8 *Periodicity of Biting Activity of Oc.niveus*

8.1 Summary

Biting activity of Oc. niveus through man landing collections in Teressa island was studied for a period of one year. The biting activity was seen throughout the day, exhibiting a bimodal peak, with the first one at dawn (0400-0600 h) and the other towards the dusk hours (1600-1800h). Peak biting hours of Oc. niveus coincides with the peak appearance of mf. The proportion of mosquitoes biting in the forenoon was 40.4% whereas in the afternoon it was 59.6% respectively. This was true for both parous (42.0% vs. 58.0%) and nulliparous mosquitoes (39.9% vs 60.1%). However, the risk of transmission of filariasis due to Oc. niveus, based on parity status was found to be in the dawn (0400-0600) and dusk (1600-1800) hours in this region.

8.2 Introduction

The intensity of transmission of filarial infection in an area depends on the degree of man-vector contact. All the pilot studies (Kalra 1974; Russel *et al.* 1975; Tewari *et al.* 1995) so far undertaken in the Nicobar group of islands were aimed to reveal mostly the endemicity status from time to time. But no published data based on any systematic studies on the biting periodicity and peak biting activity of *Oc. niveus* in the Nicobar group of islands are available. The biting pattern of another day biting mosquito *Ae. polynesiensis* is documented in South Pacific islands (Jachowski 1954; Ramalingam 1968). Samarawickrema (1967) reported variations in the biting periodicity of different age groups of Ceylon strain of *Cx. quinquefasciatus*. Information on biting periodicity will be useful to design personal protection measures. Comparison of peak appearance of mf and peak biting period would provide information on the relationship between the appearance and density of microfilaria in the peripheral blood of man and the biting periodicity of the vector population, which will influence the dynamics of transmission of filariasis. These are essential to understand the transmission potential of the vector species through time. The present chapter deals with the biting periodicity of *Oc. niveus* with particular reference to different physiological age groups.

8.3 Material and Methods

The data obtained from man landing collections done in all the three zones during the study period were analyzed to study the biting periodicity of *Oc. niveus*. Haddow (1960) stated that in the analysis of the results of long series catches and when a measure of central tendency is to be used, the geometric mean as modified by William is useful. The biting periodicity was computed as Williams's mean (M_w) expressed as a percentage (Haddow 1960), which gives the best measure of central tendency. The M_w is a modified geometric mean to allow for any zero values in the data and is calculated using the following formula

$$M_w = \frac{\text{anti log } (x+1)}{N}$$

Where,

M_w= Modified geometric mean
x = No of mosquitoes caught during different hours
N = No. of observations

The number of mosquitoes collected during day man landing collections over one year period of time from the three zones were pooled. Then, the M_w was calculated during different hours of the day.

The day man landing collection was done from dawn to dusk. The mosquitoes were kept and dissected hour-wise. The dissection procedure followed is given in chapter 6 under section 6.3.3. The determination of physiological age of mosquitoes is described in chapter 9

8.4 Results

A total of 3625 *Oc. niveus* mosquitoes were collected during the one year study period. Of these, 2767(76.33%) were nulliparous, 659 (18.17%) 1-parous, 172 (4.74%) 2 – parous and 27(0.74%) 3-parous (Fig 18).

8.4.1 Biting Periodicity

The biting periodicity, expressed as a percentage of William's mean, is depicted in Fig 19a. The data indicate that the biting activity occurs throughout the day, with a bimodal peak, the first one at dawn (0400-0600 h) and the other towards the dusk hours (1600-1800 h) with 19.5% (708/3625) and 50.4% (1828/3625) of *Oc. niveus* found biting during the former and later periods respectively (Fig 19b). The proportion of mosquitoes biting in the forenoon was 40.4% whereas in the afternoon it was 59.6% respectively (χ^2=67.83, p=0.0000).

This was true for both parous (42.0% Vs. 58.0%, χ^2=157.63, p=0.0000) and nulliparous mosquitoes (39.9% versus 60.1%, χ^2=57.26, p=0.0000).

Both parous and nulliparous mosquitoes were found to bite throughout the day. However, a small peak in case of nulliparous and small dip in case of parous mosquitoes was observed at 10:00 h (Fig 20). Detailed analysis of biting periodicity of 1-parous and a combination of 2-parous and 3-parous mosquitoes is shown in Fig 21. The biting activity of 1- parous mosquitoes was found to exhibit fluctuations during the entire day without a noticeable peak. However, a combination of 2-parous and 3-parous mosquitoes showed a bimodal peak. The first one at dawn (0400-0600 h) and the other towards the dusk hours (1600-1800 h).

