ARTICLES

NOTES ON COLLECTING MOSQUITOES [1]

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INTRODUCTION. During the past several ears, the writer and his associates have ıade hundreds of collections of mos- uitoes and some of the collecting trips ave been of several days duration. Spe- ific objectives have varied from time to me, but general objectives have been to ollect the specimens and to get them back live to the laboratory for rearing and udy. The percentage of living speci- ıens of all stages successfully transported as been consistently high. The purpose f this paper is to describe briefly the ıethods of collecting and the equipment ıat is used. Prime objectives have been) keep collecting equipment to a mini- ıum and as simple as possible. The riter does not claim that the methods ıd equipment used are entirely original; ıey have been developed over a period of ears with contributions from other col- ctors, students and technicians. Some f this material may seem elementary to xperienced collectors, but it is hoped that ven they will find certain points of some ıterest.

EQUIPMENT. A sedan has been used for ansportation with reasonable success, but has been found that a station wagon is ıore satisfactory. Perhaps because of etter air circulation, the percentage of ving specimens at the end of a trip has een higher with the latter type of vehicle. arval and pupal collections have been mphasized, since experience indicates that ıany more of these stages than adults can e found routinely in a limited time. On the other hand, if adults or egg rafts are encountered, they are also collected. The following equipment is carried routinely for each of the stages noted; the use of the equipment will be noted more fully later.

Larvae: Collecting equipment for larvae include the usual white enamel dippers and pipettes, half gallon wide mouth fruit jars with two-piece lids for transporting living larvae, and boxes divided into sections each of which will accommodate one fruit jar. Each box, which has a handle on each end, has a capacity of six fruit jars. The jars fit snugly into the sections which are lined with cork. To facilitate keeping accurate field notes, the jars and sections are numbered with black paint, each jar being carried in the section with its corresponding number. The central portion of the two-piece lids of the jars has been replaced with fine copper wire which allows air to enter.

In view of the possibility that all the larvae in some of the collections will die or pupate before they reach the laboratory, small screw top vials with bakelite lids are used for preserving a portion of those collected. The preservative used is 95% alcohol, but when this is added to the larvae, sufficient water remains to dilute it somewhat. Absorbent cotton is used to pack the preserved larvae.

At least one white enamel pan which will hold the contents of a half gallon jar is carried so that the larvae may be examined more closely at the end of the day.

Pupae: On a trip of several days duration, it is not at all unusual for many larvae to pupate in the collecting jars, and frequently, many pupae are collected at the same time as are larvae. The pupae may of course be quite different from the larvae, and adults which emerge in the

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collecting jars often fall into the water and are ruined. Consequently, one or more bell jars with top and side openings are carried to allow for possible adult emergence during the night. In addition, large shell vials four inches in length and 1¼ inches in diameter with cotton plugs and filter paper or cotton in the bottom are used for the transportation of living pupae. These vials are carried in a wooden block approximately 3½ x 3½ x 12 inches into which holes have been bored for the individual vials. Vials and holes are given corresponding numbers.

Adults: Sometimes vials of the same type as those described for pupae are used for transporting living adults. The smaller vials used for egg rafts, to be mentioned shortly, are also quite satisfactory. Small cyanide tubes and jars are used for killing adults. An aspirator and insect net are also useful on occasion for collecting adults.

Egg Rafts: A small metal instrument with one flattened end and sometimes called a section lifter, is used for collecting egg rafts. Egg rafts are transported in vials approximately 3 inches long and ⅞ inch in diameter. The vials are plugged with cotton, and several layers of filter paper are placed at the bottom of each vial. Vials are numbered and carried in a bored wooden block similar to the one used for the pupal vials.

METHODS. *Larvae and Pupae:* Larvae and pupae are transferred from dippers to collecting jars until it is felt that a reasonable sample of the instars and species present has been obtained. Only small quantities of water are allowed in each jar and when the collection is complete, the larvae of all collectors may be combined into one or more jars. Larvae and pupae are transported with the water level approximately two inches from the top of the jars, and if necessary, water is added until this level is attained. Appropriate field notes are made, but at this time larvae and pupae are not separated, nor are any larvae preserved.

