ECOLOGY AND EPIDEMIOLOGY OF DENGUE VIRUSES IN DIN DAENG DISTRICT, BANGKOK

Principal Investigators : Bruce A. Harrison, LTC, MSC
Terry A. Klein, CPT, MSC
Douglas M. Watts, Ph.D.*
David E. Johnson, MAJ, MC**

Associate Investigators : Donald S. Burke, LTC, MC
Ananda Nisalak, M.D.
Franklin Wilson, SSG
Michael C. Callahan, SFC***

Assistant Investigators : Nongnuj Maneechai
Chumnong Noigamol
Vichit Phunkitchar
Inkam Inlao
Prajim Boonyakanist
Rampa Rattanarithikul
Kol Mongkolpanya

OBJECTIVES : The overall objectives were given in a previous annual report (1). The objectives applying to this report are: (a) to determine the population density of the wild *Ae. aegypti* population on a seasonal basis; and (b) to determine the seasonal availability of artificial containers and their utilization by *Ae. aegypti* for oviposition.

BACKGROUND : These studies are a continuation of projects that were initiated in 1978 and outlined in previous reports (1, 2, 3). Dengue continues to be a very important disease in Bangkok, primarily due to the association of the vector host to the human population. Prevailing environmental conditions, e.g. the accumulation of water in artificial containers that are highly suitable for immature development and the lack of sufficient control measures, are instrumental in the continuation of periodic and seasonal dengue epidemics.

METHODS : The study area (a section of the Din Daeng slum and government housing development area),mapping, and census of the population have been described in previous reports (1, 2).

---

* Department of Arboviral Entomology, Division of Virology, U.S. Army Medical Research Institute of Infectious Diseases, Ft. Detrick, Frederick, Maryland 21701.

** USACGSC, Student Detachment, Ft. Leavenworth, Kansas 66027.

*** Department of Preventive Medicine/Biometrics, Uniformed Services University of the Health Sciences School of Medicine, 4301 Jones Bridge Road, Bethesda, Maryland 20014.

Surveys to determine the seasonal availability and utilization of containers have been continued at 6 week intervals as for the previous year (3). The use of the emergence trap to determine the seasonal changes in the emergence rate, and the floating larval trap to estimate the larval density, have been continued.

RESULTS : Field aspects of this project ended on 19 December 1980. During the 3 years of field work in the Din Daeng study area a total of 20 surveys were conducted to determine the container usage and the positive container index for *Aedes aegypti* immatures. Larval and emergence trap surveillance surveys were conducted during 17 of those survey periods. Originally, each survey period called for 100 residences (divided between slums, shops and high-rise flats) to be surveyed. Toward the end of the project, however, more residences were lost or moved between surveys than could be replaced. Thus, some of the last surveys were based on slightly less than 100 residences. Last years report (3) presented a short summary of some preliminary findings resulting from the field aspects of the project.

During this year emphasis was placed on transcribing the large amount of data into a system suitable for computer analysis. Access to an adequate computer system has caused some delay, but hopefully, has been resolved. Those data in Thailand have been transcribed and shipped to the United States for analysis.

Data from the Din Daeng study, data from other AFRIMS projects and the Thailand Ministry of Public Health weekly DHF epidemiological surveillance reports indicate that Dengue Hemorrhagic Fever cases begin to increase during the hot dry season well in advance of the rainy season. This situation has prompted several studies on the influence of temperature changes on the DHF case rates (4) and dengue virus replication in and transmission by *Aedes aegypti* (5).

