OPERATIONAL AND SCIENTIFIC NOTES

A SIMPLE BATTERY OPERATED SUCTION TRAP FOR INSECTS ATTRACTED TO ANIMAL, LIGHT OR CHEMICAL BAIT

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The trap described in this paper was originally constructed in 1969 to meet the need for an animal-baited trap which would collect *Culicoides* in reasonable numbers. The main criterion required was that the bait animal should be as far as possible completely exposed, and not separated from the attacking insects by mosquito net or wire mesh. The second criterion was that the trap should be constructed cheaply and from easily obtained materials and should not be sufficiently valuable to encourage theft.

The prototype and two other models have since been operated in tropical forests for several nights per week for the last 3 years, and have proved excellent for catching not only *Culicoides* but mosquitoes as well. They have required the minimum of maintenance, and have proved to be as reliable as the average CDC light trap. Of four traps tested for mosquito catching ability by Tikasingh and Davies (1972) the trap here described was found to catch the greatest number of individuals and widest range of species.

Ideas for various parts of the trap have been drawn from a number of sources. The intermittent fan and time switch were suggested by the Lumsden (1958) trap, the plastic foam valve by de Freitas *et al.* (1966), and the arrangement of the net by Davies (1971). A mock-up of the prototype was demonstrated at a Laboratory Meeting of the Royal Society of Tropical Medicine and Hygiene in November 1969 (Davies 1970) but hitherto no description has been published.

DESCRIPTION. The trap consists basically of four parts: lid and netting, fan housing, bait cage and time switch (Fig. 1). A power supply in the form of a 6-volt motorcycle battery is also required. The total weight without battery is 5 lb., with dimensions of 2 ft. 4 in. x 12 in. x 12 in. The lid is constructed of a single piece of ¼ in. plywood (preferably waterproof), 12 in. in diameter, fitted with a wire loop handle. The net for catching *Culicoides* was made of nylon chiffon having between 50 and 60 meshes per inch. If mosquitoes or larger insects are required, ordinary nylon or terylene mosquito netting may be used. This was constructed in the form of a straight sided tube, 20 in. in length and 12 in. in diameter. The ends were reduced to 10 in. in diameter by running a length of expanding curtain wire through a ½ in. hem at each end. A small plastic vial with the bottom cut out was cemented to the centre of the net so that an aspirator could be inserted into the cage for extracting the insects.

The fan housing is made from a metal tube approximately 8 in. long and 6 in. in diameter (a 5-pound dried milk tin with both ends cut out was used in the prototype). Halfway up this tube a small 6-volt D.C. electric motor (such as Pittman Corp. D.C. 84–6) was clamped into position with its shaft in the centre of the housing. It was found that the easiest way to do this was to construct two aluminium straps and bolt them round the motor and to the sides of the fan housing. These straps should be made of aluminium since the use of steel or iron in this position may interfere with the permanent magnets on the motor. To the motor shaft was attached a three-bladed plastic propeller, diameter 6 in. with a pitch of 4 in. such as is used for model aircraft. On the top of the fan housing lay a circular disc of flexible ¼ in. polystyrene foam. This was cemented to the top of the tube at one point so that it would be free to rise under pressure of the air flow up the fan housing when the propeller was in operation. A plywood skirt, diameter 12 in. should be fastened 3 in. below the valve to rest in the bottom of the net.

A bait cage made of ½ in. mesh galvanised hardware cloth 3 in. in diameter and 3 in. deep was suspended below the fan housing by running two long skewers through both the housing and the top of the cage. This is suitable for containing small rodents, a baby chick, or a block of solid carbon dioxide. A small 6-volt light bulb may be suspended in place of the cage if a light attractant is required.

The object of the time switch was to operate the fan for about 30–45 seconds every 7 to 10 minutes. This not only allowed insects to collect around the bait undisturbed but also conserved the battery. It was found that the easiest way of obtaining this action was to use a cheap kitchen clock fitted with electrical contacts. To do this, remove the case, face and hands from the clock mechanism and dismantle the alarm, if present, and the gears operating the hands. Inspection will show that one of the gear trains between the escapement and the main spring will complete one revolution about every 7½ minutes. A small copper or stainless steel pin should be soldered to the shaft or to one of the spokes of this gear (it may be possible to do this in situ) and a fine copper wire arranged so that it makes contact with the pin once every revolution. The other end of the wire can be insulated from the body of the clock by a piece of perspex or other plastic, bolted to

the clock body. Duration of contact can be adjusted by altering the angle and tension of the contact wire.

Because the motor employed in the fan may consume between one and two amperes the time switch cannot be placed directly in series with the battery and the fan, since arcing will take place at the contacts which may then become welded together. To avoid this, a small switch relay with a coil resistance of 50 to 100 ohms must be incorporated into the circuit.

The time switch should be enclosed in a small wooden box which can be mounted either on the top of the lid or attached to the side of the battery. Leads from the switch box should connect with the battery and the fan.