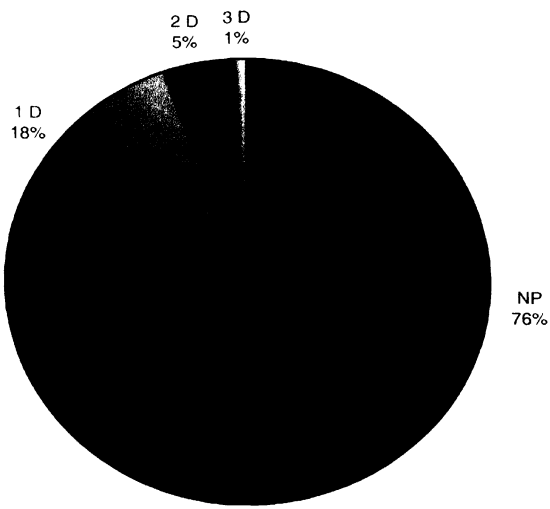

Fig. 18. Proportion of Various Age Groups of Oc. niveus From Day Man Landing Collections.

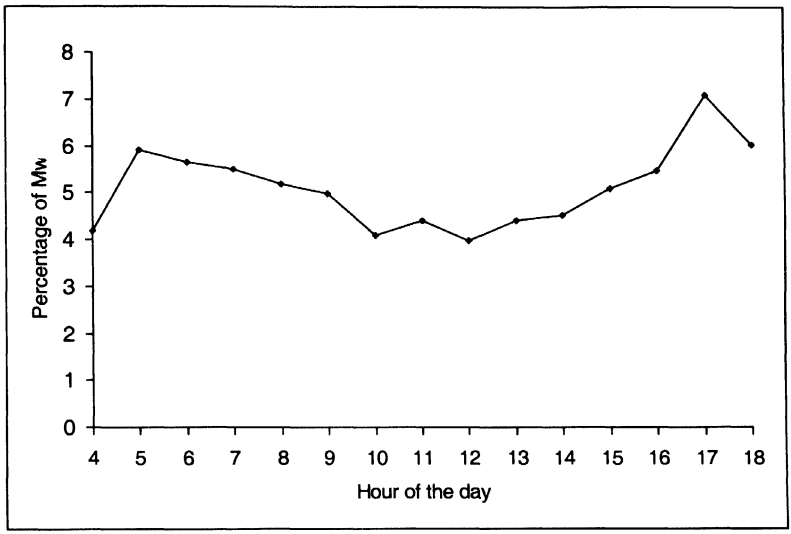

Fig 19a Biting Periodicity of Oc niveus

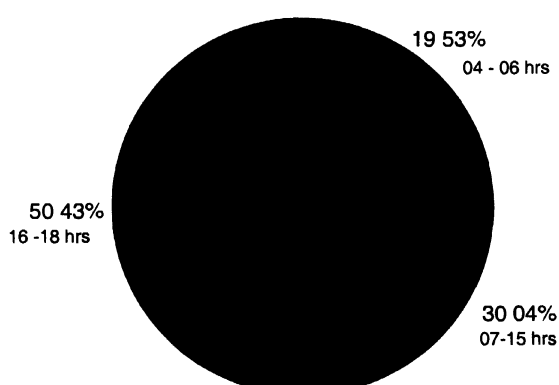

Fig 19b Proportion of Oc niveus Biting During the Day

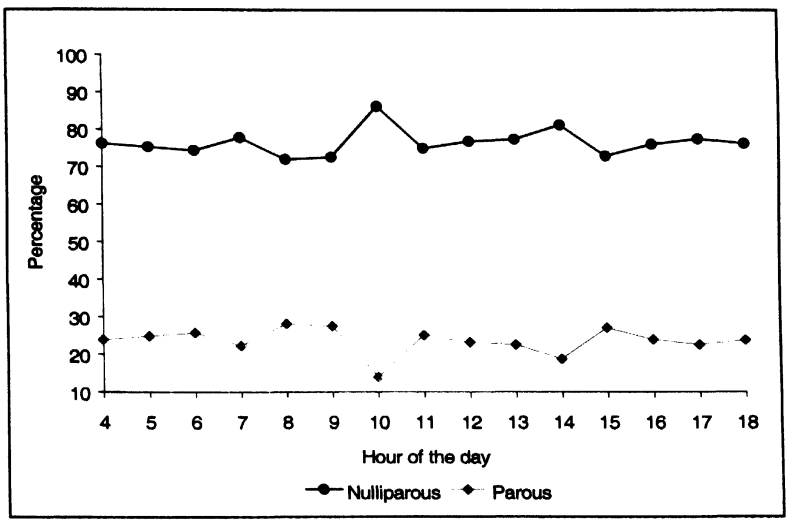

Fig 20. Percentage of Parous and Nulliparous Population of Man Landing Oc. niveus during Different Hours of the Day

