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RESEARCH ARTICLE

PATTERN OF MAN LANDING DENSITY AND PERIADICITY OF DIFFERENT SPECEASES OF MOSQUITES IN NAGAPPATINAM DISTRICT, TAMILNADU, INDIA

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ABSTRACT

Introduction: Mosquitoes are generally considered an annoyance but some species act as vectors of diseases such as malaria, lymphatic filariasis, dengue, chikungunya and Japanese encephalitis. Knowledge of the bionomics of mosquitoes, especially of disease vectors, is essential to plan appropriate vector control strategies and diseases prevention. **Objectives:** To Find out the Man landing densityand periodicity of Different species of Mosquitoes prevalence in Nagai district. **Methodology:** Two houses located close to each other in the same street have been selected for the present study with natural setup. House 1and where a human volunteer, who acted as bait, was made to lie on the floor with his usual clothing. He had been exposed to mosquito landing for five minutes of each hour of the night that is 6 pm to 6 am and the mosquitoes were collected by an electronic aspirator. House 2 also followed the same, for subsequent five minutes of the same hour. **Results:** Throughout the study period *Culexquinquefasciatus*, was found to be the predominant mosquito species in Nagapattinam area. *Culexquinquefasciatus* was found to have maximum man landing Density (MLD) 9 – 10 p.m. and 11pm to 12 mid night. However the *Culexquinquefasciatus* density ranged between 3.5 to 5 MLD throughout the night.

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INTRODUCTION

Mosquitoes, haematophagous group of insects are believed to have evolved around 170 million years ago. Mosquitoes enjoy worldwide distribution and have adopted to the changing environment. More than 300 species of mosquitoes have been recorded in India. Mosquitoes are generally considered an annoyance but some species act as vectors of diseases such as malaria, lymphatic filariasis, dengue, chikungunya and Japanese encephalitis. Mosquitoes are responsible for the most nagging health problems, causing more human suffering than any other organism. During the year 2006, in India it has been reported about 2.5 million people were affected and about one thousand people died with different mosquito borne diseases (National Vector Borne Disease Control Programme, 2006). In India, the second most populated country in the world with more than 1 billion population in 28 states and 7 union territories, most of the states have reported the outbreak of mosquito borne diseases. Diseases not only impose heavy burden on the community but also puts the public health system in a disarray. Population movement, unplanned urbanization, poor environmental sanitation, lack of effective mosquito control and wide spread travel within the country and across the borders are some of the factors responsible for the dramatic spread of mosquito borne diseases.

The diseases will continue to spread to newer areas unless vector control measures are taken up on war footing. Due to this spread in time and space, it has becomes extremely difficult to carry out control programmes since they have become very expensive for the providers (Ramaiah *et al.,* 1992). Each of these vector borne diseases is constrained with one or the other problem related to diagnosis, treatment, vector control and prevention of infection. Diagnosis still remains either difficult or not economically or operationally feasible. Effective drugs are not available for all the vector borne diseases. Threats of drug resistance by the parasites continue and all vectors are not amenable for control. Continuous use of insecticides has led to the development of resistance to insecticides among the vectors. Cost of insecticides and recurring cost of their application renders vector control economically nonviable on long terms basis. There is no vaccine available for public health use for any of these diseases. Besides theses technical problems, there are logistic problems and therefore vector control becomes increasingly difficult. Protection from the contact of vectors is the most definitive method of preventing infection and to contain the problem, which is the consequence of primarily human activities. Knowledge on bionomics of mosquitoes, especially of disease vectors, is essential to plan appropriate vector control strategies and diseases preventions. Information on

biting activity of vectors during the night hours is important for mosquitoes borne disease control. This study was carried out to find out the composition of mosquito fauna man landing densityand biting trends in Nagapattinam district, Tamilnadu, India.

Objectives

1. To find out the man landing density of different species of Mosquitoes prevalence in Nagai district, Tamilnadu.
2. To find out the periodicity of different species of mosquitoes in same district.

