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Research Note

Mixed breeding of *Aedes aegypti* (L.) and *Aedes albopictus* Skuse in four dengue endemic areas in Kuala Lumpur and Selangor, Malaysia

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Abstract. Ovitrap surveillance was conducted in four dengue endemic areas in Kuala Lumpur and Selangor, Malaysia to determine the distribution and percentage of mixed breeding of both *Aedes aegypti* and *Aedes albopictus*. The percentage of mixed breeding in all study sites both indoors and outdoors accounted for 10 to 32 % from the total ovitraps collected. *Ae. aegypti* was found at a higher frequency than *Ae. albopictus* in these ovitraps. This study again indicates that ovitrap is a sensitive tool to attract gravid females of more than one mosquito species to oviposit in the container.

Dengue is endemic in Malaysia since the disease was first reported by Skae (1902). The disease is found mainly in the urban and suburban areas. *Aedes aegypti* and *Aedes albopictus* have been incriminated as the vectors involved in the transmission of classical dengue fever (DF) and dengue haemorrhagic fever (DHF) in many urban areas of South-east Asia (Smith, 1956; Hammon, 1966; Rudnick, 1967). The distribution of *Ae. aegypti* and *Ae. albopictus* in Malaysia overlaps (Yap, 1975; Sulaiman *et al.*, 1991). Both species are adapting to urban and suburban areas.

The ovitrap was first developed in the United States for the surveillance of *Ae. aegypti* (Fay & Perry, 1965; Fay & Eliason, 1966). This technique was used, as the ovitraps were found to be sensitive and efficient to detect the population of *Aedes*, even when the population densities were low (Evans & Bevier, 1969; Jakob & Bevier, 1969; Thaggard & Eliason, 1969) and it is safe, economical and environment friendly (Chan *et al.*, 1977). Arunachalam *et al.* (1999) and Lee (1992) also reported that ovitrap surveillance was a more effective and sensitive technique than conventional larval surveys, especially when the *Aedes* infestation rates were very low.

The objective of this study was to determine the distribution and percentage of mixed breeding of both *Ae. aegypti* and *Ae. albopictus* in dengue endemic sites in Kuala Lumpur and Selangor.

Ovitrap surveillance was conducted in four residential areas (Figure 1): Taman Samudera (Gombak, Selangor), Kampung Banjar (Gombak, Selangor), Taman Lembah Maju (Cheras, Kuala Lumpur) and Kampung Baru (City center, Kuala Lumpur). The selection criteria of the study sites were based on (i) frequent reports of dengue cases from the State Vector Control Unit and (ii) these areas were located near (not more than 20 km) the Institute for Medical Research (IMR) (N03°10.167', E101°41.919'), Kuala Lumpur.

