rapidly when the methods of Meeser and Lewis were followed, and that there was a limited amount of emergence which occurred during mass rearing. A means was sought, therefore, of obtaining large numbers of flies under conditions in which rapid desiccation of vegetation and pupae would not occur.

It was found that large numbers of *Simulium* adults could be obtained over a short period of time by the use of very simple apparatus consisting of a clear, glass funnel taped on to a cylindrical receptacle of the same diameter as the funnel. The one used here was 6 inches in diameter, the stem being 5½ inches long and ½ inch in diameter.

In the present instance pupae of *Simulium damnosum* Theobald and *S. adersi* Pomeroy were reared to adults. The cylindrical receptacle may be a cracker tin, large can, glass jar, plastic jar, or battery jar. A thick layer of water-soaked absorbent cotton is placed at the bottom of the receptacle and covered with a tight-fitting layer of blotting paper. The vegetation with the pupae attached is then placed into the receptacle, and liberally sprinkled with water. The inside of the jar may be lined with blotting paper or paper towels if desired, for distribution of moisture. The funnel is inverted over the opening of the receptacle, and is taped to the latter using masking or adhesive tape. The stem of the funnel is therefore vertical, with the outer opening of the stem uppermost and uncovered. The whole apparatus is then placed *horizontally* into a large cage made of netting, with the open end of the stem facing the window. If a large enough cage is not on hand, a smaller cage with a long sleeve is an adequate substitute, the sleeve being tied around the receptacle. Regular mosquito netting has too large a mesh generally, so a more closely-woven mesh should be used. Emergence in large numbers takes place without mortality, usually beginning within a few hours if the pupae are mature enough. The flies, attracted by the light coming from the window, walk from the receptacle across the inside of the funnel, into the stem, and out into the cage. As they exit from the stem they may also be isolated as desired into individual vials or tubes.

The apparatus should not be kept vertical, since the flies have difficulty in making their way up the stem. If it appears that the vegetation is drying out, water should again be sprinkled into the receptacle. This can be done easily through narrow tubing which is passed through the stem of the funnel and down into the receptacle. In a dry atmosphere the emerged flies should be removed from the holding cage within 24 hours, but if the cage cannot be attended to for several days, wrapping several layers of wet towels around it will help in keeping the flies alive, since they need a very moist atmosphere for survival under laboratory conditions.

This simple apparatus proved to be more successful than any others used because the funnel helps to retain the moisture within the receptacle, yet the open stem permits enough air to enter. Although a considerable amount of water condenses on the flared, inner surface of the funnel and coats it, the flies have no difficulty in walking upon the wet surface toward the stem. Condensation occurs only at the base of the stem, most of its length remaining dry.

To prevent ants from entering the cage and eating the flies, the holding cage containing the rearing apparatus was placed on a large square of wood supported at each corner by a 4-inch nail driven into the wood. Each "leg" thus formed was placed in a receptacle containing kerosene arranged so that the leg did not touch the side of the receptacle. Plastic Petri dishes should not be used, since they are dissolved by kerosene.

While awaiting transference to other holding cages the flies can be fed by placing blocks of lump sugar at the bottom of the emergence cage. They feed readily on the solid sugar.

References

DALMAT, T. 1955. The black flies (Diptera, Simuliidae) of Guatemala and their role as vectors of onchocerciasis. Public. No. 4173, Smithsonian Misc. Coll. 125:1–425.

HARTLEY, C. F. 1955. Rearing simuliids in the laboratory from eggs to adults. Proc. Helminth. Soc. Washington 22:93–95.

LEWIS, D. J. 1953. *Simulium damnosum* and its relation to onchocerciasis in the Anglo-Aegyptian Sudan. Bull. Ent. Res. 43:597–644.

———. 1957. Aspects of the structure, biology and study of *Simulium damnosum*. Ann. Trop. Med. Parasit. 51:340–358.

MEESER, C. C. V. 1942. Preliminary notes on Simuliidae (Diptera) of Southern Rhodesia. Proc. Rhodesia Scientific Assn. 39:28–42.

A SELF-STRAINING LARVAL CONCENTRATOR

M. E. WARREN AND C. D. EDDLEMAN

Collection of mosquito larvae is often very time-consuming using the dipper and screw-top jar technique because of the inefficiency of manually removing the lid to add more material, and periodically replacing the lid to strain out excess water. Earlier designs for concentrators have been expensive and sophisticated (Earle, 1956) as well as simple and easy to construct (Womeldorf, *et al.*, 1963). Both called for metal construction. These devices work well for general collecting, but because of weight were intended to be placed on the ground when in use. Since it is often either impossible or inconvenient to find a suitable location on which to place the device near the collecting site, a hand-held collector utilizing certain features of the above devices, as well as new ideas and the use of new materials,

would be a more flexible collecting tool in certain instances. The device described herein has proved to be efficient because it utilizes a one-way flow of water. None of the collector's time is involved in straining, and he can concentrate on collecting.

