THE BELLEVILLE TRAP FOR QUANTITATIVE SAMPLES OF MOSQUITO LARVAE

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A trap for the sampling of mosquito larvae has been used at Belleville since 1953 and has provided useful and reliable data on population levels of mosquito larvae. Once in position, the trap operates automatically and thus eliminates much of the human error that contributes to the unreliability of the usual dipper techniques (Horsfall, 1946). Its quick operation is more desirable than the slower techniques of capturing larvae by strainers and pipettes from unit areas. The trap can be made cheaply by a tinsmith, and thus has an advantage over a radio-active tagging technique that requires expensive equipment and material (Welch, in press). One person may operate several traps simultaneously and thus increase the number of samples and the accuracy of a population estimate.

This trap incorporates the area sampling principle of Horsfall (1946), a cone similar to that used by Bidlingmayer (1954) for sampling *Mansonia* sp. larvae, and a funnel for concentrating the catch similar to those used in limnological plankton equipment. It has been used for *Aedes* mosquitoes only in pools of the Canadian woodland and tundra areas, but proved useful under these conditions. It could be easily adapted for use in tropical regions.

CONSTRUCTION. The trap consists of four parts; the cylinder, the cone, the concentrator and the bucket (Fig. 1). All are made of galvanized sheet metal except the bucket.

The cylinder is 18 inches high, and 9–13/16 inches in diameter. The metal is rolled near the top and bottom of the cylinder to give it rigidity. The upper edge is flanged, and the lower edge sharpened for ease in pressing the trap into the pool bottom. Two handles are placed on opposite sides of the cylinder. A small flange is fixed inside the cylinder approximately two inches from the lower edge, and a wire screen of one inch mesh may be attached to this to prevent the uptake of detritus, especially moss and leaves, in the trap.

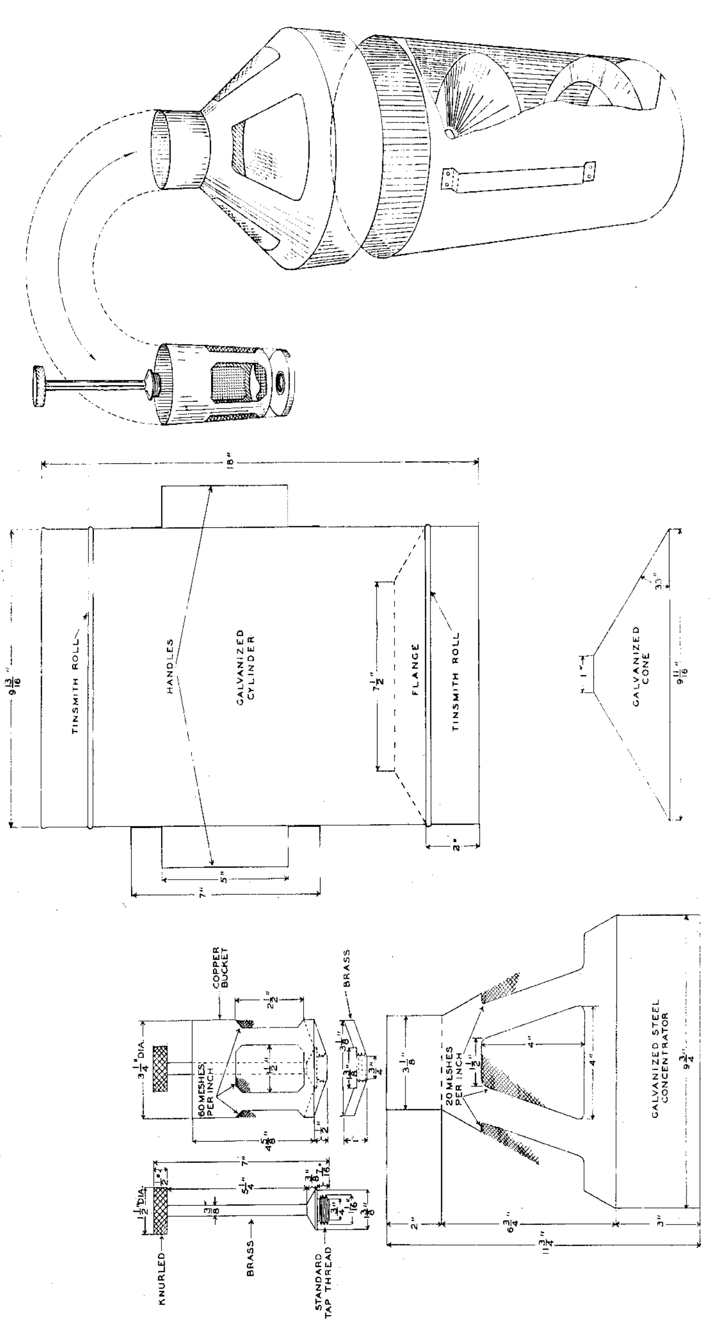

FIG. 1.—The Belleville Trap showing the assembled trap, the cylinder, the cone, the concentrator and the bucket.

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The cone has a diameter slightly less than that of the cylinder. The minimum angle of the cone for the operation of the trap against Canadian *Aedes* is 33°, but this might require alteration to permit the capture of other species of mosquitoes. The height of the cone limits the minimum depth at which the trap can be operated. Bidlingmayer's (1954) system of several small cones, if incorporated into the Belleville trap, would probably permit its operation at shallower depths. A hole, one inch in diameter, is cut at the apex of the cone.

