

FIELD STUDIES ON POPULATIONS OF *Aedes albopictus* AND *Toxorhynchites* SPECIES IN BAMBOO POTS IN MALAYSIA

SALLEHUDIN SULAIMAN AND JOHN JEFFERY

Department of Parasitology and Medical Entomology, Faculty of Medicine,
Universiti Kebangsaan Malaysia, Jalan Raja Muda Abdul Aziz,
50300 Kuala Lumpur, Malaysia

ABSTRACT. Between April 1987 and March 1988, populations of immature *Aedes albopictus* and *Toxorhynchites* spp. in bamboo pots were sampled weekly. Populations of *Ae. albopictus* and rainfall varied from month to month. During the heavy rainfall months of September and October 1987, larval counts of *Ae. albopictus* were high, between 30.8 and 49.2 larvae per week compared to 16 larvae per week during the low rainfall month of January 1988. A higher population of *Toxorhynchites* spp. was associated with a low population of the vector.

Toxorhynchites mosquitoes have shown efficacy in suppressing populations of container-breeding mosquitoes (Steffan and Evanhuis 1981, Gerberg 1985, Annis et al. 1989). This stimulated considerable interest in the potential of *Toxorhynchites* species as biological control agents against vectors of diseases, especially *Aedes aegypti* (Linn.) and *Aedes albopictus* (Skuse).

In this paper we report on population studies of the dengue vector *Ae. albopictus* and its association with predators of the genus *Toxorhynchites* (consisting of *Toxorhynchites metallicus* Leicester and *Toxorhynchites quasiferrox* [Leicester]) in a rubber plantation at an aboriginal settlement in Malaysia.

The study site, an Orang Asli (aboriginal) settlement in Bukit Lanjan, is located 24 km NE of Kuala Lumpur on a hill isolated from other communities. It is inhabited by 40 families. The village is surrounded by rubber trees and interspersed with fruit trees and bamboo stands.

Ten bamboo pots, each measuring between 30 and 35 cm in height and about 6 cm in diameter, with an opening at one side at the top portion, were tied to rubber tree trunks at a height of 1.5 m. The bamboo pots were set apart from each other by a distance of about 30 m. Each pot was filled with about 250 ml of water and any subsequent loss owing to evaporation or as a result of siphoning immature mosquitoes was replenished.

Once a week, the water from each bamboo pot was poured into an enamel pan and all immatures except for *Toxorhynchites*, which were individually kept, were transported back to the laboratory in plastic containers for identification and recording. After removal of all immatures, the water in the enamel pan was poured back into the bamboo pot. The immatures were reared and identification of *Ae. albopictus* adults and dead immatures was made by using the keys in Huang

(1972, 1979). Other mosquitoes collected were: *Aedes (Finlaya)*—2 species, *Aedes (Stegomyia)*—2 species, *Armigeres (Armigeres)*—2 species, *Armigeres (Leicesteria)*—1 species, *Culex (Eumelanomyia)*—1 species, *Heizmannia*—2 species, and *Tripteroides*—3 species.

The highest number of *Ae. albopictus* larvae was collected from the bamboo pots in December 1987, with a mean of 58 larvae per week. The lowest number was collected in August 1987 with a mean of 5.3 larvae per week. The mean number of pupae collected weekly throughout the study period was low (ranging from 0 to 3.3 pupae) (Table 1). The correlation coefficient (r) of the relationship between rainfall and mean number of *Ae. albopictus* larvae in bamboo pots per week was significant at the 1% level ($r = 0.73$, $P < 0.01$). Thus, higher rainfall was associated with an increase in larval populations of *Ae. albopictus* in the field.

Sulaiman and Jeffery (1986) studied the ecology of *Ae. albopictus* in a rubber estate in Malaysia and also found that rainfall fluctuated from month to month and year to year, and there was an association between rainfall and the numbers of eggs, larvae, pupae, and females in the field.

The correlation coefficient (r) of the relationship between *Toxorhynchites* spp. larvae and *Ae. albopictus* larvae per week in bamboo pots was significant at the 1% level ($r = -0.75$, $P < 0.01$). Thus, higher numbers of *Toxorhynchites* larvae were associated with a lower number of *Ae. albopictus* larvae due to predation, and conversely. The mean number of larval *Toxorhynchites* spp. found in bamboo pots per week varied from 0 to 3.3 (Table 1).

Annis et al. (1990) evaluated the efficacy of *Toxorhynchites amboinensis* (Doleschall) for the control of *Ae. aegypti* and *Ae. albopictus* in household water storage containers in a rural village of Central Java, Indonesia. No significant

Table 1. Numbers of immature *Aedes albopictus* and *Toxorhynchites* spp. in bamboo pots at an aboriginal settlement in Malaysia.

Date	Total rainfall (mm)	Mean no. \pm SD of <i>Ae. albopictus</i> per week		Mean no. \pm SD of <i>Toxorhynchites</i> spp. per week	
		Larvae	Pupae	Larvae	Pupae
Apr. 1987	353	39.3 \pm 26.8	0.8 \pm 1.5	0	0
May 1987	201	31.5 \pm 6.6	0.5 \pm 0.6	2.0 \pm 0.8	0
June 1987	150	22.5 \pm 8.3	0.8 \pm 0.9	2.3 \pm 0.5	0
July 1987	174	38.5 \pm 13.6	0.8 \pm 0.9	3.3 \pm 0.9	0
Aug. 1987	207	5.3 \pm 1.5	0	2.3 \pm 0.6	0
Sept. 1987	409	49.2 \pm 14.2	1.6 \pm 1.1	2.4 \pm 0.5	0
Oct. 1987	597	30.8 \pm 13.4	1.3 \pm 2.5	1.0 \pm 0.9	0
Nov. 1987	255	18.0 \pm 9.3	3.3 \pm 2.0	1.5 \pm 1.3	0
Dec. 1987	329	58.0 \pm 7.6	2.3 \pm 1.0	1.0 \pm 1.0	0
Jan. 1988	86	16.0 \pm 6.2	1.0 \pm 0.5	1.8 \pm 1.0	0.3 \pm 0.2
Feb. 1988	377	11.8 \pm 9.8	0.3 \pm 0.2	0.3 \pm 0.2	0
Mar. 1988	347	17.0 \pm 15.1	2.2 \pm 1.1	0.4 \pm 0.5	0

reductions in adult vector populations were demonstrated.

The information gained from the present studies indicates that predation by *Toxorhynchites* spp. might be a useful control strategy for dengue vectors such as *Ae. albopictus*.

We thank the Universiti Kebangsaan Malaysia for providing research facilities and Hanili Hadi for typing the manuscript.

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