Although no references have been found to indicate that these species have been collected from leaf axils before, this is not an unlikely breeding place, since the plants containing the larvae were located in a cool, low shaded section of the field, and since both species are known to breed in a variety of containers including tree holes, rain barrels, discarded tires and other artificial containers. This is apparently not a common occurrence, however, since larvae were not found in teasels in other places in the State, even in fields containing several acres of the same teasel species which were adjacent to brooks containing many *A. punctipennis* larvae and woods in which *A. triseriatus* larvae were found.

Literature cited

Borob'ev, B. A. 1960. Dipterous larvae inhabiting water lying in the leaf axils of the teasel. Ent. Rev. 39:579–580.

MOSQUITO REARING AND SORTING CHAMBERS MADE FROM EGGSHELLS AND EGG CONTAINERS

GEORGE J. BURTON [1]

Chicken or duck eggshells, and egg containers, can be used as temporary or permanent field or laboratory chambers for rearing mosquitoes. The compressed cardboard or polystyrene containers in which eggs are usually sold by the dozen can also be used for sorting both adults and larvae. Any size of uncooked eggs can be utilized, although the extra-large and jumbo sizes result in larger chambers.

PREPARATION OF EGGSHELLS FOR EGG-TO-ADULT REARING CHAMBERS. The following items are needed for this purpose: one dozen extra-large or jumbo eggs; a cardboard or polystyrene egg container for holding 12 eggs; a roll of ½-inch adhesive tape; one dozen steel split-type key rings having a hole 1¼ to 1½ inches in diameter; a round screw-cap, ⅞ or 1-inch in diameter, such as the plastic cap of a prescription bottle; cotton or nylon mosquito netting, or a substitute made from a gauze bandage 4 inches wide, open-mesh curtain material, or silk bolting cloth; a sharp-pointed pair of forceps or large safety pin; and a sharp-pointed dissecting or surgical scissors. The preparation of one complete unit is described below, and this can be repeated to provide 12 rearing chambers. The steps in the preparation of these units are shown in Figure 1.

The screw-cap is placed over the narrow end of the intact, fresh egg, and by following the bottom edge of the cap with a sharp pencil, a circle is drawn upon the shell. If the key ring is now placed upon the shell, it should rest from ⅛ to ⅜-inch below the pencil line. Refer to the two shells, front row, left, in Figure 1.

The adhesive tape is cut into 5 pieces, each 1 inch long. Each piece is pressed in turn upon the shell so as to form a complete circle of tape with its upper edge against the pencilled circle. Separate pieces of tape are used for this purpose because the curvature of the shell usually does not permit using a continuous strip of tape to form the circle. This tape has two purposes: (1) the shell will not break below the upper edge of the tape because of the reinforcement provided, and (2) the tape forms a pad for firm seating of the key ring. Masking tape may also be used, but it does not cushion the ring to the same extent.

The fine point of the sharp forceps or large safety pin is pressed gently into the center of the top of the shell until it penetrates. The shell can then be cut away easily with the fine scissors. Before reaching the pencilled circle, the contents will usually begin to ooze out. At this point the egg should be turned upside down and the entire contents shaken out into a container, to be used as food later. The shell is then cut away down to and along the pencilled line. It now has a ⅞- or 1-inch opening at the top (Fig. 1, both rows), and should be rinsed out with water. It can be used without further reinforcement, but if desired the shell can be completely wrapped with ½-inch adhesive tape or dipped into melted paraffin.

The prongs of the key ring are spread apart with a knife or sharp instrument, and the mosquito netting or gauze bandage is fed into it, rotating the ring until the netting is through the entire ring, except where the ends of the prongs oppose each other. The tight slit holds the netting fast. Then, with the fingers or with any round, blunt object, the netting is pushed out until it forms a cone- or dome-shaped umbrella above the ring, to whatever height is desired (Fig. 1). A stitch is then taken in the netting at the point where the prong ends are opposed. The excess netting below the ring is cut away until only ¼-inch projects, and the ring is placed upon the open-ended shell, where it rests upon the adhesive tape. If the ring is heavy enough, it will need no further support, but if desired it can be held in place with additional adhesive tape. The nest-unit does not have to be put in place until the pupal stage has been reached, as the open shell is sufficient for hatching of eggs, development of larvae, and holding of pupae. A larger opening may be cut in the shell if desired. The number of larvae is varied, depending on instar and size. If key rings

[1] National Cancer Institute, Landow Building, Room C309, National Institutes of Health, Bethesda, Maryland 20014, U.S.A.