The concentrator (Fig. 1) is made from a 1-

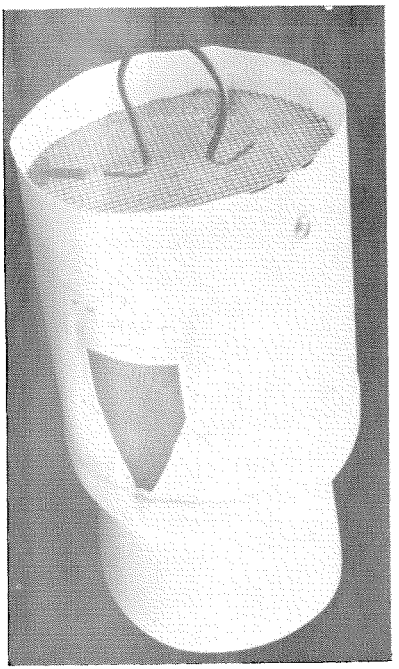

FIGURE 1.

gallon plastic bleach bottle. About 1 inch of the bottom has been cut off. The overflow port is placed so that the concentrator holds only about 1 quart of water before it begins to strain. The overflow port is covered by 35 mesh (No. 40) fine bronze screen. It is fastened to the concentrator by first stapling the edges to the bottle then drawing a hot soldering iron over the screen, melting the plastic sufficiently to bond.

The trash screen in the top is ⅛-inch mesh hardware cloth cut to fit snugly inside the concentrator. It rests on three 1¾-inch bolts. The screen handle is heavy gauge insulated wire.

In use, the water containing the larvae is poured from a dipper through the trash guard. Leaves and other pieces of large debris are caught on the guard. Any larvae remaining on the screen are washed through by subsequent dippings. When the water reaches the level of the overflow port, straining begins. Tests have shown that this size screen allows very few first instar larvae to escape. After sufficient larvae have been concentrated, they may be placed in a jar for transport by removing the trash guard and pouring out from the top.

In collecting from tree rot cavities, a one-half-inch (I.D.) plastic tube is used to siphon directly onto the trash guard, with the concentrator placed within a plastic bucket. Wood debris is held on the trash guard while the larvae pass through. Strained tree hole water caught in the bucket is returned to the cavity when collecting is completed in order to reduce the contamination of the tree hole by the addition of foreign water.

This concentrator offers several advantages in addition to field time saved. It is light in weight and easy to carry and handle, cheap and easy to construct. The plastic is hydrophobic and the smooth contour of the bottle reduces trapping of the larvae. The concentrator is not limited to the collection of larval mosquitoes, but has proved itself useful in the collection of *Daphnia* and other small aquatic organisms.

References Cited

EARLE, H. H., JR. 1956. Automatic device for the collection of aquatic specimens. J. Econ. Ent. 49(2):261–262.

WOMELDORF, D. J., GILLIES, P. A., and HOLTEN, J. R. 1963. An improved mosquito larvae concentrator. Mosquito News 23(4):351–352.

PREDATION OF *Bradysia coprophila* (LINT.) (DIPTERA: SCIARIDAE) ON MOSQUITO LARVAE [1]

USMAN M. ADHAMI AND GEORGE B. CRAIG, JR.

Department of Biology, University of Notre Dame, Notre Dame, Indiana

The arthropod fauna associated with laboratory colonies of mosquitoes is extensive. Psocids, cockroaches, fruit flies, ants, mites and spiders are well known to those who rear mosquitoes. However, sciarid flies have not been reported as associated with mosquito colonies (Jenkins, 1964).

In the course of research on population genetics, we have developed cages for continuous rearing of laboratory populations of *Aedes aegypti*. These cages are a cubic yard in volume and contain a large dishpan with water for larval breeding. The pans are lined with paper towelling as an oviposition surface. The water level is raised frequently to bring about a fresh hatch of eggs and dog food pellets are added for larval food. An aquarium aerator is used to prevent scum formation in the water. The cages are kept at 80° F. and 80 percent R.H. Adults are fed with sugar pads and anesthetized mice. Continuous mosquito breeding has been maintained in these cages for more than three years.

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