bility index, no other significant change has been observed. The adults continue to be robust, feed readily, and swarm. Larval and adult mortality appears to be no greater than normally expected.

The erratic results from attempted rearings (again starting with F_5 and F_6 pupae from the stock colony) in small cages in a window-equipped room at a constant temperature and humidity of about 70° and 70% do not warrant further reporting at this time.

Up to the present time no serious effort has been made to determine longevity of captive adults. However, some males have been observed to live 2½ months and some females more than 4 months.

Summary

A method is described for the continuous rearing of *Culex tarsalis* Coq. in the laboratory.

The adults are eurygamous; therefore it appears that successful colonization is contingent upon their induced adaptation to captivity by a conditioning process which has as its basis a day simulated from nature when conditions are favorable to sexual responses. A relatively large space and a variable light intensity are the principal factors required to stimulate swarming and mating.

A satisfactory diet for adults is chicken blood and sucrose; and for larvae a proprietary pellet of high protein content supplemented with brewer's yeast and dried milk is suitable.

Approximately 75% of all egg rafts from the principal colony contain viable eggs. In one day's production of 21 rafts, the average number of eggs per raft was 230 and the viability was somewhat greater than 83%.

Acknowledgment. The helpful suggestions and assistance of Alexander A. Hubert and William A. Rush have contributed much to the successful colonization of *Culex tarsalis*.

The isometric drawing of the mosquito cage was prepared by Mr. E. L. Cole, biological engineer of the Rocky Mountain Laboratory.

AN ADULT MOSQUITO SAMPLER

John W. Klock and W. L. Bidlingmayer [1]

It has long been realized that light traps (Mulhern, 1942)* used for sampling mosquito populations are subject to several undesirable limitations. One of these is the inclusion of large numbers of unwanted insects with each trap collection, thereby adding to the task of mosquito identification. Another handicap is that conventional light traps must be located near sources of electricity for power and light, which greatly restricts the area in which they can operate. An attempt to overcome some of these difficulties was made by Lindquist *et al.* (1945), who used mosquito biting or landing rates as an index to their population densities. Other workers have used various modifications of this technique to meet special situations. The umbrella-trap described here is a further attempt to improve upon these methods. Its use enables one person to collect all of the insects that would normally congregate around him in a definite volume of air during a given length of time. It can be operated during the night or day in almost any area accessible to an individual, and

[1] From the Communicable Disease Center, Public Health Service, U. S. Department of Health, Education and Welfare, Savannah, Georgia.

* See also Mulhern, T. D., this issue of *Mosquito News*, page 130.—Ed. Note.

has the further advantage of trapping all of the insects which are attracted to him.

The trap consists of suitable netting rolled on a circular frame that is mounted on the top of a central pole (figure 1). After determining the proper location for sampling, the operator places the pole point on the ground and anchors it firmly by applying pressure with his foot to the stirrup (A) at the lower end of the pole. A piece of canvas or other suitable material is spread on the ground around the pole. The operator then stands on the canvas under the rolled-up netting and after a suitable exposure period releases the netting enclosing himself within it. A steel ring at the bottom of the netting causes it to fall rapidly and uniformly, and helps form a tight seal with the canvas on the ground. The specimens may then be collected at leisure with an aspirator, or when collecting large numbers they may be killed with a pyrethrum aerosol and quickly recovered from the canvas.

The trap can be made of metal or wood and any type of mosquito netting. The effective diameter of the frame is 4 feet. It is held 7½ feet above the surface of the ground by the center pole when the trap is in position ready for use. The top is formed by a four-spoked hoop, covered with screen or netting, with the upper end of the drop netting attached to the outside of the frame. This drop netting is rolled up and held in place by four cloth straps (B), one at the outer end of each spoke. One end of each strap is fastened permanently to the frame. The other is hung on the steel pins (C) behind which is a metal washer (D) connected to a handle (E) by a cord. When the handle is pulled down, the four washers are pulled off the pins carrying the straps with them, thus allowing the netting to fall to the ground.

