	36	38	46	42	38	200
D. testacea	36	40	50	44	30	200
D. kuntzei	32	42	42	48	36	200
D. melanogaster	34	46	40	38	42	200
D. subobscura	36	44	44	40	36	200
0 lux						
D. funebris	2	20	140	30	8	200
D. testacea	6	26	122	36	10	200
D. kuntzei	10	30	122	24	14	200
D. melanogaster	10	20	132	28	10	200
D. subobscura	14	24	116	28	18	200

References: Kekić, V., D. Marinković, N. Tucić and M. Andjelković 1971, DIS 46:148; Kekić, V. and D. Marinković 1974, Behav. Genet. 4:285-300.

McInnis, D.O. Screwworm Research Laboratory, Mission, Texas. Estimation of the attractive radius for a Drosophila collection trap.

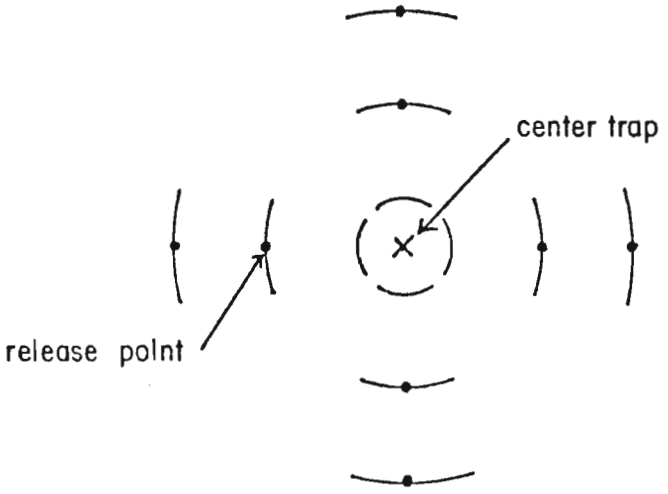


Fig. 1. Design for attractive radius determination.

A vital factor in some estimates of density and dispersal rate in field populations of Drosophila is the attractive radius of a standard trap containing a fairly fixed amount of bait. Each trap here consisted of a 2-gallon waxpaper bucket containing two fermenting bananas as bait.

Several experiments run at Schenck Forest, a pine forest in Raleigh, North Carolina, early in the summer of 1977, were directed toward estimating the attractiveness of individual traps used in a study of dispersal rate in Drosophila. The procedure involved marking and releasing flies at various distances (10 meter intervals out to 50 meters) from a central point, such that at each distance flies were marked with a differently colored dust (a micronized fluorescent pigment from Helecon Industries, U.S. Radium Corp.). An attempt was made to minimize overcrowding by releasing small numbers of flies at each of several points (at least four) around concentric circles at the specified distances (Fig. 1). Then, after one full day of elapsed time, flies were collected by swinging a net above a trap located at the center. After returning to the lab, marked flies were separated from unmarked flies after shining a U.V. lamp upon the samples. The proportion of released flies from a certain distance trapped at the center is illustrated in Fig. 2. A trap placed in a relatively sheltered site yielded a greater percentage of recaptured Drosophila at all distances compared to a trap placed in a more open area. For both traps the distances at which a trap's power to attract reaches zero (i.e., the attractive radius) is estimated to be approximately 60 meters from the best fitting lines of linear regression.