

SURVEY OF PERIDOMESTIC MOSQUITO SPECIES OF JAFFNA PENINSULA IN SRI LANKA

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Abstract. Surveys of mosquitos in Sri Lanka have generally been confined to the South. A recent study in Jaffna peninsula in northern Sri Lanka reported on the biology of peridomestic mosquito species. The present survey indicates the predominant species to be *Armigeres durhami* (Edwards) and *Armigeres subalbatus* (Coquillett). *Aedes albopictus* (Skuse), *Ae. aegypti* (Linnaeus) and *Ae. novalbopictus* Barraud were recorded only occasionally during the survey. Sampling of ponds in the Jaffna peninsula recorded the presence of *Ae. aegypti*, *Anopheles* sp. and *Culex quinquefasciatus* (Say).

INTRODUCTION

A recent survey of mosquitos in Sri Lanka, carried out by the Southeast Asia Mosquito Project (SEAMP) and the Medical Entomology Project (MEP) of the Smithsonian Institution, National Museum of Natural History, Washington, USA, from 1970 to 1973, provides distributional and biological data for a total of sixty-four taxa of Culicidae (Huang, 1972; Harrison, 1973; Krombein, 1981). Collections were made from Kandy District in the Central Province and surrounding districts. However the northernmost point collection was made in Vavuniya in the North-Central Province, 90 miles south of Jaffna. Previous lists of mosquito species from Sri Lanka include those of Jayasekara and Chelliah (1981) who listed one hundred and thirty one species in sixteen genera (in the subfamilies Anophelinae, Toxorhynchitinae and Culicinae) and Amerasinghe (1982) who listed thirty-six species of mosquitos occurring in the Udawattakele forest reserve, Kandy, in Central Province of Sri Lanka.

The only previous study on mosquitos in Jaffna peninsula in northern Sri Lanka reported on the biology of three peridomestic mosquitos – *Aedes aegypti* (Linnaeus), *Armigeres subalbatus* (Coquillett) and *Culex quinquefasciatus* (Say) (Rajendram *et al.*, 1989). The present article constitutes the first survey of mosquitos in northern Sri Lanka

and reports on the distribution of peridomestic man-biting species from the town of Jaffna and its environs.

MATERIALS AND METHODS

Adult mosquito collection was carried out weekly from January 1986 to June 1987. The mosquitos were sampled by means of the human bait method in three different locations : Vembadi and Chundukuli in Jaffna town and Chunnakam, 6 miles north of the town (Fig 1). The person acting as a bait was seated on an open verandah and mosquitos landing on the exposed legs were caught with individual glass vials. Collections were made once a week from 18.15 to 18.45 hours, the period which preliminary studies indicated as that when mosquitos were most active. There were a total of 210 catches, making a total of 105 man biting hours. The mosquitos were killed with ethyl acetate and identified.

Larvae were also collected weekly from January 1986 to June 1987, from three ponds, located near adult sampling sites, in Jaffna town : Aariyakulam pond in Vannarpannai, Periyakovil pond in Chundukuli and Sivankovil pond in Thirunelvally (Fig 1). Temperature and pH of the pond water were recorded at every sampling date. A one liter sample was collected from the four corners of the

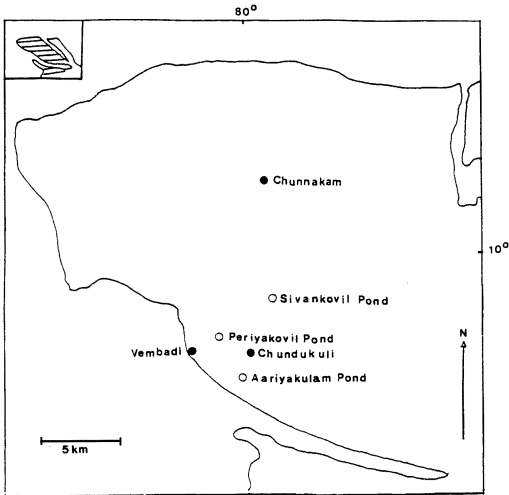


Fig 1—Map of Jaffna peninsula showing location of sampling sites:
 Adult sampling sites: Vembadi, Chundukuli, Chunnakam,
 Larval sampling sites: Aariyakulam Pond, periyakovil Pond, Sivankovil Pond

