

BITING CYCLES OF SOME POTENTIAL VECTOR MOSQUITOS OF JAPANESE ENCEPHALITIS OF ASSAM, INDIA

DR Bhattacharyya¹, P Dutta¹, SA Khan¹, P Doloi¹ and BK Goswami¹

¹Regional Medical Research Centre, NE Region (ICMR), Post Box No. 105, Dibrugarh-786001, Assam, India

Abstract. Biting activities of five potential vector species of Japanese encephalitis (JE) were observed in a JE affected district of Assam, India. Most of the species exhibited two peak periods of biting activity, one in early hours and other around midnight. However, in case of *Culex fuscocephala* several peaks were observed throughout the night.

INTRODUCTION

Biting cycle of vector mosquitos is an important parameter to know the actual disease transmission potential and time and to gain more knowledge in general about the epidemiology of any vector borne disease. Many countries belonging to Southeast Asian region including India are known for the prevalence of Japanese encephalitis. Although there are numbers of studies regarding JE vectors specially in South India, but information about JE vectors of North East Region of this country are scanty. Except isolation of JE virus from *Mansonia annulifera* (Chakrabarty *et al*, 1981) in Dibrugarh district, Assam, neither JE virus isolation attempt nor any ecological studies on potential JE vectors were made in this area. This paper presents the biting cycles of five potential JE vectors (reported elsewhere in India) which are prevalent in this region, as a part of our ongoing ecological studies on mosquito vectors.

MATERIALS AND METHODS

Four villages of Dibrugarh district endemic for JE were selected for this study. The geographical coordinates of the Dibrugarh district are: 94° 45' to 96° East longitude and 27° 15' to 28° North latitude. The average maximum temperature is 27.7°C and average minimum is 18.7°C and relative humidity is 86% in morning and 55% in evening. Rainy season starts from April and lasts up to November with yearly average rainfall of 106 inches. The total area of this district is 7023.9 km² out of which the reserved forest have covered

1,378.77 km² area. The principal crop being the paddy cultivation which covers about 1,630 Km².

This study was carried out during the rainy summer months (May to June). Mosquitos were collected using a cattle bait kept outdoors from dusk to dawn. Two collectors using a suction tube and flash light collected mosquitos from the cattle. Hourwise collections were kept separately after proper labelling and were subsequently transported to the main laboratory. Mosquito species were identified with the aid of standard keys using a stereoscopic microscope.

RESULTS AND DISCUSSION

Mosquitos comprising of 22 species in 5 genera were collected during the biting collection.

Cx. fuscocephala was found to bite almost, throughout the night, highest numbers coming between 2200-2300 hours (IST; Fig 1). Quarterly distribution throughout the night showed that the highest numbers were collected in the third quarter of night. Reisan and Aslamkhan (1976) observed

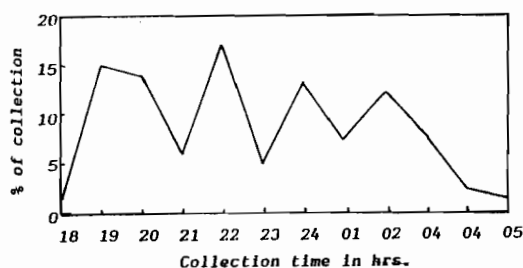


Fig 1-Biting rhythm of *Cx. fuscocephala*.

that *Cx. fuscocephala* exhibits uniform biting throughout the night in Philippines.

In the present study, biting cycle of *Cx. pseudovishnui* was found to be bimodal with first peak activity at 1900 hours and a more pronounced second peak at 2400 hours (Fig 2). This type of bimodal rhythm of *Cx. pseudovishnui* was also observed at Sattoki (Reisen *et al*, 1976). However, Reuben (1971) in North Arcot district, Madras state observed a rounded curve in regards to biting rhythm of *Cx. pseudovishnui*, with peak activity at 24 hours which is similar to the present finding.

In case of *Cx. tritaeniorhynchus*, biting cycle was observed to be bimodal in nature which is somewhat similar to that of *Cx. pseudovishnui* (Fig 3). However, in case of *Cx. tritaeniorhynchus*, the first peak is at 2100 hours, which is more pronounced than second peak at 2400 hours. The second peak shows gradual decline in contrast to that of *Cx. pseudovishnui* which shows a sharp decline. The bimodal biting behavior of *Cx. tritaeniorhynchus* seems to be the characteristic of this species in the Far East (Kato and Toriumi, 1951; Wada, 1969; Wada *et al*, 1970; Kanda *et al*, 1975). However, Aslamkhan and Salman (1969) found that this species feeds on cattle throughout the night with a peak activity at 0100 hours after

dusk. Reuben (1971) reported a unimodal rhythm with maximum peak at midnight for the above species.

The biting curve of *Cx. vishnui* exhibited a peak at 2000 hours, and thereafter somewhat rounded pattern of biting activity was observed (Fig 4). Reuben (1971) in South India described a rounded unimodal biting pattern with a maximum peak at 2300 hours. Colless (1957) in Singapore found maximum biting activity of the above mosquito species just after sunset.

Anopheles peditaeniatus were collected in large numbers in the dusk hours specially at 1900 hours, and thereafter there is a gradual decline (Fig 5). Very little information exists on the biology of this species in India.

