A PORTABLE MOSQUITO TRAP FOR USE WITH A BANTAM FOWL

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INTRODUCTION. An investigation into arboviruses in the Westland District of New Zealand was initiated in 1962 by the Virus Research Unit of the Medical Research Council of New Zealand. Here, as in most arbovirus programmes the collection of large numbers of the adult vectors became an integral part of the programme.

In the early stages of these investigations the stable trap of Bates (1944) baited with domestic chickens was the main source of mosquito catches. However, due to their bulk the use of these traps over rugged and swampy terrain was strictly limited.

Several types of portable mosquito traps for use with small vertebrate bait have been described previously. The "Baitcan" of Bellamy and Reeves (1952) is compact but the mosquito catch is not separated from the attractant animal bait; consequently the bait has to be kept immobilised during trapping operation. The trap of Lumsden (1958) requires a power source to operate the fan, which provides the suction into the collecting bag. The small traps suggested by Worth and Jonkers (1962) have been designed for use with mice and therefore have a rather restricted use.

Since none of these designs was entirely satisfactory for the existing conditions, it was decided to see whether a more suitable design could be produced.

Local Geography. Westland is situated in a high rainfall belt on the west of the main divide of the Southern Alps of the South Island of New Zealand. There is an annual rainfall of about 3,800 mm, an average daily temperature of 52° F., and an average of 1,830 hours of sunshine annually. Much of the area where the investigations are being carried out is covered in rain-forest and swamp in a low lying terrain.

MATERIALS AND CONSTRUCTION OF TRAP. A 12-gallon drum (or similar capacity) is cut in the middle horizontally. The lower half is used to house the bait and the top half forms the middle chamber. The two halves are modified further as follows:

The Lower Half (The bait chamber).

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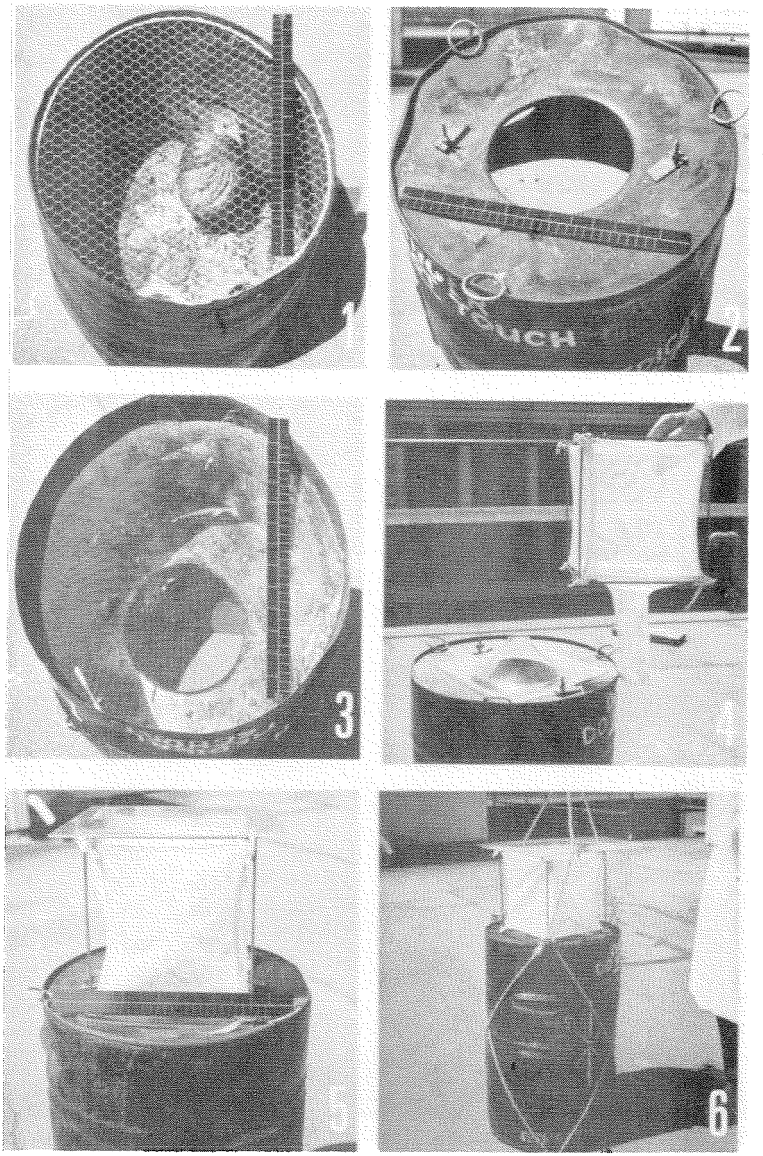
The cut edge was turned in slightly so that the top half could fit neatly when placed on it. A piece of chicken wire mesh attached to a circular 4 mm diam.



FIGS. 1–6.—Stages in the construction and assembly of the trap. 1. Lower half with the bait in situ, restrained by circular wire mesh. 2. Top half. 3. The undersurface of the top half. 4. Top half showing stages in assembly. 5. Assembled trap, showing top half only. 6. Modification for aerial sampling.

wire frame, was supported by three evenly placed screws one inch below the cut edge. This served as a retaining lid for the bait, Fig. 1. A few ¼" holes bored in the floor of the drum served as drainage holes, thus preventing unhealthy fouling of the drum during operation.

The Upper Half (The trapping chamber). A circular hole about 6" in diameter was cut out in the centre of the top of the drum. On either side of the hole, approximately 11 inches apart, a three-sixteenth of an inch brass screw was welded with its free end facing upwards. Over each screw a brass strip 2½" x 1" x ⅛" with a hole at one end was slipped, and held by a wing nut. These strips were used to anchor both the wire frame of the collecting cage and a plexiglass cone (see Fig. 2).