OPERATION. For carrying, the trap may be dismantled to its main components and the bait animal placed in its cage. On reaching the site, the trap is best assembled from the top downwards. The lid should be hung on a suitable fixture by the handle, and the net slipped around it. The fan housing and skirt can then be inserted into the bottom of the net. If the net has been made correctly the weight of the fan assembly should keep the sides of the cylinder taut enough so that no insects can escape around the edges of the lid or skirt. The lead from the fan can then be connected to the time switch, and the battery; both may be placed on the ground. Correct polarity should be observed to ensure that the fan rotates in the right direction.

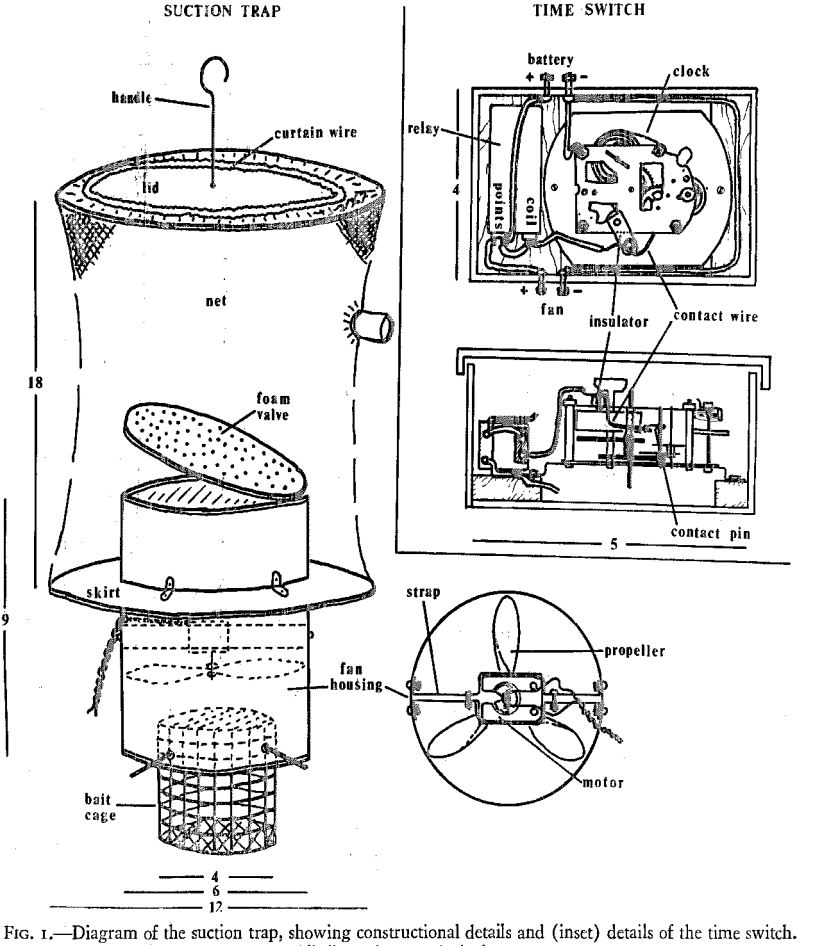

FIG. 1.—Diagram of the suction trap, showing constructional details and (inset) details of the time switch. All dimensions are in inches.

Lastly the bait cage can be attached to the bottom of the fan housing by the two metal skewers, and the clock wound and started. If the trap is likely to be invaded by ants, the handle and lead to the time switch should be smeared with motor grease as a deterrent. The trap will withstand light rain without further protection, but if heavy rain is expected a small roof of galvanised iron or polythene sheet may be necessary.

MODIFICATIONS. The description above represents the trap in its simplest form, but the design lends itself to many modifications and refinements depending on local circumstances and trapping requirements. None of the dimensions are critical, and traps of double the diameter have been employed successfully for accommodating larger bait animals. The modified clock used as a time switch may be replaced by a D.C. timing motor, or by an electrically driven clock. The frequency and duration of the fan operation may be adjusted to suit any prevailing need, remembering that the more frequent the operation the shorter will be the life of the battery.

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SEASONAL ABUNDANCE OF MOSQUITO LARVAL COUNTS AND ADULT LIGHT TRAP CATCHES IN OKINAWA [1]

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The success or failure of any mosquito control program is dependent on surveillance; if the surveys are conducted thoroughly and often enough excellent mosquito control can usually be realized. Two tools of a mosquito survey are larval dips at the breeding sites and mosquito light traps. Normally these two tools can be fairly effective indicators in determining whether mosquito populations are likely to get out of hand.

The U. S. Army's intensive mosquito surveillance program conducted over the past several years on Okinawa has provided a significant amount of data for a 7-year period, 1965–1971. These data were collected and summarized on a monthly basis. Permanent larval dipping stations provided a constant source of information about the aquatic stages of the local mosquitoes. Twenty-five New Jersey type light traps in operation 7 days a week were used to collect the adult mosquitoes.

The voluminous data from this 7-year mosquito surveillance project were analyzed by the computer at U. S. Naval Medical Research Unit No. 2 (NAMRU-2). Monthly counts of larvae and adults of various mosquito species were expressed graphically in percent of the total count during the full period for which data were available, usually 7 years. Figures 1 through 10

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