MATERIALS AND METHODS

Study area: The present study has been carried out in Nagapattinam urban conglomerations inNagapattinam district. Nagapattinam is the headquarters of Nagapattinam district. It is located about 400 km south of Chennai on the east coramendal coast of south India. The total area of Nagapattinam district is 2715.83 sq km. Total population is 14, 88,839 as per the census by year 2001. Out of which 7,69,920 are males and 7, 18,919 are females. The urban population is 3, 30,282 and rural population is 11, 58,557 respectively. This district has already been reported for endemic of filariasis (Chari, 1981). Here, the summer season is from April to June. The maximum temperature reaches during these months. Occasionally, it gets summer rain due to south west monsoon. From July to September the temperature is usually moderate. The rainy season is from October to December. The North West monsoon brings good amount of rainfall during these months. The post-monsoon season begins from January and lasts till March. However, the seasons are conveniently classified into Monsoon (September to December), Premonsoon (May to August) and Postmonsoon (January to April) based on average rainfall (http://hsp.iitm.ac.in/~jm/ARCHIVES/Sep-Oct04/ article_files/seasons.html) and the same has been followed in the present study.

Sampling

To evaluate the man landing rhythm, mosquito density, different species of man landing mosquito, two houses have been selected in a slum of Nagapattinam urbanized area which has good mosquito genic condition. Two houses located close to each other in the same street have been selected for the present study with natural setup. They were almost similar in type and dimensions. Both houses were made of mud walls having a single room with doors for entry and exit on the opposite walls. There were no windows, however cross ventilation was adequate. Electricity was available in both houses. House 1 where a human volunteer, who acted as bait, (Consent certificate of the concerned persons have been taken) was made to lie on the floor with his usual clothing. He had been exposed to mosquito landing for five minutes of each hour of the night that is 6 pm to 6 am and mosquitoes were collected by an electronic aspirator. The collected specimens were transferred to test tube and labeled. During the mosquito collection 40W - Bulb was kept on for the illumination purpose and no fan was used. This procedure hadbeen repeated throughoutnight (12 man hour collection) for two year. House 2 was also followed the same in subsequentfive minutes of the same hour. The collection of mosquito landing was limited to 5 minutes since we were using 'human bait'(as per the WHO standard method). By considering the high mosquito density it was considered unethical to expose a volunteer for longer than 5 minutes and it will be extrapolated for calculating one hour man landing density. This procedure and mosquito collection was followed for four times in each month for two years. The landing collections were brought to the laboratory alive, anaesthetized with solvent ether and species were identified as suggested by Barraud (1933) and Cristophers (1933).

Methods of Assessing Annual Man Landing Rate (ABR): Parameter used in this study were calculated as described by Sharma *et al.* (1986).

Annual Man Landing Rate (ABR): Annual man landing rate is the number of landing mosquito received by a man during a period of one year. It is the sum of 12 monthly man landing rates, which are calculated by multiplying the average number of mosquito landing a man per night with number of days in that month. (The annual biting rate is now changed into the annual man-landing rate due to ethical reasons).

RESULTS

Species of Mosquitoes: Throughout the study period the mosquito species *Culexquinquefasciatus*, *Anophelesstephensi*, *Anopheles culicifacies, Culexvishnui, Armegerus, Aedesaegypti* were collected. Table .1 shows the total number of all species of man landing density collected in through the two consecutive years in a frequency of four times in a month.

Table 1. Monthly man landing rate (extrapolated) in four different spell for two years

S.no	Mounth	Collection I	Collection II	Collection III	Collection Iv
1	Oct –2003	25668	13020	13020	14880
2	Nov-2003	15120	15840	15120	16560
3	Dec-2003	15996	19716	16368	18600
4	Jan-2004	24552	21576	21948	19344
5	Feb-2004	19824	17136	15456	14448
6	Mar-2004	11904	13392	10788	6324
7	Apr-2004	7560	10800	6840	12240
8	May-2004	12276	14508	13020	12648
9	Jun-2004	12240	7920	9000	8280
10	July-2004	9300	18228	12648	13020
11	Aug-2004	16740	18600	17856	18600
12	Sep-2004	19800	19800	18000	19080
13	Oct-2004	17640	20460	20460	21948
14	Nov-2004	20880	18720	18000	19080
15	Dec-2004	20088	21204	20832	17484
16	Jan-2005	20088	22320	24552	25668
17	Feb-2005	21504	20496	20832	20496
18	Mar-2005	20088	16740	17112	14880
19	Apr-2005	17280	13320	14400	15480
20	May-2005	11160	11532	13020	9672
21	Jun-2005	10440	11880	11520	8640
22	July-2005	10044	13764	14880	14880
23	Aug-2005	17112	19344	19344	19716
24	Sep-2005	20520	19440	21240	19440

Density: Among the collected species the *Culexquinquifasciatus* was highest in number (89.3%), *Anopheles* was second highest (6.9%) and all other species together made up the remaining 3.8% (Fig 1,2,3). Therefore *Culexquinquifasciatus wa*s found to be the predominant mosquito species in the Nagapattinam study area.