pond with a dipper. Aliquots of the dample (500 ml) were examined with the dissecting microscope for immatures. The larvae were then placed in a 250 ml beaker filled with water and powdered maldive fish was provided as food. Some larvae were mounted on slides for identification. Others were allowed to hatch into adults and then identified.

Rainfall data for Jaffna were collected from the weather bureau for the years of the survey 1986 and 1987 as well as the year preceding the survey, 1985.

RESULTS

The annual rainfall for the years 1985 to 1987 is given in Fig 2. During the 18 months of the study there was a total precipitation of 920 mm, with rains occuring mostly during September to December, during the southwest monsoon. April to July were the dry months of the year.

The results of the survey of adults are given in

Table 1. Representatives of the genus *Armigeres* Theobald were present in all three locations throughout the sampling period, up to a high of 14 per sample, with *Armigeres durhami* (Edwards) and *A. subalbatus* being found in approximately equal numbers. Populations peaked in all three locations around January to March, in both 1986 and 1987. A secondary peak was also noted between August to October.

Representatives of the genus *Aedes*, up to 4 per sample, were noted in Vembadi and Chunnakam only. *Aedes albopictus* (Skuse) was collected in Vembadi in February : *Ae. aegypti* in Chunnakam during January-February and November-December 1986 and *Ae. novalbopictus* Barraud in Chunnakam during August 1986.

The results of the survey of larvae are given in Table 2. All three ponds had a pH range of 6-8. Temperature range of Aaryliakulam pond was 32-36°C (average 34°C), of Periyakovil pond 33-36°C (average 34.5°C) and of Sivankovil pond 33-36°C (average 34.5°C).

During the whole period of sampling, larvae were collected only on a few occasion from each ponds. *Ae. aegypti* larvae were collected from Aariyakulam pond and Periyakovil pond, *Anopheles* larvae from periyakovil pond and *Cx. quinquefasciatus* (Say) larvae only from Aariyakulam pond.

DISCUSSION

In the present study *Armigeres* species were the

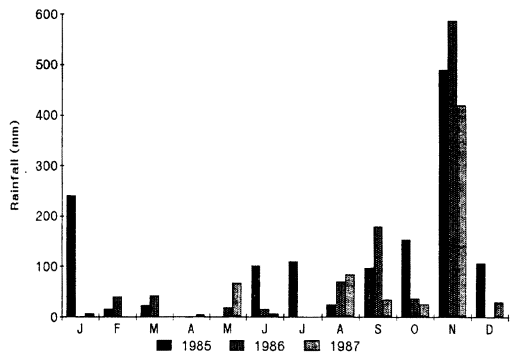


Fig 2—Rainfall in Jaffna peninsula during 1985, 1986 and 1987.

MOSQUITO SURVEY IN JAFFNA

Table 1

Adult mosquitos collected by human bait method in Vembadi, Chundukuli and Chunnakam.

