ANOPHELES LITORALIS KING AND *A. BARBIROSTRIS* GROUP ON THE ISLAND OF GUAM [1]

R. A. WARD,[2] B. JORDAN,[3] A. R. GILLOGLY [4] AND F. J. HARRISON.[5]

Prior to 1970, a single anopheline, *Anopheles* (*Cellia*) *indefinitus* (Ludlow), was known from Guam (Bohart, 1957). This was presumably a post-Warld War II introduction as this species was first collected during March 1948 by the 207th Malaria Survey Unit, U.S. Army (Yamaguti and LaCasse, 1950). In the period 1970–1971, 6 additional species of *Anopheles* were recorded from Guam by U.S. Navy and U.S. Air Force military entomologists. These included *baezai* Gater, *lesteri* Baisas and Hu and *sinensis* Wiedemann in the subgenus *Anopheles* and *subpictus* Grassi, *tesselatus* Theobald and *vagus* Dönitz in the subgenus *Cellia* (Holway and Bridges 1970, 1971; Reisen et al 1971a, 1971b; Darsie and Cagampang-Ramos 1972). The records of *lesteri* and *sinensis* will require further study as Harrison (1972, 1973) indicated that until his re-examination of the type series of *sinensis* and designation of a lectotype, considerable doubt existed on the true identity of *sinensis* and related taxa.

In May 1975, further collections were made by Army personnel of the 714th Medical Detachment during surveillance activities at the onset of Operation New Life—the program involving the use of Guam as a transit area for Vietnamese nationals prior to their entry to the United States.

On May 22, 1975 an undetermined female anopheline was collected at the Rojas Sports Arena, Naval Station, Guam in a CDC light trap baited with dry ice. This was submitted to the Medical Entomology Project for identification and was determined to be a member of the *A.* (*A.*) *barbirostris* species group, previously unrecorded from Guam. Additional single female specimens were found on May 27, 1975 by military entomology surveillance programs in a CDC light trap located 200 yards from the site of the initial collection and in a New Jersey light trap on October 10, 1975 in the Apra Heights housing area. This last site is within a mile of the original collection sites.

The *barbirostris* group consists of 11 species and was previously restricted to the Oriental region except for one species on Western New Guinea (Harrison and Scanlon 1975). Three members of the group, *barbirostris* Van der Wulp, *campestris* Reid and *donaldi* Reid are known to be vectors of malaria and/or filariasis in Southeast Asia. Since the adult females are so variable in the group, positive identification to species cannot be made without associated immature stages. It should be pointed out that adult *barbirostris* are very smiliar to *campestris* and that only 80–85% of the adults can be reliably separated.

In an attempt to locate the breeding site(s) of the above species, the U.S. Navy Environmental Health Service has made additional surveys on Guam. During July 1975, 3 of the 15 larval collections made disclosed the presence of a second unrecorded species, *A.* (*C.*) *litoralis* King. This species was present in 2 collections from artificial containers in an old dump by the Batchelor Officers' Quarters at Orote Point and 1 collection from an oil drum at the junction above the NCS Beach. These 3 collections were all accompanied by reared adults of both sexes with associated larval and pupal pelts.

A. litoralis has previously been reported from the Philippines and may possibly occur in Sabah, Malaysia (Reid 1968). It has been incriminated as a vector of both vivax and falciparum malaria in Pangutaran Island, Sula Archipelago, Philippine Islands (Cabrera, Ramos and Cruz, 1970) and may be of importance on other islands in the Philippines where malaria is present but *A.* (*C.*) *minimus flavirostris* (Ludlow) is absent.

Reference specimens have been deposited in the collections of the U.S. National Museum.

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[2] Department of Entomology, Walter Reed Army Institute of Research, Washington, DC 20012.

[3] Chief Hospital Corpsman, Environmental Health Service, U.S. Naval Regional Medical Center, FPO San Francisco, CA 96630.

[4] Captain, MSC, U.S. Army Environmental Hygiene Agency, Entomology Branch, Fort McPherson, GA 30330.

[5] Captain, MSC, Department of Entomology, University of Illinois, Urbana, Ill. 61801.

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A METHOD FOR CULTURING SINGLE FAMILIES OF *ANOPHELES ALBIMANUS*[1]

M. G. RABBANI,[2] J. A. SEAWRIGHT[3] and L. B. LEATHERWOOD[4]

Dame et al. (1974) described an efficient method of culturing the mosquito *Anopheles albimanus* Wiedemann suitable for the production of the large numbers needed for mass releases into natural populations. We have been successful in adapting this method so that it is suitable for rearing a small number of mosquitoes,, e.g., a single family culture. With this rearing procedure, we usually observe more than 90% survival from larvae to adults. Such a method is very necessary in genetic studies that require an accurate estimate of different phenotypes within a single family.

We isolate individual gravid females in plastic tubes (2.5 x 6 cm) lined inside with a strip of filter paper. The vials contain 5 ml water infused with 0.5 ml of 2% liver powder-yeast (2:1) suspension and are plugged with cotton balls. A 27 x 30-cm rack can hold 56 such vials (Fig. 1-A). Eggs are normally laid within 24 hr. On the third day after isolation when hatching is almost complete under our laboratory conditions, temperature 28±0.5° C, we open the vials, remove the females, and whenever necessary, take out the strips of filter paper with the eggs to count for hatching percentage estimation. The batches of larvae are then transferred to 16-oz squat-type clear plastic cups (Sweetheart Plastics®) containing 200 ml water (from a subterranean well) infused with a 2-ml volume of 2% liver powder-yeast (2:1) suspension. Well water is used in lieu of distilled water because of high larval mortality observed with the latter. The cups are covered with plastic tops that have a 2-cm hole in the center. The hole is plugged with cotton and allows feeding the larvae without opening the entire lid. These cups are space-saving and can be stacked on shelves. A 25 x 135 x 185-cm wooden rack can hold about 200 cups at a time.

After the initial infusion, the families of larvae are not fed again until the fourth day when a new feeding regimen is followed. The families are given 0.5 ml aliquots of a 2% suspension of hog supplement (40% protein, made by Ralston-Purina®). The hog supplement pellets are roasted at 120° C for 1.5 hr, ground, and sieved through a 300-μm screen. We have observed that preparing and storing the suspension at 7° C for a day prior to use gives better rearing results.

When the first pupae appear which can be observed through the clear plastic cups, the amount of hog supplement suspension added each day is decreased. When more than 50% of the larvae have pupated, the feeding can be stopped al-

[1] Mention of a commercial or proprietary product in this paper does not constitute an endorsement of this product by the USDA.

[2] Biologist III, Florida Medical Entomology Laboratory, Box 520, Vero Beach, FL 32960.
[3] Research Entomologist, Insects Affecting Man Research Laboratory, Agr. Res. Serv., USDA, Gainesville, FL 32604.
[4] Lab Technologist, Department of Entomology and Nematology, University of Florida, Gainesville, FL 32611.

Fig. 1-A. Egging vials in a wooden rack.
1-B. Families of larvae in plastic cups are being fed with hog supplement.
1-C. Transferring adults from cups by a mouth aspirator.