Periodicity: The average night man landing density over 12 man hour collection is shown in Figure, 4. From this it is observed that among the 12 man hour collection (6pm – 6am.), the

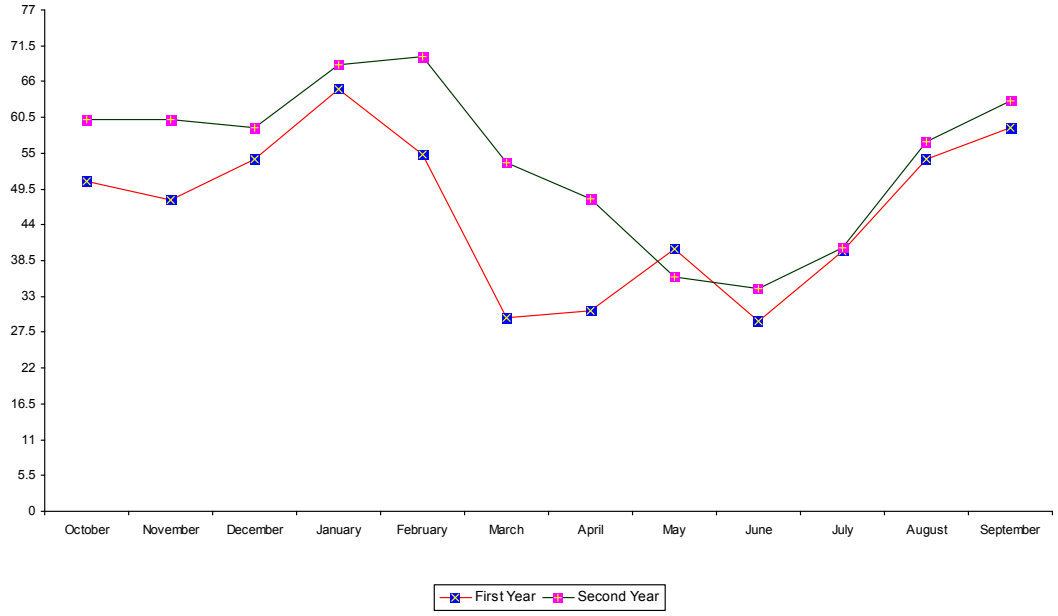

Fig 1. Man Landing Density of Mosquitoes (All Species)