The diameter of the bottom of the concentrator is slightly less than that of the cylinder. This end of the concentrator fits into the cylinder in a sleeve-like junction. Four openings are cut in the wall of the concentrator and covered with 20-mesh per inch copper screen. The opening of the concentrator is 3⅛ inches wide.

The bucket is a modified form of the bucket of the Wisconsin plankton net (Welch, 1948). The walls are of copper, while the base and drain plug are of brass. The four openings are covered with 60-mesh copper screen. The diameter of the bucket is slightly larger than that of the top of the concentrator to provide a sleeve junction.

OPERATION. Most *Aedes, Culex,* and *Anopheles* mosquito larvae dive to the bottom of a pool when disturbed, and then slowly rise to the surface again. This habit is utilized in the operation of the trap. When the cylinder is dropped into position in the pool the mosquitoes dive to and remain at the bottom. A length of cotton dental roll is placed in the flange of the cylinder and provides a tight seal for the cone. A rubber flange fitted to the cone would serve the same purpose. The cone is then dropped into the cylinder (Fig. 2(1)) and sinks until it is seated in the flange at the bottom of the cylinder. The trap is left in this condition for 10 to 20 minutes. The enclosed larvae rise from

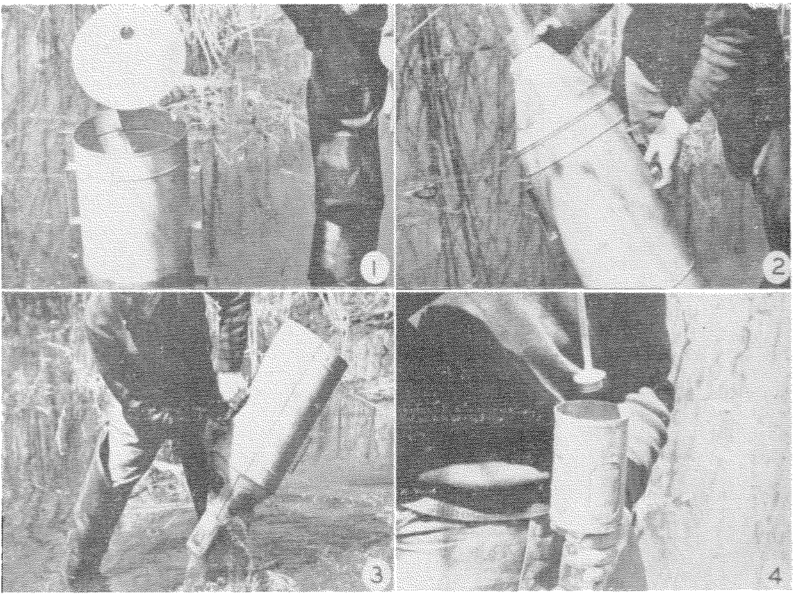

FIG. 2.—Operation of the Belleville Trap. (1) Placement of cone; (2) fitting of concentrator; (3) draining trap; (4) removal of sample from bucket.

the bottom, move along the underside of the cone, rise through the opening in the cone, and enter the cylinder.

A cork is inserted in the hole of the cone to produce a better water seal, especially if the samples are taken in shallow water. The bucket is attached to the concentrator, and the concentrator fitted into the top of the cylinder (Fig. 2(2)). The trap is grasped by the handles, lifted, inverted, and allowed to drain (Fig. 2(3)). The bucket is then removed, the plug unscrewed, and the contents drained into a two-ounce jar (Fig. 2(4)). The mosquito larvae may be counted in the field or taken back to the laboratory for examination.

The efficiency of the trap was tested in the laboratory at three larval densities and for three intervals of time. The trap was placed in a large container with a clean sand bottom. A known number of larvae of *Aedes aegypti* (L.) were placed in the cylinder and the cone lowered into position. After a fixed period of time the trap was lifted and the larvae in the trap and the container counted. The following readings are the average and standard error of the number recovered in five replicates for each interval of 5, 10, and 20 minutes respectively at three larval densities: 50 larvae per square foot, 14.4 ± 2.2, 18.6 ± 1.0, 18.6 ± 1.9; 100 larvae per square foot, 34.6 ± 1.8, 37.6 ± 2.5, 36.4 ± 2.6; 200 larvae per square foot, 63.2 ± 7.1, 79.0 ± 3.8, 72.0 ± 3.7. No statistically significant difference was found between the average recovery for each time, though it is obvious that higher recoveries were made at the longer time intervals. The magnitude of the errors appears unrelated to time or larval density. No statistical difference was found in the percentage of recovery when calculated for the nine readings. The percentages show better recovery at 10- and 20-minute intervals than 5 minutes. These percentages, though lower than one might expect, are comparable to those obtained by Bidlingmayer (1954) under similar conditions.

Some larvae are not washed down into the concentrator or bucket, but adhere to the cylinder and the cone. Counts were made during the above tests and the number of larvae remaining in the cylinder was found to be independent of the duration of operation and the number of larvae caught. The percentage of such larvae varied from 1 percent to 20 percent of the total catch. A quick rinse of the cylinder and cone would recover these in the field.

Efficiency in the field could be tested by comparing the catch in the cylinder and cone for a specific period with the catch in the cylinder for a 24-hour period without the cone in position.

The most practical operation of the trap involves the use of 10 cylinders and cones and one concentrator and bucket. The cylinders are set out in a series. When the last trap is set in position, the first trap is ready to lift and to collect mosquito larvae.

As the area of the cylinder is a constant, the number of larvae caught may be used as a measurement of density. Several catches from one pool may be totalled to give the average number per unit area. Determination of the pool population may be made by multiplying the pool area by the unit density.

References

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