

MOSQUITO (DIPTERA: CULICIDAE) DIVERSITY AND THEIR HABITAT IN THOOTHUKUDI DISTRICT

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Abstract: Mosquitoes that inhabit water habitats play an important role in the ecological food chain, and many of them are biters and transmitters of human and animal diseases. Mosquito diversity was studied in three areas of the Thoothukudi district Tiruchendur, Satthankualam, Sawyerpuram in indoor and outdoor habitats from February 2017 to January 2019. Seven species belonging to 3 genera were collected and identified as *Anopheles culicifacies*, *Anopheles stephensi*, *Anopheles annularis*, *Culex quinquefasciatus*, *Culex tritaeniorhynchus*, *Aedes aegypti* and *Aedes albopictus*. The higher number of mosquitoes were collected outdoors as compared to indoor. The percentage of *Anopheles* mosquitoes at outdoor was (60.80%) followed by *Culex* (60.75%) and *Aedes* (59.33%) and indoor *Anopheles* (39.20%) followed by *Aedes* (40.67%) and *Culex* (39.25%) was recorded during 2017-18. At outdoor *Anopheles* (52.79%) followed by *Culex* (57.22%) and *Aedes* (56.06%) and *Anopheles* (47.21%) followed by *Culex* (42.78%) and *Aedes* (43.94%) was recorded during 2018-2019 in indoor. Shannon and Evenness were calculated.

Keywords: Evenness, Habitats, Mosquitoes, Shannon-Weiner diversity index, Thoothukudi city.

1 INTRODUCTION

Mosquitoes are wide spread and diversified group of insects. More than 3500 species of mosquitoes belonging to 42 genera have been recorded under three subfamilies, Anophelinae, Culicinae and Toxorhynchitinae[1]. They are prominent blood suckers that annoying, mammals, birds, reptiles, amphibians and fishes. Owing to their biting, blood feeding habits and ability to transmit pathogens causing fatal diseases including filariasis, malaria, yellow fever, Japanese encephalitis and dengue fever etc. [2]. Biodiversity of mosquitoes is an important aspect of medical science and is destined to emerge as a new significant and integral aspect of human life. Among the insects, mosquitoes are most important since they are related to health and survival of man. The diversity of mosquito species varies among different geographical regions of the world. Mosquito biodiversity has been studied by several workers,[3, 4, 5, 6]. Due to rapid urbanization and industrialization, large numbers of people migrate from rural to urban areas. This leads to the development of slums with no proper sanitary works, poor maintenance and water bodies conducive for the breeding of mosquitoes thus increasing the incidence of vector borne diseases in an urban environment.

The present study was carried out to study the distribution of mosquitoes in different habitats of Thoothukudi district in rural environment.

2. MATERIAL METHOD

2.1 Study area

Thoothukudi is located at 8.53°N 78.36°E. Thoothukudi is located in South India, on the Gulf of Mannar. The city mostly has a flat terrain and roughly divided into two by the Buckle channel. Being in coastal region, the soil is mostly clay sandy and the water table varies between 1 and 4 m (3.3 and 13.1 ft) below ground level. The city has loose soil with thorny shrubs in the north and salt pans in the south. The city experiences tropical climatic conditions characterised with immensely hot summer, gentle winter and frequent rain showers. Summer extends between March and June when the climate is very humid. Thoothukudi registers the maximum temperature of 39 °C (102 °F) and the minimum temperature of 32 °C (90 °F). The city receives adequate rainfall during the months of October and November The coolest month is January and the hottest months are from May to June. The city has a very high humidity being in the coastal sector.

Species Shannon-Weiner index:

$[H = -\sum P_i \log P_i]$ and Evenness index $[J=H/H_{max}]$ were worked out

Specis Shannon-weiner index: $H = -\sum P_i \log P_i$, where H= shannon –weiner index, $P_i=ni/N$,

= Sum, n_i = Number of individuals of each species in the sample, N= Total number of individuals of all species in the sample.

Evenness index: $J=H/H_{max}$ Where, J= Evenness index, H is Shannon-Weiner index, $H_{max} = \log S$, 'S' is the number of species.

Different habitats of mosquito species in Thoothukudi District Rural Environment



Open type sewage Canal



Cattle Shed



Mosquito collecting from paddy field



Indoor collection system



Construction Pit



Tyres

3. RESULTS AND DISCUSSION

A total of 2440 mosquitoes from outdoor and 1085 mosquitoes from indoor were collected in the rural thoothukudi district. Outdoor and indoor collections revealed seven species of mosquitoes viz *Anopheles culicifacies*, *Anopheles stephensi*, *Anopheles annularis* in sub family *Anophelinae*, *Culex quinquefasciatus*, *Culex tritaeniorhynchus*, *Aedes aegypti* and *Aedes albopictus* in sub family *Culicinae*. (Table 1)

Table 1: Diversity of mosquitoes in Rural Thoothukudi District

Family	Sub family	Species
Culicidae	Anophelinae	<i>Anopheles culicifacies</i>
		<i>Anopheles stephensi</i>
		<i>Anopheles annularis</i>
	Culicinae	<i>Culex quinquefasciatus</i>
		<i>Culex tritaeniorhynchus</i>
		<i>Aedes aegypti</i>
		<i>Aedes albopictus</i>

Among these genera Anopheles percentage was high outdoor (60.80%, 52.79%) followed by Culex (60.75%, 57.22%) and Aedes (59.33%, 56.06%) and Anopheles (39.20%, 47.21%) followed by Aedes (40.67%, 43.94%) and Culex (39.25%, 42.78%) indoor during February 2017-January 2018 and February 2018-January 2019 respectively (Fig 1).