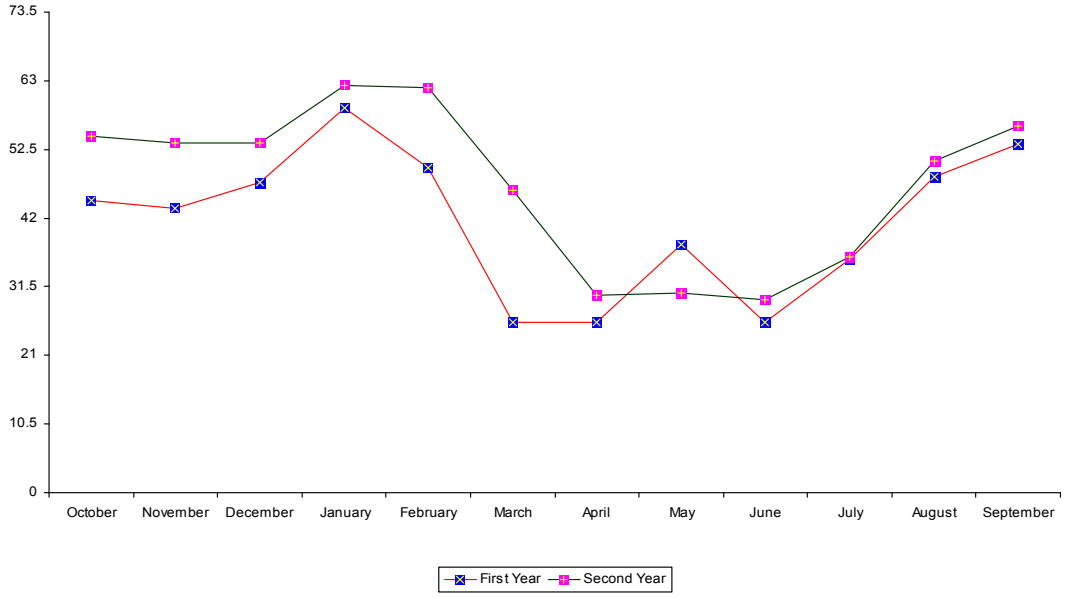

Fig. 2. Man Landing Density of *Culexquinquefasciatus*

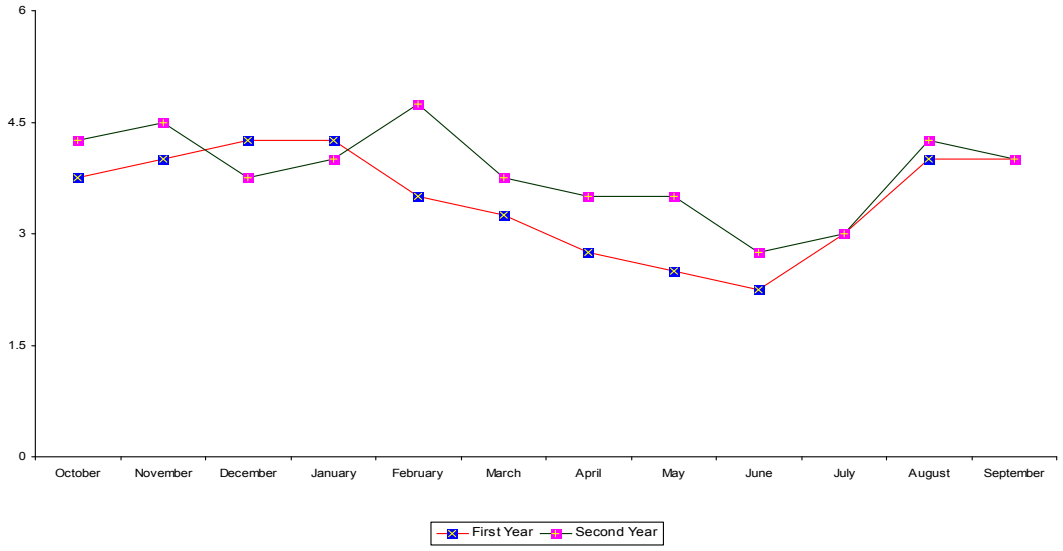

Fig. 3. Man Landing Density of *Anopheles*

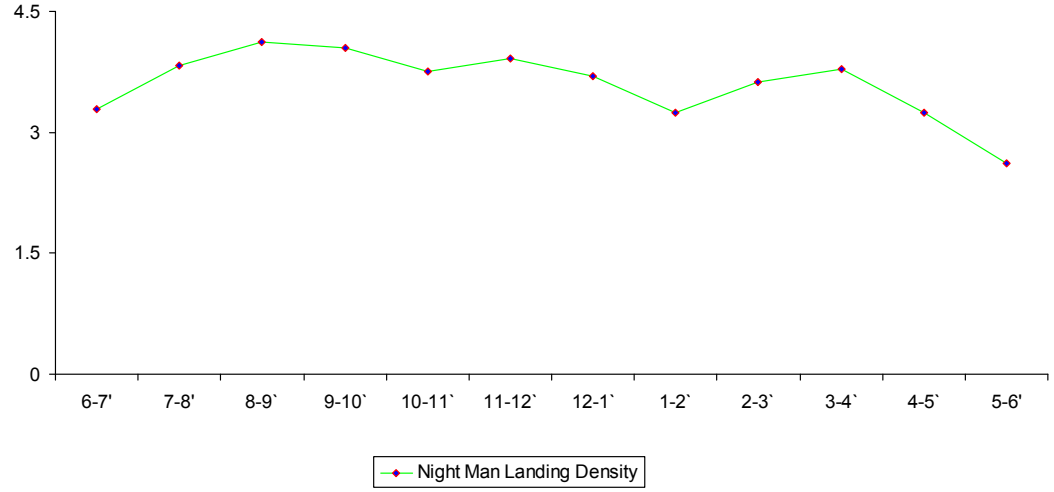

Fig. 4. Periodicity of Person Mosquito Contact in All Man Landing Species

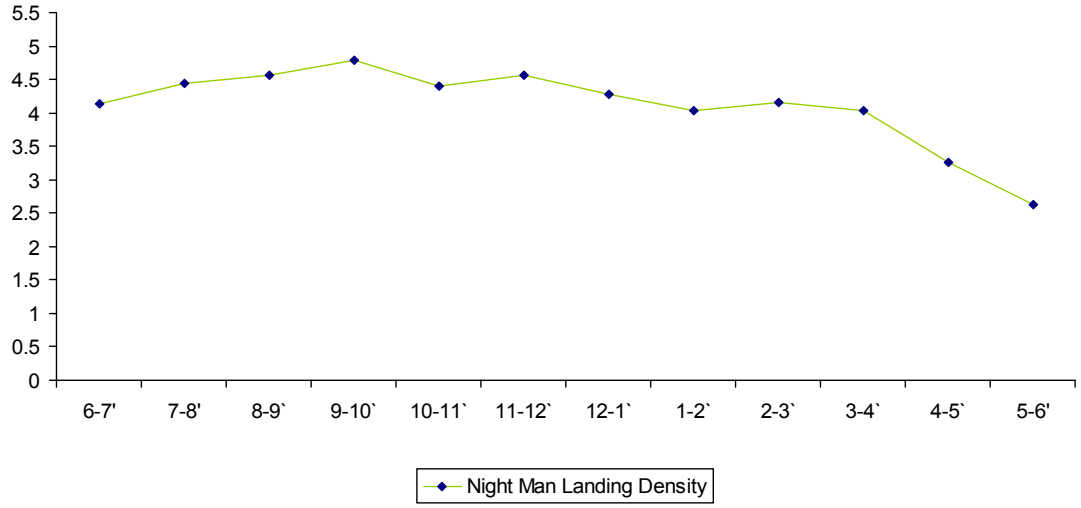

Fig. 5. Periodicity of Person Mosquito Contact in *Culexquinquefasciatus*

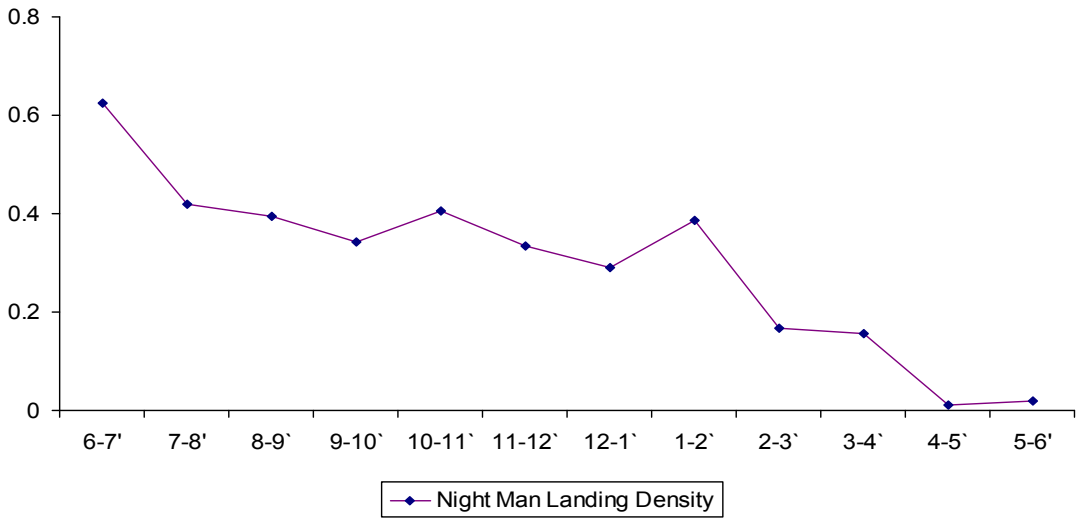

Fig 6. Periodicity of Person Mosquito Contact in *Anopheles*

maximum man landing density was observed between 8 p.m. to 9 p.m. followed by 3 to 4 a.m. And the minimum is observed between 5 to 6 a.m. followed by 1 to 2 a.m. In case of *Culexquinquefasciatus* the maximum night man landing density was observed between 9 – 10 p.m. and 11pm to 12 mid night. The minimum density was recorded between 5 to 6 a.m. However the *Culexquinquefasciatus* density ranged between 3.5 to 5MLD throughout the night (Figure, .5). Similarly in the case of *Anopheles*,

the maximum night man landing density was observed between 6 – 7 p.m. and minimum between 4 - 5 a.m. (Figure, 6).