When the sampler is to be moved, the cords are wrapped around the bolts (F), passed over the groove at the ends of the

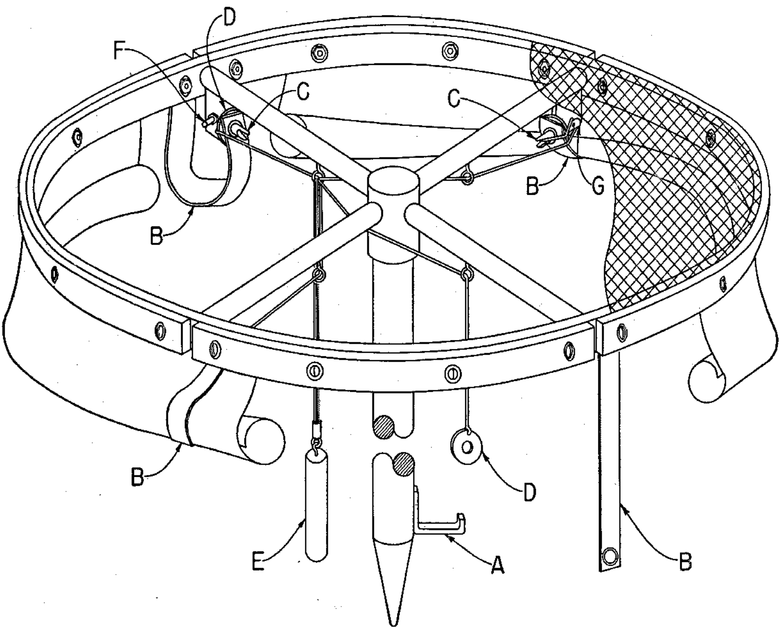

FIGURE 1: A SCHEMATIC DRAWING OF AN ADULT MOSQUITO SAMPLER.

steel pins and hooked behind the jam cleats (G), thus securing the netting during transportation.

While this umbrella-trap was developed primarily for use in sampling adult mosquito populations, it could also be used advantageously in studies on other biting insects such as stable flies, deer flies, blackflies, and biting gnats.

Authors' Note: When this manuscript was sent to the Florida State Board of Health for comment, it was pointed out to us that Mr. J. A. Mulrennan and Mr. R. R. Sheppard had independently developed an essentially identical device over two years ago. Their device was recorded in their reports, but the description of it has never been published.

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SEASONAL SUCCESSION OF MOSQUITO SPECIES AND THE RELATIONSHIP EXISTING BETWEEN DISSOLVED MINERALS IN MOSQUITO-BREEDING WATERS AND SPECIES

CHARLES O. MASTERS

For several years prior to 1953, the author made a rather comprehensive study of the habits of the mosquitoes in Cuyahoga County, Ohio. One of the experiments conducted in 1952 was carried out in order to determine whether or not there would be a succession of species among the mosquito larvae found in a body of water throughout the breeding season, and also, if there might be a relationship existing between the amount of mineral matter dissolved in mosquito-breeding waters and the species found therein.

On June third, 1952, five large metal tanks, 6 feet long, 3 feet wide, and 1½ feet deep, were arranged side by side in a vacant lot and filled with tap water. Various quantities of water were passed through a bushel basket of horse manure and allowed to drain back into the tanks. As the minerals present in the manure came into solution, and passed into the tanks, the total amount of dissolved matter gradually increased. Measurements were made with a Barnstead Purity Meter in order to determine the grains per gallon, in terms of sodium chloride, of mineral matter present. The tap water contained eight grains per gallon as it was run into each of the five tanks. By the use of horse manure, this was increased in the tanks as follows: Tank Number One, 11 g/gal.; Tank Number Two, 14 g/gal.; Tank Number Three, 16 g/gal.; Tank Number Four, 24 g/gal.; Tank Number Five, 40 g/gal.

The color varied from a very light brown (610 millimicrons) to a dark brown. The difference in concentration became more apparent after testing with a Leitz Photrometer. The percent transmittance was recorded as follows: Tank Number One, 94%T.; Tank Number Two, 90%T.; Tank Number Three, 83%T.; Tank Number Four, 72%T.; Tank Number Five, 72%T.

Nothing more was added to the tanks except manure water whenever a test with the Purity Meter indicated it was necessary. All of the tanks were fully exposed to sunlight but, because of their large surface area, the temperature never exceeded