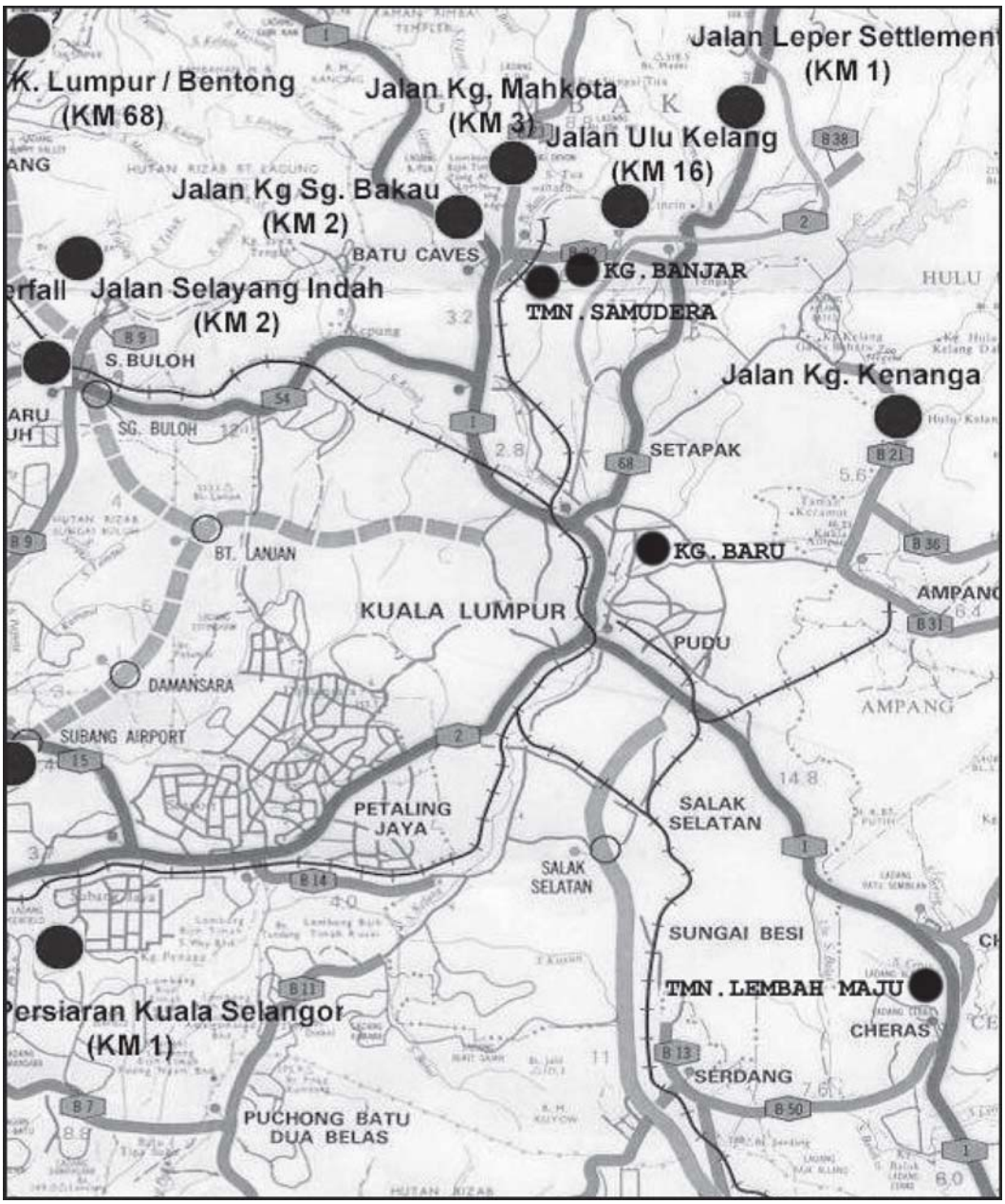

Figure 1. Location of 4 study sites.

Ovitraps were placed in not less than 10% of the houses in Taman Samudera (40 houses); Taman Lembah Maju (40 houses); Kg. Baru (35 houses) and Kg. Banjar (30 houses). Ovitraps were placed indoors and outdoors in randomly selected houses. In this study, "indoor" is referred to the interior of the house, while "outdoor" is referred to outside of the house but confined to the immediate vicinity of the house (Lee, 1992). As it was not possible to differentiate indoor from outdoor in Kg. Banjar, the 30 ovitraps were placed randomly without any differentiation of indoor and outdoor. Ovitraps in all sites were collected after 5 days.

The collected ovitraps were brought back to the laboratory and the contents were

Table 1. Distribution of *Aedes* population in the ovitraps in 4 study sites

Study site	Ovitrap placement	No. of ovitraps Collected	Total positive ovitrap	Ovitrap with mixed breeding	Percentage of mixed breeding	Ratio of *Ae. aegypti* : *Ae. albopictus* in mixed breeding
Taman Samudera	Indoor	26	10	1	10.00%	4.00 : 1.00
	Outdoor	29	9	1	11.11%	2.09 : 1.00
Kg. Banjar	Indoor / Outdoor	23	13	2	15.38%	7.80 : 1.00
Taman Lembah	Indoor	40	5	1	20.00%	5.14 : 1.00
Maju	Outdoor	30	17	0	0	0
Kg. Baru	Indoor	28	25	8	32.00%	1.26 : 1.00
	Outdoor	34	28	8	28.57%	1.00 : 1.18

poured into plastic containers, together with the paddle. Fresh water was added into the containers and the larvae were allowed to hatch and colonize in the laboratory for another 9 days. The containers were kept covered. A small piece (10 mm) of fresh cow liver was added into each container as larval food. The hatched larvae were subsequently counted and identified at 3rd instar. The numbers of larvae were also recorded individually for each positive ovitrap.

Table 1 describes the distribution of *Aedes* population in ovitrap. The percentage of mixed breeding in all study sites, both indoors and outdoors accounted for 10 to 32 % from the total collected ovitraps. However, there was no mixed breeding found in outdoor ovitrap surveillance in Taman Lembah Maju. Chang & Jute (1994) reported mixed breeding of both *Ae. aegypti* and *Ae. albopictus* in house surveys, which were mainly outdoor containers (9% of total number of breeding habitats). Containers in which co-breeding of *Ae. aegypti* and *Ae. albopictus* occurred were also found in Singapore city which accounted for 7.1% of total number of breeding habitats (Chan *et al.*, 1971). The percentage of mixed breeding reported by Chan *et al.* (1971) and Chang & Jute (1994) were much lower than this study. In contrast, Yap & Thiruvengadam (1979) found extensive sharing of 55.40% of total positive ovitraps by *Ae. aegypti* and *Ae. albopictus* in Georgetown, Penang.

Beside that, this study also found mixed breeding of *Culex quinquefasciatus* Say and Chironomid with *Aedes* mosquitoes, but in very low frequency. Yap (1975) found that ovitraps also attracted *Culex fatigans* (*quinquefasciatus*) and *Toxorhynchites* species, but it was less than 1% of total collected ovitraps.

Generally, *Ae. aegypti* was found at a higher frequency than *Ae. albopictus* in these ovitraps. According to a review paper done by MacDonald (1956), *Ae. aegypti* had been introduced into Kuala Lumpur from the seaports and coastal areas by 1913 and later it replaced *Ae. albopictus* as common *Aedes* species in the towns. However, Sulaiman *et al.* (1991) reported that in certain human dwellings / habitats, *Ae. albopictus* were ovipositing inside the premises and was dominant in population compared to *Ae. aegypti*.

Mixed breeding indicates that more than one mosquito species can oviposit in a single ovitrap. This study again indicates that ovitrap is a sensitive tool to attract gravid females of more than one mosquito species to oviposit in the container.

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