DISCUSSION

Man Landing Collection

Person Mosquito Contact

Density: In the total mosquito landing collection of the present study, maximum attracting species has been found to be *Culexquinquefasciatus* 89.3%, *Anopheles* 6.9% and other species 3.8%. Ramaiah *et al.* (1996) have reported *Culexquinquefasciatus* was the predominant mosquito species and contributed 80% of the mosquito population in their study area of Ramaiah*et al.* (2003) also reported that 90% of attracting species was *Culexquinquefasciatus*. Though malaria cases have been reported from study area by public health department, the predominant mosquito species has been found to be *Culexquinquefasciatus* which is vector for filariases.

Periodicity: The average night man landing density over night (12 man hour collection) is shown in Figure, .4. From this it is observed that among the 12 man hour collection (6 pm – 6 am), the maximum man landing density was observed between 8 p.m. to 9 p.m. followed by 3 to 4 a.m. And the minimum was observed between 5 to 6 a.m. followed by 1 to 2 a.m. The night man landing mosquitoes include *Culexquinquifasciatus, Anopheles* and others as pointed out in the previous section. The vector of bancroftianfilariasis, in urban and semi-urban areas worldwide is *Culexquinquifasciatus,* a primarily domestic mosquito that breeds in open sewers, drains and pits, contaminates pools and ponds and other polluted waters. This mosquito also transmits bancroftianfilariasis in crowed rural areas where domestic sanitation is poor (Dennis, 1991). In the present study, collection of night man landing mosquitoes reveals that *Culexquinquifasciatus,* is the prevalent form to a level of 89.3%. The prevalence of the mosquito species may be due to the conducive environment for its breeding purpose as evidenced by the surroundings in the study area. The surroundings of the study area clearly indicates that these stagnant water bodies are highly polluted which is preferred by *Culexquinquifasciatus,* for its breeding purpose thereby high density of the mosquito species may be expected. So, the surroundings of the study area may be attributed for the higher density (89.3%) of the mosquito species recorded in the present study. With regard to periodicity of the night man landing mosquitoes higher number of mosquitoes were landing at 8 - 9 p.m. and 3 - 4 a.m during the 12 hours study from 6.00 p.m. to 6.00 a.m. (Figure, 4). However, *Culexquinquifasciatus* was observed to be active throughout the night hours (Figure,.5) Nagapattinam area has been reported to be highly endemic area for filariasis (Chari, 1981). In the filarial endemic area as evidenced by thefilariasis infected residents for spreading of the disease may naturally be expected because of the nocturnal habit of the filarial vector mosquito, *Culexquinquifasciatus* which is observed to be active during night hours. In connection with the above, it is appropriate to point out that the biological variants of lymphatic filarial parasites may be distinguished by the rhythmic patterns of micro filarial circulation in the peripheral blood of infected population. These patterns have evolved as adaptations to the biting habits of vector species. Where night-bitting mosquitoes are the vectors, microfilariae are nocturnally periodic, reaching peak density in the blood between 10.00 p.m. and slowly declining in density, disappearing during the day time (Dennis, 1991). In such a daily cycle, the filarial vector mosquito, *Culexquinquifasciatus* which is predominant and active during the night hours, may spread the disease from person to person at a faster rate and this may be reason for the Nagapattinam area to be highly endemic for filariasis. Moreover, *Culexquinquifasciatus*is observed to be present in all seasons (Figure, 3) which may be attributed for the continuous water stagnation (polluted) in the surroundings of the study area.

Conclusion

Species of Mosquitoes: Throughout the study period *Culexquinquefasciatus*, was found to be the predominant mosquito species in Nagapattinam area.

Periodicity: *Culexquinquefasciatus* was obfound to have maximum man landing Density (MLD) 9 – 10 p.m. and 11pm to 12 mid night. However the *Culexquinquefasciatus* density ranged between 3.5 to 5 MLD throughout the night.

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