	No.	Vembadi				Chundukuli		Chunnakam			
		A.ae.	A.n.	A.d.	A.s.	A.d.	A.s.	A.a.	A.n.	A.d.	A.s.
January	5					5	3			3	4
1986	12			2		4	3			3	3
	19				2	3	5			6	7
	26	1	1			4	5	2		4	5
February	2	2	2	3	4	5	8	1		3	4
	9	1		3	3	3	4			2	3
	16			1	4	4	5			5	8
	23			2	3	7	4			2	3
March	2			3	1	7	6			3	2
	9			2	1	4	4			3	3
	16			7	4	5	7			2	1
	23			4	1	4	5			2	2
	30			2	3	3	3			1	2
April	6			2	1	3	2			2	3
	13				2	2	3			3	2
	20			2	1	3	4			4	2
	27			2		3	2			3	1
May	4			1		2	1			2	0
	11			2		4	3			1	0
	18			2	2	3	3			0	2
	25	2		3	2	2	2			0	3
June	1	1	1	1	2	2				1	3
	8	3	2	2	1	4	3			2	2
	15	1	2	2	2	3	2			2	4
	22			3	2	2	1			0	2
	29			1	3	4	3			0	1
July	6			1	2	3	2			1	1
	13			3	5	2	1			1	2
	20			3	4	3	2			2	2
	27			3	2	1	2			2	3
August	3			2	3	4	2		2	0	2
	10			2	5	2	1		1	1	0
	17			2	3	3	2			2	1
	24			2	1	2	1			2	2
	31			1	2	3	3			3	2
September	7			3	2	3	2			3	3
	14			3	2	3	2			3	1
	21			4	2	2	4			6	5
	28			7	3	3	3			4	2

Table 1 Continued

	No.	Vembadi				Chundukuli		Chunnakam			
		A.ae.	A.n.	A.d.	A.s.	A.d.	A.s.	A.a.	A.n.	A.d.	A.s.
October	5			3	3	4	3			3	1
	12			3	2	5	3			3	2
	19			3	4	3	2			4	5
	26			2	4	1	2			2	4
November	2			3	2	1	2			2	3
	9			3	3	2	1			1	2
	16			4	1	2	1	2		2	3
	23			2	2	4	2	2		1	2
December	30			1	3	3	2	3		2	3
	7			1	2	2	3			2	1
	14			3	2	3	4			1	2
	21			3	1	2	3			2	3
January 1987	28			2	2	2	4			2	1
	4			2	2	3	2			1	2
	11			2	2	2	4			2	1
	18			3	3	2	3			1	3
February	25			3	6	4	5			2	1
	1			2	3	2	3			2	2
	8			1	3	3	3			2	5
	15			4	2	3	2			1	1
March	22			3	2	4	3			2	1
	1			2	1	3	3			1	2
	8			3	2	4	2			3	3
	15			2	1	3	2			1	2
April	22			3	1	2	1			1	3
	29			2	2	4	2			2	4
	5			2	2	5	3			2	3
	12			1	2	3	2			2	2
May	19			3	3	2	1			2	3
	26			1	3	4	3			2	2
	3			1	1	1	3			2	4
	10			3	2	1	2			2	3
June	17			2	3	2	1			2	2
	24			1	2	3	3			2	3
	1			1	2	2	3			3	2
	8			2	2	2	1			2	2
	15			3	2	1	4			2	2
	22			2	2	3	4			2	1
	29			3	1	2	3			1	0

A.a. = *Ae. albopictus*
A.ae. = *Ae. aegypti*
A.d. = *A. durhami*
A.n. = *Ae. novalbopictus*
A.s. = *A. subalbatu*

MOSQUITO SURVEY IN JAFFNA

Table 2
Mosquito larvae collected Vembadi, Chundukuli and Chunnakam.

Dates of successful sampling	Aariyakluam pond		Periyakovil pond		Sivankovil pond	
	A.ae.	C.q.	A.ae.	An.	A.ae.	An.
March 7 (1986)					3	
April 24	3					
May 5					5	
12		2				
June 1			4			
July 6			2			
August 3						8
17					2	6
September 28					2	
December 7						2
April 3 (1987)	2					
May 12					3	

A.ae. = *Ae. aegypti*
An. = *Anopheles* sp.
C.q. = *Cx. quinquefasciatus*

most predominant and were collected throughout the sampling period in all three locations. *Aedes* species were found only occasionally in two locations-Vembadi, and Chunnakam. It was not collected in Chundukuli. *Armigeres* species and species like *Ae. aegypti*, *Culex fuscocephala* Theobald and *Cx. pseudovishnui* Colless are commonly associated with human habitations according to Amerasinghe (1982).

