ARTICLES

DESCRIPTION OF A TRAP FOR *MANSONIA* LARVAE

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The biology of *Mansonia* mosquitoes is always been difficult to study. An important factor has been the difficulty of taining larvae, since they remain attched to the roots of aquatic plants iring their development. McNeel (1931) cured the larvae of *Mansonia perturbans* Valker) by pulling or digging up the ost plant and washing the roots in a icket with a screened bottom. The muck us collected was examined in small iantities for the larvae. This method uld not yield any quantitative data.

It was observed that the larvae of *ansonia perturbans* (Walker), when pt in a container without plants, would se to the surface of the water and obtain r as do mosquito larvae of other genera. This observation had been previously ade by Shute (1930).) Utilizing this ibit, a trap was designed whereby the rvae, once dislodged from their host ant, would rise to the surface for air, and ould be caught and held in a collecting isin at the surface.

The trap consists of two parts. The rst is an outer cylinder of twenty-two iuge galvanized sheet metal, thirty inches gh and thirteen and seven-eighths inches diameter. The area of its base is one juare foot. The second part is an inner isert that collects and holds the larvae. wo kinds of inserts have been devised, it both operate on the same principle. igure 1 shows the outer cylinder with a ortion of it cut away to show one of the iserts, in this illustration, the pyramid pe. This type consists of a cylinder ightly less than 13⅞ inches in diameter id 10 inches high. Its floor is composed a number of pyramids with a base of ½ inches and 2¾ inches in height. See so figure 2.

The simpler type of insert is shown in figure 3. It operates on the same principle as the pyramid type. It consists of a twenty-six gauge galvanized sheet metal cone, slightly less than thirteen and seven-eighths inches in diameter, twelve inches high, and with a one and three-quarters inch opening at the top. The cone is sur-

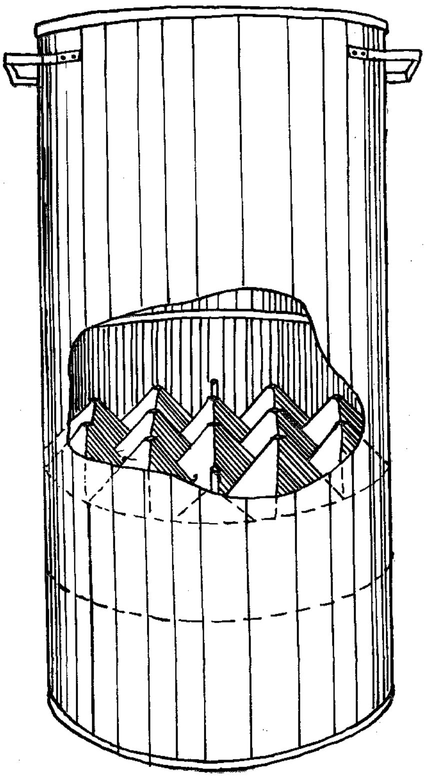

FIG. 1. Cutaway perspective view of *Mansonia* trap, showing pyramid type of insert.

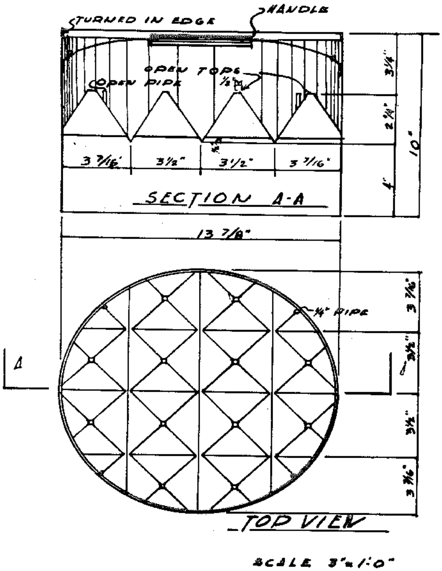

FIG. 2. Details of pyramid type of insert.

mounted by a collecting basin twelve and one-half inches high and nine inches in diameter, which is riveted and soldered to the cone. The disadvantages of this type are that it requires approximately fourteen inches of water when set, and while being set, a certain amount of sediment frequently is carried upward into the collecting basin. It is advantageous to have a trap that contains little sediment, as first and second instar larvae are difficult to recover from even small amounts of debris.

To set the trap, the outer cylinder is placed over the host plant and pressed firmly downward into the bottom of the marsh. All plants within the cylinder are then pulled up, rinsed thoroughly within the cylinder, and discarded. All fragments of broken roots and stems protruding from the bottom or floating at the surface are also rinsed and discarded. After waiting for a five- or ten-minute period to allow the coarser material and larvae to settle, the insert is pushed dow ward into the cylinder until the opening one or two inches beneath the surface the water. The insert is held in place l friction, as its diameter is slightly less th: that of the cylinder. (Figure 2.)

The larvae, having been washed free the roots, and finding no roots availab for attachment, are compelled to come the surface when their oxygen supply depleted. They pass upward through tl opening at the apex of the insert and a held in the collecting chamber abov When setting the insert, (less frequent with the cone type) it is usually possib to bail out several inches of water fro inside the cylinder, adjust the insert to tl desired level, and then refill with cle: water obtained from outside the trap. Th results in less sediment in the collectio If the bailing is done five or ten minut after the plants have been removed, the

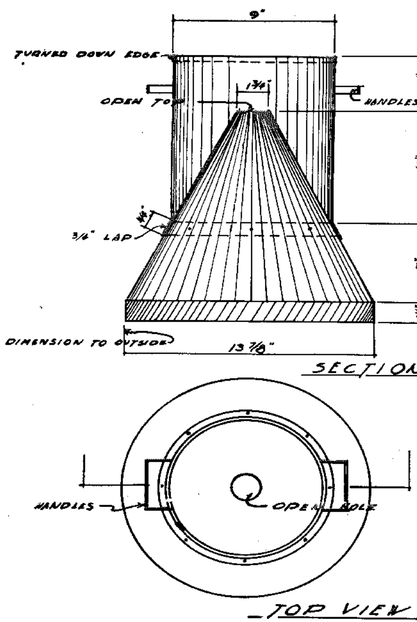

FIG. 3. Details of cone type of insert.

little danger of losing *Mansonia* larvae, they will be at the bottom of the linder.