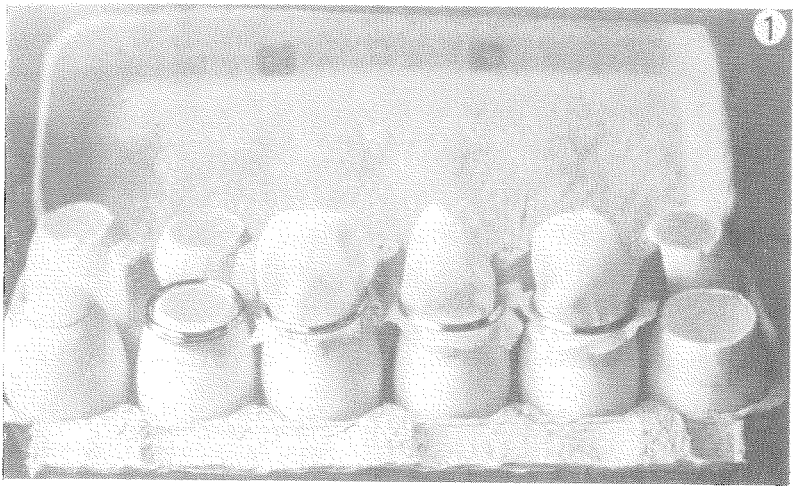

FIG. 1.—Stages in preparation of eggshell mosquito breeding units.

are not available, then large rings used for loose-leaf paper can be used, or stiff wire can be fashioned into a ring of desired size. In these latter cases, the netting must be hemmed, and the binder-ring or wire fed into it as one puts a curtain rod through a curtain hem. The name of the species being reared can be written directly upon the shell in pencil, or on a section of tape which is affixed to the shell.

When the adults have emerged into the netting, the ring is lifted off the shell slightly, and is set upon a small square of cardboard. It is then placed into a large adult-holding cage, and the netting everted; otherwise, the mosquitoes can be removed from the netting with an aspirator.

Alternative adult-resting devices can be made from glass funnels, wide plastic test tubes, cylindrical plastic bottles, or from metal or rigid nylon netting. The stem end of a glass funnel of appropriate small size is covered with a small piece of mosquito netting, which is taped on; this unit is placed upon the shell and is held in place with tape. Emerged mosquitoes can easily be seen through the glass. Cylinders may also be cut from wide plastic test tubes or cylindrical plastic bottles; netting is taped over the open end, and the opposite end is taped to the shell. Finally, cones or cylinders can be made from metal or rigid nylon mosquito netting, and then taped to the shell. One could even dispense with the adult-resting units, if necessary, and merely place the 12 breeding shells into a large holding cage.

EGG CONTAINERS AS LARVAL BREEDING CHAMBERS. The egg containers themselves can be used for rearing the aquatic stages, without using shells. In this case it is necessary to construct water-holding hemispheres from either aluminum foil or Parafilm. The design of most egg containers involves 5 projections between the two rows of eggs, and deep cutouts extending from the four sides of each projection. The cutouts limit the amount of water which the egg sockets can hold; therefore the water-holding capacity must be increased. This is done as follows: A number 2½ food can or tin is that size which holds 1 pound and 13 to 14 ounces of food. It is usually exactly 4 inches in diameter. A square of aluminum foil about 4¼ inches square is placed over the end of such a can, is pressed with the fingers over the entire edge, and is then removed. The resulting 4-inch circle is cut out with sharp scissors. This circle of foil is centered against the broad end of a hard-boiled extra-large egg, and is then crimped up and around the entire egg. A sac slightly larger than a hemisphere results. This is removed from the egg, is pressed down into one of the sockets in the egg container, and is seated in place with the same hard-boiled egg. This device holds much more water than the original compartments. The same procedure may be followed using Parafilm in place of foil. The entire series of 12 breeding chambers can easily be carried into the field by closing the cover of the egg container. Figure 2 shows 4 hemispheres of Parafilm at the left of the container, and 8 made from aluminum foil. When the pupal stage is reached, the pupae can then be transferred to the previously-described apparatus.

