Summary

1. Malaria existed in Calcutta since its inception as would be evident from the early records. Following the success of NMEP, malaria cases became wane in Calcutta from 1960 onwards. Resurgence of malaria from 1970 again posed a serious health problem in Calcutta.

2. The incriminated vector of malaria in Calcutta metropolis is *Anopheles stephensi*. Various ecological aspects of it were carried out in the present study especially the day time resting habit, blood feeding spectra in nature, man landing collection, natural infection rates, proportion parity, daily survivability and mortality rate. etc., without knowing which no effective control measures against the vector would be formulated.

3. As the day time resting habit of *An. stephensi* was obscure in the past, four areas of Central Calcutta namely Dharmatala (Esplanade), Bowbazar, Central Avenue and Sealdah were searched thoroughly for haunting the species. Three types of habitations viz. brick built rooms, cattlesheds or mixed dwellings and temporary hutments (Jhupries) were looked into.
4. In Dharmatala and Sealdah, out of 17109 and 10582 different species of mosquitoes, *An. stephensi* comprised 357 (2.1%) and 285 (2.69%). The corresponding per man hour figures of the two areas were 0.30 and 0.84 respectively. Only temporary hutments were searched in such areas.

5. By searching sophisticated brick built rooms of Central Avenue and Bowbazar only 3 (0.03%) and 7 (0.17%) *An. stephensi* were obtained respectively whereas in cattlesheds of Central Avenue and Bowbazar the corresponding figures were 91 (14.1%) and 130 (21.27%) respectively showing high preponderence of this species in cattlesheds at day time than that of sophisticated brick built rooms. Therefore, significantly high density of *An. stephensi* was noticed in temporary hutments and cattlesheds of Calcutta in the situations under study in this Thesis.

6. The day time resting sites of *An. stephensi* in temporary hutments were umbrellas (13.33%), strings (5.96%), earthen pitchers (4.91%), cobwebs (8.77%), bamboo poles (15.08%), iron pillers (5.96%), mosquito nets (8.07%), hanging clothes (6.66%), ceiling (18.94%), wooden cots (7.36%) and walls of thatched houses (4.91%).
In cattlesheds, the species was collected from ceiling (31.86%), body of the cattles (8.79%), cemented walls (12.08%), cobwebs (7.69%), bamboo poles (14.28%), iron pillers (9.89%), wooden cots (6.59%), gunnies (6.59%) and thatched walls (2.19%). In brick built rooms it was obtained from empty drum (14.28%), cemented wall (14.28%), blade of ceiling fan (14.28%), hanging cloth (14.28%), wooden furniture (14.28%), string (14.28%), and mosquito net (14.28%). Such authentic and precise information regarding the day time resting sites of An. stephensi throughout the year in Calcutta was never documented in earlier studies.

7. In all sets of experiment the prevalence of An. stephensi was significantly abundant in the rainy season followed by winter and summer seasons in order of dominance. And the peak collection was observed in the month of either July or August in all the years.

8. For measuring house, container and breteau indices of An. stephensi, altogether 4918 containers or reservoirs (2087 indoors and 2831 outdoors) were thoroughly searched in 100 brick built rooms in every month of a year. The number of infested containers searched indoors were more or less same in every month but at outdoor situations, the number of water holding containers was more due to
precipitation of rain water in the rainy seasons. As a result, at outdoors breteau and container indices were found to be higher in the rainy seasons. In the month of August, the indices reached their respective peak (house index 24, container index 17.0 and breteau index 86). In summer months those figures were quite low. In April, the corresponding figures were as low as 7, 6.9 and 28 respectively.

9. When house index, container index and breteau indices were compared statistically with the monthwise summation of malaria incidence in Calcutta, it was observed that breteau index was the best sampling device since it produced highest (0.9998) degree of relationship (r) amongst those three indices.