The trap is usually set for a period of enty-four hours, although this is far ıger than necessary, particularly when *ansonia indubitans* larvae are being colted. The water within the collecting sin is removed with a rubber syringe d spread in a large white enamel tray. ıe larvae may then be removed with a pette. If the trap is carefully set, there ould be very little sediment in the water, hough, as mentioned before, the cone pe usually contains more sediment than e other type.

The two types of inserts were compared a borrow pit which had a clean sand ttom and was completely free of any getation. A known number of 4th instar vae of *Mansonia perturbans* were placed ithin the cylinders and the trap set. fter 24 hours, the cone type recovered average of 83 percent and the pyramid pe 71 per cent of the larvae.

In the author's opinion, the pyramid pe of insert is to be preferred over the ne type. Although it is more difficult construct and somewhat less efficient, it possible to set the pyramid type in as tle as four inches of water and it usually ntains less sediment. This reduces the ne required to examine it. The cone pe, however, is entirely satisfactory herwise.

FACTORS AFFECTING *Mansonia* COLLECONS. The proportion of occurring larvae hich the trap will catch at one setting ill depend to some extent on the care ith which it is set and collected from, ıt more especially it will depend on enronmental conditions. There is every dication that all four larval instars are llected in the proportions actually occurıg. Pupae are rarely recovered in these aps, for as shown by Dorer *et al.* (1950), ey are attached so tenaciously as to be ldom washed free.

Another factor affecting the efficiency of e traps is the number of roots still reaining at the bottom of the cylinder ter the trap is set. In areas where only a few inches of sediment overlie a sand substrate, it is not difficult to remove virtually all roots. But in areas where the substrate consists of several feet of peat, removal of the host plant often results in removing a core of roots and peat so that the bottom is beyond arm's reach. In other cases, the substrate is interlaced with such a vast number of roots that many exposed broken ends must be available to the larvae for reattachment. Nevertheless, when traps were reset for two or three days in succession in a peaty area, and the water inside the cylinder agitated to dislodge any reattached larvae, very few additional larvae were recovered. For instance, over one period of three days of successive settings, 681 larvae were collected the first day, 56 the second day, and only one the third day. This means that 92.3 per cent of the total were caught the first day, 7.6 per cent the second day, and only one-tenth of one per cent on the third day.

The amount of plant roots and litter that must be removed is another factor affecting the trap's operation. The volume of material to be washed and discarded is so great that often the water level within the cylinder is lowered by two to eight inches. It is almost certain that some larvae must become entangled and lost.

Mansonia larvae exhibit a light avoidance reaction which prolongs the time before they will attempt to rise to the surface. The larvae also become increasingly sluggish with lowered temperatures, and are inert at temperatures close to the freezing point. Thus, the trap becomes less effective with decreasing water temperatures.

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SUMMARY. A trap for the recovery of *Mansonia* larvae is described which is intended to yield quantitative data. The trap is based on the principle that *Mansonia* larvae will rise to the surface of the

water to obtain air if there are no aquatic plants available. Several environmental factors which affect the operation of the trap were discussed.

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A PORTABLE PNEUMATIC SPRAY UNIT [1]

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In recent years a number of appliances have been developed for producing insecticidal fogs or mists for the control of adult biting flies. Some of these are highly efficient, but almost all of them depend upon a vehicle of some sort, either as a source of power or as a means of transport. There remained a need for a unit that would produce a useful volume of insecticidal mist, but would be sufficiently light and portable to be operated independently of existing roads or trails.

The subject of this paper is a unit developed from one produced at the Orlando, Fla., laboratory of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture (Husman, 1953), which was originally intended to be operated from the engine of a jeep or similar vehicle. A later modification, powered by a small air-cooled engine, was mounted on a small hand-cart. The sprayer developed at Kamloops (Figs. 1–5) utilizes an extremely light gasoline motor coupled to an air compressor slightly smaller than that in the prototype, and is mounted on a pack-frame. The total weight, including engine, compressor, two-gallon tank, spray boom, and all connections, but without insecticide, is 40 lb. an the unit can be carried with ease whereve a man can go.

The pack-frame is made of ⅞-inch ste tubing (electrical conduit) with welde joints. The design and dimensions ar given in Fig. 1. The frame is supporte on the back by a strip of canvas 24 x 2 inches, laced to the frame with a cor that passes through six brass grommets i each of the opposite ends of the canva The load is carried to the shoulders by wide canvas band 54 inches long, each en of which terminates in a leather stra The straps engage in buckles bolted to th lower ends of the outer bars of the fram and the band passes from one buckl through an 8-inch slit in the canvas 2½ inches below the upper margin, wrapped twice around the upper cros bar, and returns through the slit an down to the other buckle. The leathe straps permit adjustment of length to su the operator.

The engine is one of a series produce by Power Products Corp. of Grafton, Wi It develops 1.2 h.p. at 3300 r.p.m., an weighs 16½ lb. complete. Some minc changes were necessitated by the attach ment of the engine to a vertical base. Th original rectangular fuel tank was re moved, and a new one of somewh streamlined form, made of aluminu

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