EGG CONTAINERS AS SORTING CHAMBERS. The flat cover of an egg container is very useful for sorting a light-trap catch. The box is set on the table with the cover toward the person engaged in sorting. The 12 compartments or sockets can be labelled with species names by affixing at the

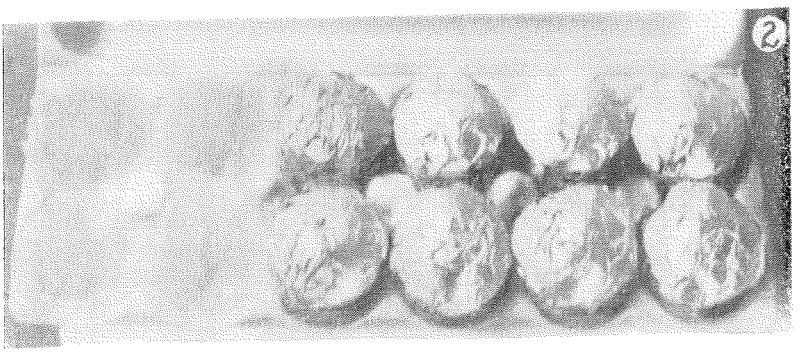

FIG. 2.—Hemispheres of Parafilm and aluminum foil inserted into egg compartments for larval breeding.

top of each compartment a strip of masking, adhesive, or other tape bearing the species name. Some types of containers have flattened sockets, which are quite suitable for direct use; however, others have narrowed bottoms, and in this case flattened plugs can be cut from a sheet of ⅜- or ½-inch plastic foam, and inserted into the sockets. These may be used as they are, or else the top covered with soft white paper. Polystyrene egg containers are waterproof, and may be used for sorting larvae, with or without the hemispheres of foil or Parafilm. If available, refrigerator-type plastic egg containers or trays may also be used for rearing and sorting larvae.

In parts of the world where egg containers are not available, the eggs can be kept erect by setting them into holes cut into a cardboard box or carton, or into wood or plastic sheets. They may also be propped up in sand, clay, or sawdust. Small tumblers or egg-cups of plastic, glass, or ceramic material may also be used. The shells can also be supported by using ¼- to ½-inch wide metal ribbon, in the manner used to support tools of various kinds.

CONTROL OF CATCH-BASIN MOSQUITOES USING ZOECON ZR515 FORMULATED IN A SLOW RELEASE POLYMER— A PRELIMINARY REPORT

RANDALL L. DUNN AND FRANK E. STRONG

Department of Entomology, University of California, Davis 95616

Mosquito abatement personnel responsible for mosquito control in cities recognize that catch basins serve as important mosquito breeding sites. In Stockton, and seven other communities within the district, the San Joaquin Mosquito Abatement District (MAD) treats from 15,000 to 25,000 catch basins monthly to eliminate this potential source of infestation. All catch basins are treated with either an insecticide or an oil throughout the entire breeding season which lasts about 7 months. This requires the services of two full time personnel and accounts for 3 percent of the district's total budget. Any control method which would prolong the effectiveness of each treatment would result in freeing assigned personnel for other duties.

Laboratory studies using slow-release polymers incorporating insecticides have been used for mosquito larviciding by Stockman *et al.* (1970) and Whitlaw and Evans (1968). We have been engaged in both laboratory and field studies using juvenile hormone (JH) mimics formulated in slow release polymers. With a single application, some of our formulations have maintained 100 percent kill of *A. aegypti* for as long as 100 days. These studies will be reported later. In this report we describe the results of one summer's research in the control of *Culex pipiens* Linnaeus in catch basins in Stockton.

METHODS. Technical grade of JH mimic ZR515 (Zoecon Corp., 975 California Avenue, Palo Alto, California) was combined with the polyurethane foam component W of Isofoam PE-12® (Isocyanate Products, Inc., 900 Wilmington Road, New Castle, Delaware) to yield a 3 percent (W/W) mixture at the completion of the foaming reac-