10. Survey of Metro rail construction tunnel of Calcutta brought out larvae of different species of mosquitoes namely C. quinquefasciatus (402, 51.1%), An. subpictus (115, 14.6%), An. stephensi (108, 13.7%) and Ae. aegypti (161, 20.5%). During one year study period, a total of 3806 water holding spots were searched, of which, 20.6% were observed to be positive with mosquito larvae.
11. When equal opportunities were given to each floor for breeding of mosquitoes in a five storied building, it was seen that *An. stephensi* bred significantly in greater number in upper floors (7.2 m - 18.0 m) showing its geophobic breeding behaviour while *C. quinquefasciatus* and *Ae. aegypti* displayed their geophilic pattern in relation to breeding nature, as no *C. quinquefasciatus* larva was obtained from upper floors.

12. *An. stephensi* is held solely responsible for the transmission of malaria in Calcutta. With a view to assess the extent of contact between the vector and man by way of determining its blood feeding spectra in nature, blood meals of *An. stephensi* caught in two different biotopes namely human habitations and cattlesheds were analysed by gel diffusion method. Out of 225 *An. stephensi* caught in human habitations, 94.6% (213) and 0.8% (2) were found to be positive for human and bovine blood respectively. Taken as a whole, 76.1% (322) and 19.6% (83) were positive for human and bovine blood respectively. Human blood index (HBI) of *An. stephensi* population in Calcutta was 76, which is differed considerably from those of previous investigators, tallying recent spread of malaria in the metropolis.
13. No *An. stephensi* was landed on man bait in morning hours between 6 a.m. to 6 p.m. in man landing experiment. But at night (between 6 p.m. and 6 a.m.) a total of 54 (0.72%) *An. stephensi* landed on man bait in the whole year. Per man hour and mean per man per night contact was found to be in the order of 0.09 and 1.12 respectively.

14. Out of a total of 54 mosquitoes, 42 and 12 represented indoor and outdoor collections respectively. Interestingly no *An. stephensi* was collected in the months of December, January, March and April in both indoors and outdoors. The mean per man per night contact was found to be lower (0.05) in outdoor situation than in indoor one (1.75). Maximum collection was made in the month of August (15, 27.77%).

15. Out of 54 mosquitoes, 43, 8 and 3 were captured at the rainy, winter and summer seasons respectively.

16. The man landing experiment showed that the preferential biting sites of *An. stephensi* were hand (12, 22.22%) and leg (27, 50.0%) regions.
17. The highest number of *An. stephensi* (18, 33.3%) was landed on man bait between 24 and 01 hours. The man landing experiment indicated the highest number of collection in the III quadrant of night in both indoors and outdoors.

18. It would be worthmentioning here that out of 112 wild caught *An. stephensi* dissected, sporozoites infection was found in two mosquitoes at the rate of 1.78%, while oocyst rate was found to be 0.

19. The average duration of each gonotrophic cycle in one-year was found to be 3 days (72 hrs.) for *An. stephensi* in the laboratory conditions. The average duration was 4 days (96 hrs.) in winter followed by 2.5 days (60 hrs.) each in the rainy and summer seasons.

20. Out of a total of 371 *An. stephensi* mosquitoes, 187 (50.40%), 127 (34.23%), 46 (12.39%), 10 (2.69%) and 1 (0.26%) were detected as nulliparous, primiparous, biparous, triparous and tetraparous respectively. Maximum parous females was obtained in the rainy seasons (55.25%) which indicated that in that season *An. stephensi* attained the potentially dangerous age.
21. The average proportion parous, daily survival rate and daily mortality rate were 0.50, 0.79 and 0.21 respectively. Maximum proportion parous was obtained in the months of November (0.48), December (0.51), January (0.52), August (0.57) and September (0.51). The maximum daily survival rates were found in November to February (range 0.59 - 0.85) while the maximum daily mortality rates were seen between March and June (range 0.94 - 0.99).

22. For identifying the best sampling device in Calcutta, five sampling methods i.e. hand collection from temporary hutments, cattlesheds and brick-built rooms, per man per night collection and breteau index were compared with the monthwise summation of malaria incidence in Calcutta. Out of five sampling methods, breteau index proved statistically the best sampling technique, and this technique might easily be employed for determining the critical density of An. stephensi where hand collection methods were painstaking, cumbersome, rigorous, tedious, time consuming and less remunerative.