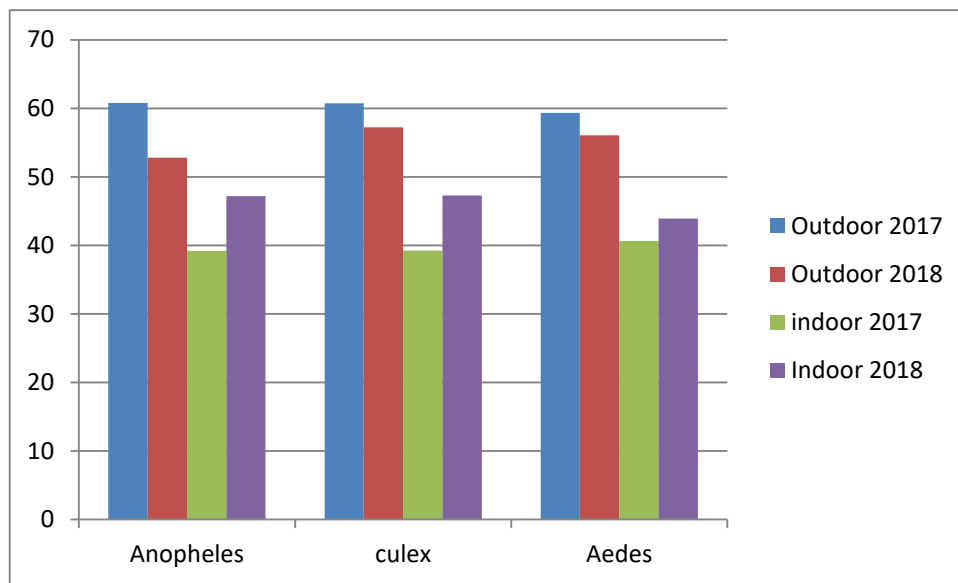


Fig 1: Percentage of mosquitoes in indoor and outdoor habitats of Thoothkudi rural environment during Feb-2017- Jan-2018 and Feb-2018-Jan-2019

Table 2: Mosquitoes collected from different outdoor habitats during the study period.

Habitats	<i>Anopheles</i> (%)		<i>Culex</i> (%)		<i>Aedes</i> (%)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
Open type drainage	10.96	10.71	15.80	15.76	8.29	8.56
Sewage canal	22.31	20.73	19.62	19.61	9.27	9.23
Ditches	16.74	15.35	16.76	16.36	5.86	6.53
Cattle sheds	15.6	14.65	19.15	18.87	7.80	10.81
Rice fields	10.74	15.24	11.34	10.90	15.90	4.46
Construction pits	9.92	6.85	5.62	6.21	12.10	0.73
Cement tank	5.44	6.43	4.22	4.99	11.95	9.46
Tires	2.86	6.90	3.24	4.47	5.61	16.67
Plastic container	2.08	1.14	2.45	0.87	10.2	19.82
Flower pots	2.11	1.00	0.96	1.00	4.73	5.61
Mud pots	1.24	1.00	0.84	0.96	8.29	8.12

Anopheles species are the vectors of malaria[11]. These mosquitoes prefer to live in shady vegetation and cool water at outdoor habitat in rural ecosystems. Similar results have been reported by Nagpal and Dash et al.[9, 12]. Aedes species the vectors of chikungunya and dengue fever showed preference to live in plastic containers, cement tank, tires, and flower pots at outdoor. Similar observations have been recorded by Wangkoon et al., [13]. Culex species are vectors for filariasis and Japanese encephalitis and prefer to live-in sewage canals, ditches, cattle sheds, rice fields and open drainage system at outdoor habitats. This has been in accordance with the reports of Derraik and Slaney, Thongsripong *et al.*, [14, 15]. The mosquitoes at outdoor habitats, thus prefer to rest in drainage, sewage and shady vegetation and plastic containers etc.

Table 3: Diversity indices of mosquito species in Thoothukudi rural environment during the study period (Feb-2017-Jan 2019)

Month	2017-18		2018-19	
	H	J	H	J
February	1.3672	0.9862	1.3145	0.9482
March	1.7750	0.9906	1.8179	1.0145
April	1.9148	0.9841	1.7908	0.9204
May	1.9346	0.9943	1.9399	0.9971
June	1.7813	0.9941	1.7885	0.9982
July	1.7760	0.9911	1.7868	0.9972
August	1.8887	0.9707	1.9134	0.9834
September	1.7790	0.9143	1.8960	0.7450
October	1.8997	0.9764	1.9108	0.9821
November	1.7860	0.9967	1.7747	0.9904
December	1.7408	0.9715	1.7755	0.9909
January	1.0796	0.9827	1.0749	0.9784

H=Shannon-Weiner diversity index, J=Evenness diversity index.

Species diversity was evaluated using Shannon-Wiener index (H) and Evenness index (J). The values of Shannon–Weiner index was founded in the range 1.7096 to 1.9346 and 1.0749 to 1.9399 during 2017-18 and 2018-19 respectively. The lowest value was recorded in January and the highest in May during both the years. The Shannon index showed high resemblance to each other during the study period for both the years. The values of Evenness index were between 0.9143-0.9943 and 0.745-1.0145 during 2017-18 and 2018-19 respectively. The lowest value was recorded in September and the highest in March during the study period. (Table 3)

4. CONCLUSION

The present investigation indicates that diversity indices and evenness were close and highly resemble to each other. The value under 1.0 (H) indicates the low quality of habitat that is supporting mosquito survival.

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