The mosquito populations were generally high during January to March in both years, in all three locations sampled. This is a consequence of heavy rains in the peninsula during November of the previous years-490 mm in 1985 and 580 mm in 1986 (Fig 2). The population of *Aedes* was very low in May in all three localities in the present study. Low numbers in May appears to be related to low rainfall.

The varying population of mosquito species or differences in species composition appears to be related to the varying combination of the following factors-human habitation, rainfall and time of the year.

The species composition of urban Jaffna comprising the following species-*A. subalbatus*, *A. durhami*, *Ae. aegypti*, *Ae. albopictus*, *Ae. novalbopictus* and *Cx. quinquefasciatus* is considerably less than those recorded from Udawattakele Forest in Kandy District by Amerasinghe (1982). He reported 36 species of mosquitos and immatures of 17 species. Twenty-one species were taken at day-time human bait catches, the most prevalent being *Ae. albopictus* and *A. subalbatus*. The small number of species recorded in Jaffna peninsula may be due to poor vegetation and lower rainfall.

Females of *Ae. novalbopictus* from Udawattakele forest were captured while biting man between 0900 and 1800 hours at ground level, and comprised 6.9% of the total mosquito catch taken at a series of human bait catches and were also collected on the Peradeniya University Campus, showing that the species is not confined to forested habitats, but may occur in association with human habitations (Amerasinghe, 1982).

There was only one record of *Cx. quinquefasciatus* larva in early May in Sivankovil pond in the

present study. *Ae. aegypti* was recorded in all three ponds and *Anopheles* larvae in two ponds. The larval mosquito population in the ponds sampled has been low apparently due to fresh water fish and other predators inhabiting the ponds.

In India Iyengar (1938) found that the incidence of breeding in ponds was much higher in the dry months and fell rapidly with the onset of rains. In the tropical rain-forest of Malaya rainfall is the only meteorological factor which can regulate breeding since adult survival and larval breeding are not restricted by unfavorable temperatures (Wharton, 1962).

The range of pH of water in ponds sampled in this study were narrow. In the study by Amerasinghe, samples from natural containers varied widely in pH (5.0-10.0) and most of the container breeding species occurred over a broad pH range ; 5.0-9.0 for *Ae. albopictus*, *Ae. krombeini* Huang *Toxorhynchites splendens* (Weidman), *Cx. uniformis* (Theobald) and *Cx. brevialpilis* (Giles) and 6.9-9.0 for *A. subalbatus*.

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REFERENCES

- Amerasinghe FP. Observations on the mosquitoes (Diptera ; Culicidae) of Udawattakele Forest, Sri Lanka. *Natl Sci Council Sri Lanka* 1982; 10 : 81-97.
- Harrison BA. *Anopheles reidi*, a new species of the *barbirostris* species complex from Sri Lanka (Diptera : Culicidae). *Proc Entomol Soc Wash* 1973; 75 : 365-71.
- Huang YM. Contributions to the mosquito fauna of Southeast Asia. XIV. The subgenus *Stegomyia* of *Aedes* in Southeast Asia. I. The *scutellaris* group of species. *Contr Am Entomol Inst* (Ann Arbor) 1972; 9 : 1-109.
- Iyengar MOT. Studies of the epidemiology of filariasis in Travancore. *Ind Res Memoirs* 1938; 30.
- Jayasekera N, Chelliah RV. An annotated checklist of mosquitoes of Sri Lanka. UNESCO-Man and the Biosphere National Committee for Sri Lanka Publ. 1981; 8 : 1-16.
- Krombein KV. The Smithsonian Insect Project in Sri Lanka. *Spolia Zeylanica* 1981; 35 : 119-34.
- Rajendram GF, Antony NR, Nagalingam R. Biology of peridomestic mosquito species of Jaffna peninsula. *Vingnanam-J Sci* 1990 (in press).
- Wharton RH. The biology of *Mansonia* mosquitoes in relation to the transmission of filariasis in Malaya. Bulletin No. 11. Institute of Medical Research, Federation of Malaya 1962.