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A DEVICE FOR THE PUPAL SEPARATION OF MALE FROM FEMALE MOSQUITOES IN THE FIELD

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ABSTRACT. A portable device has been developed to separate male from female mosquito pupae in the field. Trials reveal that a high percentage of males can be obtained with only few females recovered when the selection level is set for about a 40 percent recovery of the total to be sexed. This device can be used to meet partially or fully the demand for males in sterile releases.

Investigations on insect control or eradication programs involving the release of sterile males are being widely conducted to determine whether they can be used to supplement or replace conventional control measures. In many cases the releases can involve both sterile males and females, but on occasion the release of females can be highly detrimental. This is especially true when the females being released are disease vectors, as in the case of mosquitoes. That a mosquito population can be eliminated by the release of genetically manipulated males has been amply proven by Laven (1967) and Patterson *et al.* (1970) in Burma and the United States, respectively. However, in both of these studies the magnitude of the releases was dependent upon two factors, the development of mass rearing facilities and the accurate and rapid separation of the sexes to insure that only males are released. Both problems have now been resolved at this Unit and extensive sterile male release studies are in progress against *Culex pipiens quinquefasciatus* Say (*C. fatigans* Wied.). However, if natural occurring insects could be utilized in a release program, an additional benefit could be obtained. Not only would a lesser number of laboratory reared insects be needed, but also the number of indigenous individuals would be reduced.

Most of the devices developed for rapid sexing of mosquito pupae (McCray 1961, Gerberg *et al.*, 1969, and Sharma *et al.*, 1972) are based on the size differential between the sexes. The pupae pass through an aperture that allows exit of only individuals of a specific size; the males being normally smaller pass through whereas the females are retained. Where rearing conditions are standardized in the laboratory, these sexing devices are very efficient. Unfortunately in the field where conditions are variable this distinct thoracic size differential between sexes is not uniform from one environment to another, and therefore,

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a new sexing device had to be developed for field use.

As a starting point, the sexing device devised by Sharma *et al.* (1972) was modified for field evaluation. The principle remained the same, i.e., pupae in order to reach the surface of the water have to migrate through a sexing grid consisting of parallel nylon strands strung at specific distances from each other on an aluminum frame. As the larger females are retained, the pupae surfacing are mostly males. However, where pupal size is variable, more sexing grids had to be used. The device described herein consists of a series of 7 grids with spacings between the nylon strands of 0.92 mm, 0.98 mm, 1.02 mm, 1.05 mm, 1.08 mm, and 1.11 mm, one superimposed upon the other, with the grid unit having the widest spacing between the strands at the bottom (Fig. 1, right). A screened aluminum tray of the same dimension as the grid is used for holding the pupae (Fig. 1, lower left). All the seven grids and the bottom screened pupal holder are mounted onto a 15.2 cm x 20.3 cm aluminum base plate which has a central opening of 10.2 cm x 10.2 cm to allow for upward migration from one grid to another. An aluminum container 15.2

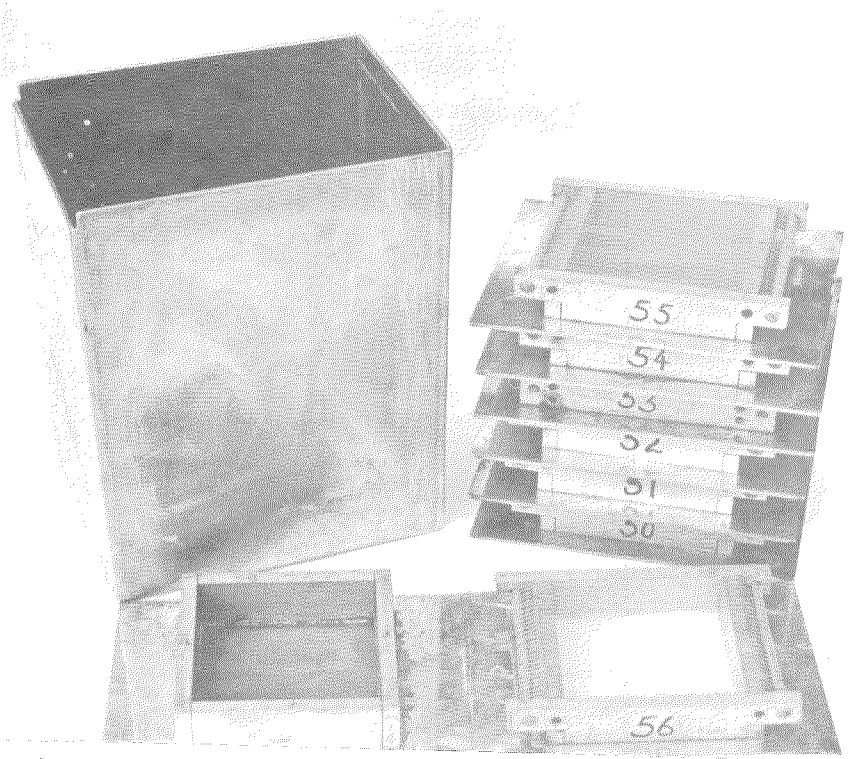

FIG. 1.—A device for the pupal separation of male from female mosquitoes in the field.

cm x 20.3 cm x 34.3 cm (Fig. 1, upper left) is used to align the openings of these grids one above the other. The pupal holder with pupae is placed on the bottom of the container and the grids are then added. The outside frame of the pupal holder and grids fit exactly to the inner dimension of the container. The container is then filled with water. As in the grid system of sexing (Sharma *et al.*, 1972), all the pupae struggle to pass through the various grids and come up to the water surface. Depending on their size, the pupae are trapped in between these grids. After an interval of 5 minutes, the grids are removed singly from the top. The results of preliminary field studies conducted in the New Delhi area are given in Table 1. Only pupae from a single habitat were sampled at a time as dietary and environmental conditions influence their size. Pupae from a pond in Shakapur were relatively small and 44.3% of the pupae surfaced before any of the grids were removed; of these, 95% were males. Between 97% to 100% males were recovered from the pupae on the surface by the removal of 0, 6, and 3 grids, respectively, when these pupae were collected in various breeding sites. This was about 30% of the total pupae placed in this sexing device.

TABLE 1.—Evaluation of device used for separating male from female mosquito (*C. p. quinquefasciatus*) pupae in the field.

Locality	Nylon strand spacing (mm)	Replications	Pupal selection level (%)	Sexing accuracy (%) males
Shakarpur (pond)	0.92	3	44.3	95.5
Gazipur (pond)	0.92	2	30.5	97.0
Chandan Hola (drains)	1.11	3	30.5	100
Palla (pond)	1.02	3	30.5	100
Bijwasan (drain)	1.02	2	30.5	100

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IMPORTANT NOTICE

The Board of Directors accepted the resignation of Mr. T. G. Raley as Executive Director, effective December 31, 1973. The newly appointed Executive Director is:

Mr. Thomas D. Mulhern
5545 East Shields Avenue
Fresno, California 93727