One major objective of the project was to develop surveillance techniques and/or equipment that will efficiently sample the relative density of *Ae. aegypti*. Early in this project a very efficient floating larval trap was designed and tested in the laboratory (1, 3). This trap was integrated into the field aspects of the Din Daeng study in January 1979. Accordingly, when the Din Daeng project was terminated in December 1980, approximately 2 years of field collection data had accrued for the AFRIMS Larval Trap. During the 2 years of field trials traps were placed in 1,322 known positive water jars and 42,541 immature mosquitoes were captured, of which over 98% were *Ae. aegypti*. Of the 1,322 traps set, only 21 failed to collect immature mosquitoes in the 24 h period, indicating a trap "sensitivity" (6) of 98.4%. Positive water jars were determined by visual inspection and the detection of at least one specimen (either larva or pupa). During the first 2 field survey periods the 5,305 immatures collected in 163 traps were not separated into larvae and pupae, thus data on trapping effectiveness for these 2 life stages (Table 1) were based on 1,159 traps set during the following 15 survey periods. The "sensitivity" of the trap during these 15 survey periods was 99.2%, with larvae comprising 95.7% of the immatures collected. These data (Table 1) indicate that a mean number of 30.99 larvae and 1.39 pupae were collected per positive

AFRIMS trap in 24 hours. These trap returns, in a field situation where numbers of immatures per jar were variable, even as low as one, suggest the trap efficiency was high, as previously determined in the laboratory tests (1).

Besides sensitivity and efficiency, the AFRIMS larval trap has other advantages, e.g., small size, low cost, simple construction (Figure 1), keeps specimens alive, collects larvae and pupae, sturdy and durable, functions as a random sampler, and also can be used as a surveillance or control device.

A manuscript (7) describing the development and testing of the AFRIMS larval trap has been prepared and is ready for submission.

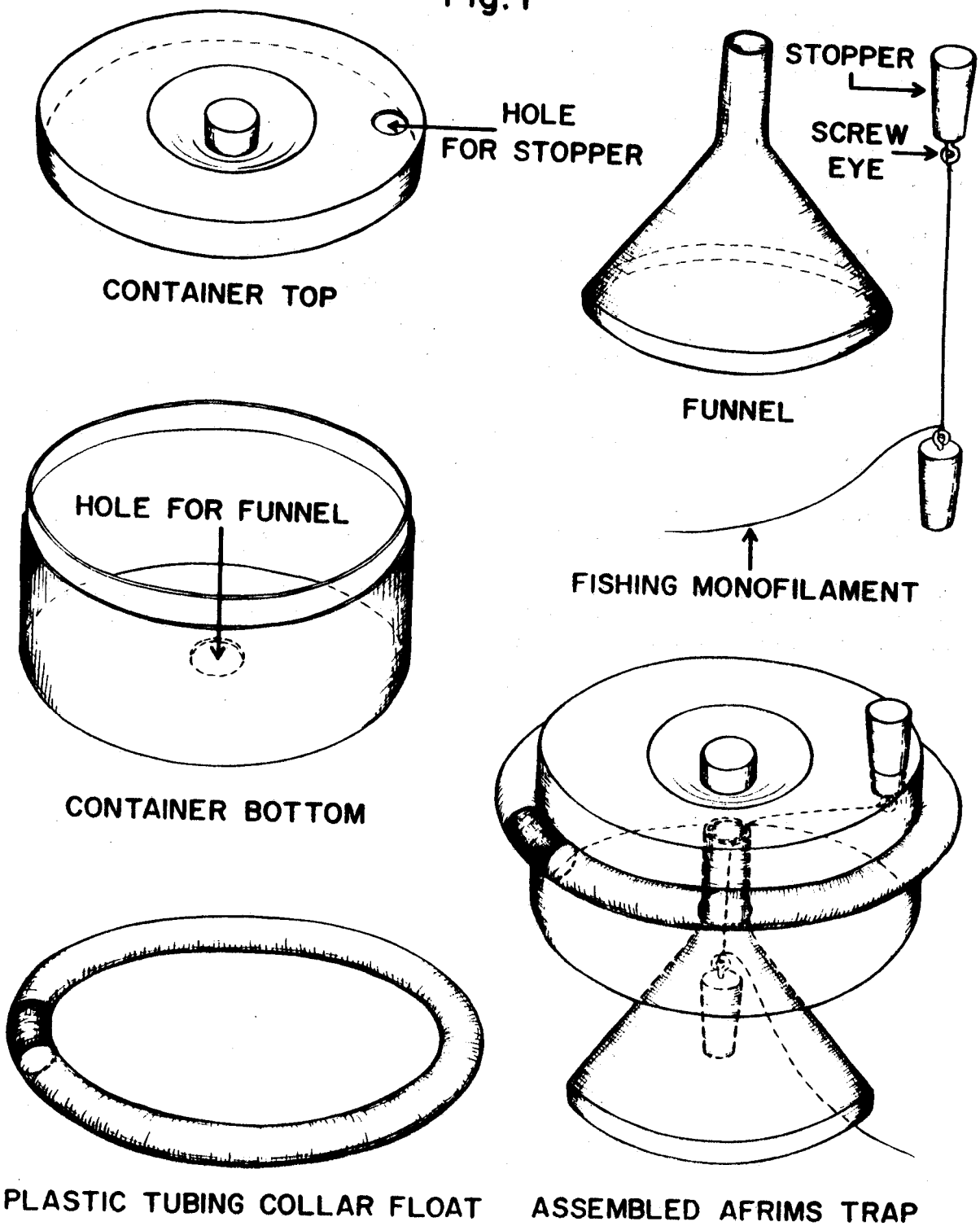
This project has been terminated.