All species exhibited a early hour peak mostly around 1900-2100 hours, alongwith another peak at midnight around 2300-2400 hours. Thereafter, their biting activity declines gradually except in *Cx. fuscocephala* where the biting activity continues throughout the night with several peaks.

There exists a considerable seasonal variations in the biting activities of the same species in different places. Even variation exists among collectors or host (Reisan and Aslamkhan, 1978). The degree of

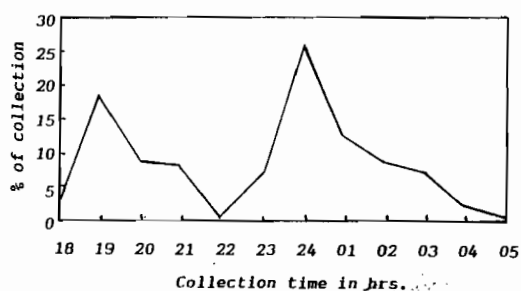


Fig 2—Biting rhythm of *Cx. pseudovishnui*.

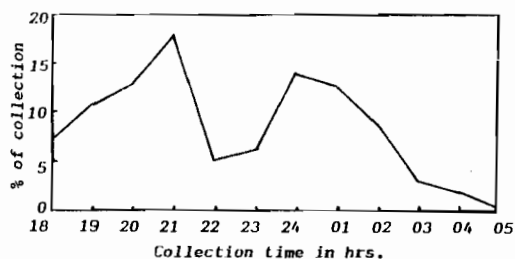


Fig 3—Biting rhythm of *Cx. tritaeniorhynchus*.

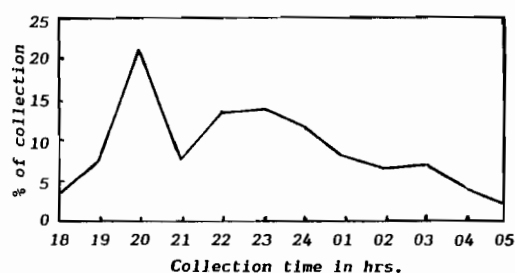


Fig 4—Biting rhythm of *Cx. vishnui*.

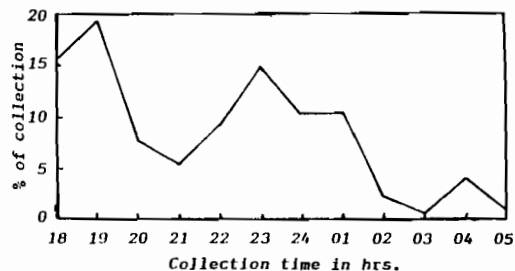


Fig 5—Biting rhythm of *An. peditaeniatus*.

seasonal change in biting time varies with different species. Aslamkhan *et al* (1977) observed that in species with bimodal biting rhythms, the predawn peak varied considerably in amplitude, perhaps as a function of physiological age or survivorship, nulliparus female being more prevalent at dusk and parus females more prevalent at dawn. Comprehensive studies are needed in this region covering the whole seasons (monsoon and non monsoon) including the determination of influence of physiological age on biting population of different potential vector species.

ACKNOWLEDGEMENTS

The authors wish to thank Dr J Mahanta, Officer In Charge, RMRC(ICMR), Dibrugarh, for his encouragement and guidance.

REFERENCES

- Aslamkhan M, Salman C. The bionomics of the mosquitos of the Changa Manga National Forest, West Pakistan. *Pakist J Zool* 1969; 1 : 183-205.
- Colless DH. Components of the catch curve of *Culex vishnui* in Singapore. *Nature* 1957; 180 : 1496-7.
- Kanda T, Joo CY, Choi DW. Epidemiology studies on Malayan filariasis in an Inland area in Kyungpook, Korea. *Mosq News* 1975; 35 : 513-7.
- Kato M, Toriumi M. Studies on the associative ecology of insects. III. Nocturnal activity of *Cx. tritaeniorhynchus* Giles and *An. hyrcanus sinensis*. Wiedemann. *Sci Rep Tohoku Univ Ser 4 (Biology)*. 1951; 19 : 1-6.
- Reisen WK, Aslam Khan M. Notes on the biting rhythms of some Philippine mosquitos on carabao baits. *Kalikasan* 1976a; 5 : 309-14.
- Reisen WK, Aslam Khan M, Suleman M, Naqvi ZH. Observation on the diel activity patterns of some Punjab mosquitos (Diptera : Culicidae). *Biologia Lahore* 1976b; 22 : 68-77.
- Reuben R. Studies on the mosquitos of North Arcot district, Madras state, India. Part 2. Biting cycles and behaviour on human and bovine baits at 2 villages. *J Med Entomol* 1971; 8 : 127-34.
- Wada Y. Ecological studies of *Cx. tritaeniorhynchus summorosus* (Diptera : Culicidae). I. Biting rhythm of mosquito. *J Sanit Zool* 1969; 20 : 21-6.
- Wada Y, Kawai S, Ito S, *et al*. Ecology of vector mosquitos of Japanese encephalitis, especially *Cx. tritaeniorhynchus*. 2. Nocturnal activity and host preferences based on all-night catches by different methods in 1965 and 1966 near Nagasaki city. *Trop Med Nagasaki* 1970; 12 : 79-89.