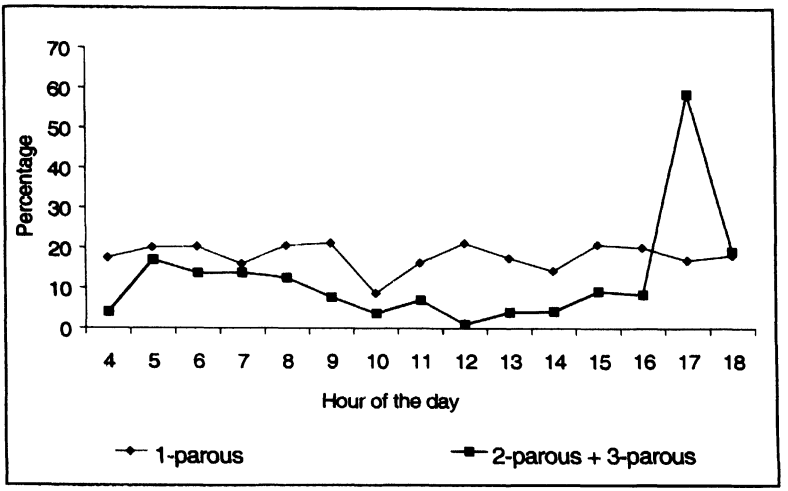

Fig. 21. Biting Periodicity of 1-Parous and a Combination of 2 & 3 Parous of Oc. niveus from Day Man Landing Collections

8.5 Discussion

Kalra (1974) carried out man landing collections between 1730 to 2100 hours and during the day between 0800 to 1000 hours in one village of Kamorta island. Tewari *et al.* (1995) collected mosquitoes landing on human bait during the forenoon and afternoon. The biting pattern of *Oc. niveus* could not be understood from the earlier studies of Kalra (1974) and Tewari *et al.* (1995) in view of the fact that in both these studies man landing collections were done only for few hours during the forenoon and afternoon only. In the present study man landing collections were carried out continuously from dawn to dusk in five villages for a period of one year, thus illustrating the biting periodicity using M_w for the first time for *Oc. niveus* population.

The biting activity of *Oc. niveus* was seen throughout the day, thus showing that it is strictly a diurnal species. In *Oc. niveus*, bimodal peaks of activity, a minor one, just at dawn (0400-0600 h) and a major one towards the dusk hours (1600-1800 h) was noted. *Ae. polynesiensis* is the principal vector of subperiodic *W. bancrofti* over a wide area of the South Pacific islands. Studies carried out by Jachowski (1954) and Ramalingam (1968) reported *Ae. polynesiensis* as being diurnally active with two peaks of activity, a lesser one in the morning and a greater one in the afternoon. Although the biting activity of *Ae. polynesiensis* was predominantly diurnal, some females were found to bite at night. Besides, the study undertaken by Ramalingam (1968) also described the biting activity of *Ae. tabu,* a member of the *scutellaris* group, which is a secondary vector of subperiodic *W. bancrofti* in Tongatabu, Samoa. The peak biting was reached between 10.00 and 12.00 hours, with no biting before sunrise or after sunset, showing that this mosquito is strictly diurnal and crepuscular species. In the present study, a single collection carried out initially in one of the villages to understand the biting pattern over a 24-hour period showed no *Oc. niveus* mosquito between 1800h and 0400 h. suggesting that *Oc. niveus* is strictly a diurnal species. Subsequent man landing collections were carried out between dawn and dusk only. The biting pattern of *Oc. niveus* observed in the present study corresponds in general with earlier studies on

Ae. polynesiensis (Jachowski 1954; Ramalingam 1968)

Analysis of microfilarial periodicity by Tewari *et al.* (1995) showed that the density of microfilariae in the peripheral blood of humans was highly variable, with a peak at about 1800 and a trough between 0300 and 0600 hrs. The present study shows that the dusk hours were found to be the peak biting hours of *Oc. niveus* which coincides with that of the peak appearance of microfilaria observed by Tewari *et al.* (1995). This facilitates the optimum infection of the vector population.

Many factors influence the number and periodicity of mosquitoes biting man. Haddow (1954) commenting on the biting activity of African mosquitoes, states that there are different groups within the same species which bite in successive waves and that factors like wind, impulse to bite and proximity of breeding places influence the numbers biting at given time. In the present study, the parous mosquitoes were found to bite throughout the day. The risk of transmission of filariasis due to *Oc. niveus*, based on parity status was found to be in the dawn (0400-0600) and dusk (1600-1800) hours in this region.

In the light of findings of this study, it can be inferred that the biting periodicity of *Oc. niveus* is diurnal, with bimodal peaks. The peak biting activity of this mosquito coincides with the peak appearance of microfilariae. The risk of acquiring the infection based on the parity status could be pinpointed towards the dawn and dusk hours as evidenced by the bimodal peaks of biting activity of mosquitoes viz., a minor peak at dawn and major peak towards the dusk.

Controlling *Oc. niveus* is ecologically and logistically challenging. The options for the control of *Oc. niveus* is very limited. Alternatively, man-vector contact could be reduced by time (peak biting period) and space (while working in the jungles) targeted approach of adopting personal protective measures like protective clothing and repellants. These measures need to be encouraged among the aborigines. Considering the enormous wield of control by the tribal chieftains and the pastors over the tribal community, the native aborigines could

be sensitized and motivated to adopt such measures by the tribal chieftains and pastors. Besides, these measures could be popularized through radio programmes in their native language. The key to implementation of these personal measures are health education and socio-economic development.