At the end of the day the collections receive further attention. Each jar i emptied into the large enamel pan pre viously mentioned and the larvae are ex amined. Representative larvae from eac collection are preserved by placing them i vials, removing most of the water an adding 95% alcohol. An appropriat label is placed in each vial and the spec mens held in place by a small wad of co ton that is pushed into the vial until i comes in contact with the larvae.

If large numbers of pupae are presen some of them are put in small dishes an placed under bell jars. Often a surpri ingly large number of adults will emerg during the night. The next morning th emerged adults are knocked out wit ether and then transferred to cyanide jar At a later date the adults are often put int screw top vials and held in place with bit of cellucotton or tissue paper.

If there are pupae from more localitie than there are bell jars, the extra pupa are placed in the pupal vials noted abov The pupae are added to the surface of th cotton or filter paper, and the excess wat removed. Pupae will survive for man hours on the moist surfaces and will ofte emerge as adults while in the vials.

The living larvae which remain in th enamel pan are returned to the origin jar for transportation to the laborator We have found larval mortality to be qui low although they have sometimes r mained in the jars for as much as 72 hou and have been transported for more tha 500 miles.

Adults: As we have implied previousl collections of adults have been somewh subordinated to larval collections. Hov ever, adults are often attracted to ou bodies, and they are sometimes seen ne larval collecting sites. If our only intere is to obtain specimens, biting adults a collected by placing a small cyanide tul over them. If we want the specime alive, we use a pupal or egg raft vial, an allow the mosquito to finish its meal b fore capturing it. This practice is course not recommended in areas whe mosquito borne diseases are prevalen

Adults from vegetation or elsewhere in the vicinity are captured with an insect net or aspirator.

So far we have not attempted to carry adults great distances, but have done so successfully for more than 50 miles with no provision for moisture. On several occasions these females have deposited viable eggs in the laboratory. It is thought probable that moistened cotton or filter paper in the vial would increase the percentage of survival for greater distances.

Egg Rafts: A small amount of free water is added to the vials used for egg rafts. Each raft is lifted from the surface of the collecting site with a section lifter. Effort is made to have the raft near the end, since it is removed from the section lifter by sticking the end into the free water in the vial. After the raft has floated free, the excess water is removed from the vial with a pipette. This allows the raft to rest on the surface of the moist filter paper.

By using these methods we have had egg rafts retain their viability for several days although sometimes they partially hatch while in the vials. In the laboratory the vials are partly filled with pond water. This usually floats the rafts off the filter paper and frees any larvae that may have hatched. The egg rafts and any larvae which may be present are then placed in larger containers for hatching and rearing.

Summary: Methods and equipment used for collecting and transporting living mosquitoes have been described. Larvae, pupae, and egg rafts have been kept alive for 72 hours and transported over 500 miles; pupae often emerge successfully as adults in the vials used for their transportation. No effort has been made to carry adults this far or for this length of time, but they have remained alive for shorter times and distances.

A REPORT ON TESTS OF THE PERFORMANCE OF ADULTICIDING MACHINES IN CALIFORNIA [1]

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INTRODUCTION. The fifty-three local agencies presently engaged in mosquito control in California emphasize the control of mosquitoes while in the aquatic stages, by elimination or reduction of the sources and by the application of larvicidal measures. However, adulticiding is, on occasion, a necessary supplement to the control of the preadult stages, and many of the agencies maintain adulticiding equipment on a standby basis, for use as need may arise. A survey by the Forms, Records and Statistics Committee of the California Mosquito Control Association showed that there are employed by 28 of the agencies within the state the following numbers of machines:

Venturi Exhaust Generators (on jeep exhausts)	23
California Exhaust Generators (on jeep exhausts)	21
California Fog Applicators	10
Holmes Insect-a-Fog Machines	10
Mist Blowers (various makes)	11
Husman Pneumatic Sprayers	1
TIFAs	20
Bes-Kil Aerosol Generators	8
Total	104

[1] The testing program, the results of which are reported herein, was conducted from July 1 to July 15, 1954, as a joint study of the California Mosquito Control Association, Inc., and the Bureau of Vector Control of the California State Department of Public Health.

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