Table 1. Field Trials: Results from AFRIMS traps set in mosquito positive water jars in the Din Daeng area, Bangkok, during 15 survey periods in 1979-80.

	Traps			Mosquitoes Collected*		
	Total	Positive	Negative	Larvae	Pupae	Total
Number	1,159	1,150	9	35,637	1,599	37,236
%	100.0	99.2	0.8	95.7	4.3	100.0

* Over 98% *Ae. aegypti*

Fig. 1


HOLE
FOR STOPPER
CONTAINER TOP
STOPPER
SCREW
EYE
FUNNEL
HOLE FOR FUNNEL
CONTAINER BOTTOM
FISHING MONOFILAMENT
PLASTIC TUBING COLLAR FLOAT
ASSEMBLED AFRIMS TRAP

REFERENCES :

1. Watts, D.M., B.A. Harrison and D.E. Johnson. 1978. Ecology and epidemiology studies of dengue viruses in Din Daeng, Bangkok, Thailand. AFRIMS Annual Progress Report, October 1977 - September 1978. pp. 66-79.

2. Watts, D.M., B.A. Harrison, D.E. Johnson and T.A. Klein. 1979. Ecology and epidemiology of dengue viruses in Din Daeng district, Bangkok. AFRIMS Annual Progress Report, October 1978 - September 1979. pp. 73-112.

3. Watts, D.M., B.A. Harrison, D.E. Johnson and T.A. Klein. 1981. Ecology and epidemiology of dengue viruses in Din Daeng District, Bangkok. AFRIMS Annual Progress Report, October 1979 - September 1980. pp.

4. D.S. Burke, S. Jatanasen, D.M. Watts and D.B. Tang. 1980. Abst. 10th Int. Cong. Trop. Med. Malaria, Manila, Nov. 1980, p. 35.

5. Watts, D.M., D.S. Burke, B.A. Harrison, R.E. Whitmire and A. Nisalak. Effects of temperature on the transmission of dengue virus type 2 by *Aedes aegypti*. (Manuscript submitted for clearance).

6. Dixon, W.J. and F.J. Massey, Jr. 1969. Introduction to statistical analysis. 3rd Ed. McGraw-Hill Book Co., New York. 638 p.

7. Harrison, B.A., M.C. Callahan, D.M. Watts and L. Panthusiri. A floating trap for determining relative densities of immature *Aedes aegypti*. (Manuscript cleared for publication).