Three slits approximately 6" long and 1 inch wide were cut outwards from the side of the drum at different levels around the circumference, one about 2 inches from the top edge, another on the opposite side about 2 inches from the bottom edge and the third equidistant from the two about half way up around the circumference, Fig. 6. A circular piece of metal mosquito gauze netting was soldered on the lower end (cut end) of the drum. This formed a barrier between the captured mosquitoes and the live animal bait, Fig. 3.

The Top Collecting Chamber. This consisted of a mosquito netting bag 8" x 8" x 8" suspended within a wire frame and having a sleeve 6" long and 3" diam., which fitted over the plexiglass cone. A sheet of ⅛" thick plexiglass was clipped over the top of the frame to give protection against rain, Figs. 4 and 5.

Assembling the Collecting Apparatus and Setting the Trap for Operation. The hen was placed in the lower chamber with adequate provision for grain and water. A small quantity of straw or dry leaves usually added to the comfort of the animal. The circular piece of chicken mesh was placed on the three point support of the drum. The middle chamber was put on over the lower chamber. Next the cone was placed over the circular opening. The net, which was stretched and suspended from the corners of the frame by means of the calico strips, was placed on the cone with its sleeve rolled over the opening.

The frame net was clamped by means of the brass strips which were pivoted on to the lower bar of the frame and tightened by means of the wing nuts. This also enabled the cone to be held down in place. Finally the 12" x 12" square plexiglass sheet was brought to rest by means of two clips on top of the frame. The completed trap is shown diagrammatically in Fig. 7.

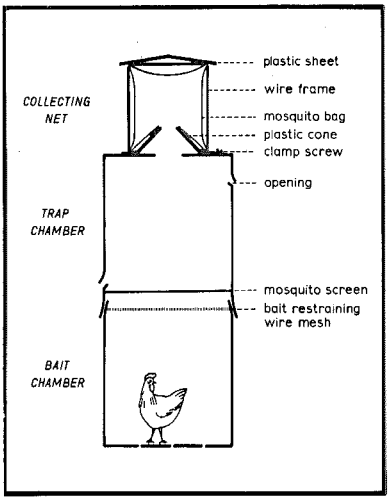


FIG. 7.—Diagrammatic detail of a trap in operation.

The two halves can be securely combined by lashings to three supporting rings welded to the top and bottom surfaces of the trap. This allows canopy mosquito sampling by the use of a pulley fastened on to the branch of a tree and by which the trap is raised to the required height, Fig. 6. It has a total height of less than 36" and weighs less than 15 kg. with a bantam bait in it.

Operation of the Trap. Mosquitoes attracted by the live animal bait entered the slits in the top half of the drum. Once inside, the screen below prevented them from reaching the bait. Attracted by light they flew through the transparent cone

and escaped above into the net. In the morning the mosquitoes were retrieved by moving the frame with net attached to it and a fresh one was attached for subsequent capture. The framed net with the mosquitoes in it could now be easily transported to the field laboratory.

To prevent desiccation and other harmful effects of direct sunlight the trap was usually set for operation in a sheltered, moist and shady position.

RESULTS. For three years the trap has been used as the basis for mosquito collection for virological and biological investigations of mosquitoes in Westland. The trap has been tested under a variety of conditions including one in a tree canopy at a height of 70'. Large numbers of the two commonest species of mosquitoes, *Culiseta* (*climacura*) *tonnoiri* Edwards and *Culex pervigilans* (Bergroth) were caught in peak mosquito seasons at Whataroa. A total of 1,326 adult *tonnoiri* was the largest number obtained in one night from a single trap. A nightly catch of 500–1000 adults per trap was not unusual during a peak mosquito season. This was higher than the numbers obtained from a stable trap in any one night.

The trap was also tried in an area covered with native forest on the southeast coast of Otago, where four species of mosquitoes belonging to the genera *Culex, Culiseta* and *Aedes* occur. All four were taken by the trap in large numbers.

DISCUSSION. It is generally recognised that adult mosquitoes held in captivity will fly, when disturbed, towards a light source. This characteristic reaction occurs in any size or shape of cage or container. In constructing the trap this basic pattern of adult behaviour has been used to advantage. For instance, the transparent cone is intended to allow a shaft of light inside the dark trapping chamber so as to stimulate an upward movement by the mosquitoes into the collecting net.

The screening of the bait from the trapped mosquitoes has an obvious advantage. It eliminates the possibility of extraneous contamination by the hen, a matter of particular importance when the catch is used for arbovirus investigations. It also enables the two functions of trapping and servicing of the trap to be carried out separately with a minimum of disturbance. Once the live animal bait is adequately provisioned with food and water no further attention is necessary for several days, while mosquito catches can be removed daily with a minimum of routine. Under the climatic conditions of Whataroa, bantam hens have been left for 7 days at a stretch without suffering any obvious ill effects. Under tropical conditions more frequent changes might be necessary.

When it becomes advisable to change the hens, their transport is easy within the bait chamber which may be fitted with a carrying handle like a bucket.

Perhaps the most useful feature of this trap is the ease with which the trapped mosquitoes can be retrieved. This is quicker and more efficient than any other trap in use with live bait attractant today. Moreover the trapped adults are retained in a perfectly healthy condition which is invaluable when they are required for biological investigations, or for examination as specimens.

With only a slight modification the trap can be adapted for sampling mosquito fauna of forest canopy.

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