following the more tortuous alternatives. This is one of the advantages of a trap as compared with a lid—mosquitoes will eventually find small imperfections in the fitting of a lid.

The other advantage of a trap is in human reactions to them. The principle of the trap is readily understood and catches of mosquitoes or flies obtained from heavily infested pits are impressive and informative to the householder in showing where an insect pest problem originates and that it can be stopped at source by the "self-help" measure of always ensuring that the trap is put back in place after using the pit. Initial trials, in collaboration with the Dar es Salaam City Council, over periods of up to 2 weeks on a variety of pit latrines and cesspits in Dar es Salaam produced large catches of *Cx. quinquefasciatus* and blowflies and, in one case *Aedes aegypti,* and there were uniformly favourable reactions of householders to the traps which were always found in place when checks were made. It remains to be seen whether such co-operation can be achieved over the long term by an appropriate initial programme of public information followed by periodic checking on the traps for correct usage and for the repair of any damage. It also remains to be demonstrated that the area-wide use of traps is effective in suppressing the density of *Cx. quinquefasciatus* and blowflies in houses. If this can be confirmed it would seem that traps would be a more "appropriate technology" for dealing with insect problems arising from pit latrines than the use of imported insecticides of diminishing effectiveness because of the evolution of resistance.

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A METHOD FOR HOLDING SMALL POPULATIONS OF *GAMBUSIA AFFINIS HOLBROOKI* GIRARD

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The mosquito fish, *Gambusia affinis* has been used in mosquito control operations for many years as an effective biological agent in the suppression of mosquito larvae in permanent and semipermanent waters. In Florida, *G. a. holbrooki* Girard is generally present in both brackish and freshwater habitats. This situation affords a great reservoir of readily available fish for use in biological or integrated control efforts within mosquito control programs. The East Flagler Mosquito Control District found that it was time consuming and expensive to have inspectors catch these minnows every time to stock mosquito producing areas found while on larval inspection. The only effective method found to capture the fish, in the field, was a 51 cm diameter dip net with a 0.3 cm mesh. Consequently, the integration of fish within the mosquito control program was not reaching its fullest potential. To develop an economically feasible integrated control program, a stock of mosquito fish was established at the office compound.

Many who use mosquito fish utilize large concrete holding tanks (Johnson 1976), construct stocking ponds (Coykendall 1977), or use large free standing swimming pools (Johnson 1976) to hold their fish populations. However, these techniques appear to be more conducive to large scale *Gambusia* operations. A mosquito control district initiating a fish program may not want to go into such large scale production. Small, workable populations of *G. a. holbrooki* were held, for stocking purposes, in

[1] This work was performed while the author was Director of the East Flagler Mosquito Control District, Flagler Beach, Florida.

old 1.5 m by 0.6 m bathtubs containing a volume of 0.3 cubic meters at a depth of 0.3 m. Approximately 500 fish were held in each bathtub for 2 to 3 months without any noticeable amount of mortality. The size range of the fish in the tubs ranged from 2 to 4 cm, with the majority of the fish being about 3 cm long. An air pump, commonly used in home aquariums, supplied oxygen to the fish. One pump, in continuous use, serviced 2 tubs adequately. Commercial fish food was fed to the minnows. During the mosquito breeding season, the fish were fed mosquito larvae, whenever possible, instead of the artificial diet.

A barrier of aquatic weeds, such as watermilfoil (*Ceratophyllum demersum* L.) woven into a plastic rack or lattice-type frame arrangement, was submerged in the water to provide protection from cannibalism and predation. This frame could be easily lifted out of the tub for removal of the fish which were then transferred to 9.5 liter buckets and transported to the field for stocking.

Wood (1976) found that exposure of these fish to daylight increases swimming activity and results in greater oxygen consumption and fish bruising. Since this may have a significant impact on the culture of the mosquito fish, a flat plywood cover was placed over the tops of the tubs. Two 2.5 cm wooden slats were placed, width-wise under the cover to provide an air space. Each cover was left on continuously. This tended to minimize algae production in the water and stopped fish predation by vertebrates such as raccoons. More fish could probably be held in the tubs if they are used within a couple of weeks. Several tubs can be used to obtain quite a large holding population of mosquito fish for stocking purposes.

The technique of using bathtubs as holding tanks was an economical and efficient way to have fish available throughout the year for the suppression of natural mosquito populations.

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DIFFERENCE IN FLOW RATES OF MALATHION USING THREE TYPES OF HOUR METERS COMPARED TO A CONSTANT VOLUME FLOW CONTROL PANEL[1]

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At the present time ULV cold aerosol generators are widely used for ground adulticiding operations. This type of equipment has been shown to be effective against rice field mosquitoes in Arkansas (Mount et al. 1972). Tachometers are used to maintain a constant speed (16 kph), and an hour meter hooked to the on-off switch of the cold aerosol generator records the number of minutes the machine is in operation each night. This number is then divided into the amount of chemical used which gives the rate at which the chemical is dispersed per minute.

A constant volume flow control panel was purchased in order to improve the consistency of our flow rates. The hour meter was retained on the unit to indicate the performance of the C. V. (constant volume) panel. The flow rates calculated using the hour meter were consistently from 14.8 to 44.4 ml/minute lower than the rate the C.V. panel was set to deliver. Thus, a test was conducted to determine the ability of

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