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Prevalence of Mosquitoes in an Agro-Ecosystem (Athikulam, Virudhunagar District Tamil Nadu, India)

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Abstract: Mosquito diversity was carried out in Athikulam, an agro-ecosystem for theperiod of six months from September 2011 to February 2012. A total of 22 species of mosquitoes belonging to 5 genera namely *Aedes, Anopheles, Armigeres, Culex* and *Mansonia*were collected and recorded in the study area. Among the five genera of mosquitoes the genes *Culex* represented the maximum number of species followed by *Anopheles*, *Aedes*, *Mansonia* and *Armigeres*. Biodiversity index and species richness were high during December 2011 (0.90) (21 species) followed by November 2011 (15 species), October 2011 (9 species) and the remaining months showed moderate diversity.

Key words: Diversity · Genera · Richness and Moderate

INTRODUCTION

Mosquitoes are regarded as public enemies because of their biting annoyance, noise nuisance, sleeplessness, allergic reactions and disease transmission due to their bites. They transmit human disease such as malaria, yellow fever, dengue haemorrhagic fever and encephalitis [1]. Mosquitoes considered as serious nuisance pests and vectors of many dreadful diseases both in the urban and rural areas. The problem is more severe in the rural areas especially those areas are associated with a well irrigated agro ecosystem. In theseareas, poor sanitation facilities, severe agricultural practices and lack of medical facilities enhance the diversity of the population of mosquitoes and vector-borne diseases. For successful implementation of vector management programme, adequate knowledge about the species composition, density and feeding behaviour is essential [2].

Mosquito survey provides valuable information on occurrence, distribution, prevalence and species composition of various mosquitoes in an area, which assumes significance due to their public health importance [3]. Field research on mosquito biology and ecology has been aimed towards a better understating of mosquito reproductive biology. Favourable larval habitats can be found mainly on the coastal and in the lowlands. Mosquitoes appear in the large numbers after flooding and the resulting tributaries cause considerable extension of mosquito breeding habitats [4].

MATERIALS AND METHODS

The study was conducted in Athikulam, a typical rural area, located in SrivilliputhurTaluk, Virudhunagar district. The study area comprised of well diversified ecological locations, such as, population rich residential site, more cultivated lands and non- cultivated lands. The adjoining area consists of more cultivated crops, stagnant water bodies, highly polluted sewage water bodies and other mosquitogenic conditions. The study area also comprised of various types of human settlement and varying number of cattle's and other animals that favour the mosquito population. Four sites have been selected on the basis of the location of breeding habitats and the availability of vertebrate hosts for the mosquitoes.The study was carried out for a period of 6 months from September 2011 to February 2012. The location of the study area was closely associated with water bodies which including fresh water, polluted water, pond and agricultural fields. Month wise and region wise study was carried out in the study area to monitor the prevalence of mosquitoes collected for the six

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months period of time.The systemic weekly collection of adult female mosquitoes was made for 24 hours at ground level in dim light the dark phase of the day. While one person was acting as bait by sitting motionless, another person collected the biting mosquitoes following the method adopted [5]. To minimize the damage of body parts and to collect the biting mosquitoes a very thin and transparent (1x1 inch size) plastic vials were used and killed by ether, separated (hours–wise) [5]. All the preserved wild–caught mosquitoes were identified upto species level by the Entomologists, Centre for Research in Medical Entomology (ICMR), Madurai.

Biodiversity Index: Mosquito diversity was evaluated using species richness index or alpha diversity [6] to assess the degree of biodiversity by following the formula,

$$\alpha = I\text{-}\Sigma\ (x_1/ t)^2\ (x_2 / t)^2\ (x_3/ t)^2 + (x / t)^2$$

where,

α = Species richness index
x = Number of each species
t = Total number of mosquitoes of all species.

RESULT AND DISCUSSION

A total of 22 species of mosquitoes belonging to 5 genera namely *Aedes, Anopheles, Armigeres, Culex* and *Mansonia*were collected and recorded in the study area. Among the five genera of mosquitoes the genes *Culex* represented the maximum number of species (8 species) followed by *Anopheles* (6 species), *Aedes* (5 species),*Mansonia*(2 species) and *Armigeres* (1species) (Table 1). Among the four regions of the study area, western region exhibited high diversity (20 species) followed by Eastern region (19 species), Northern and Southern region (15 species) each (Table 2). This is because of the availability of different kinds of breeding habitats and rich cultivation of agricultural crops. Similar observation was reported where the diversity was positively correlated with existence of artificial irrigation system and simultaneous plantation of paddy and other crops also [7, 8]. Mosquito diversity and species richness was high during the month of and December 2011 (21 species) followed by November 2011 (15 species), October 2011 (9 species) and the remaining months showed moderate richness (Table 3). This result was supported that increasing rainfall influence the diversity by forming of new breedinghabitats [9]. The diversity index was also recorded. The index was higher in

Table 1: Diversity of mosquito species recorded inAthikulam during September 2011 - February 2012.

S.No	Name of mosquitospecies
1.	*Aedes (Stegomyia) aegypti* (Linn.)
2.	*Aedes (Stegomyia) albopictus* (Skuse)
3.	*Aedes (Neomelaniconion) lineatopennis* (Ludlow)
4.	*Aedespallidostriatus*
5.	*Aedes (Stegomyia) vittatus* (Bigot)
6.	*Anopheles (Anopheles) barbirostris* (Vander wulp)
7.	*Anopheles (Cellia) pallidus* (Theobald)
8.	*Anopheles (Anopheles) peditaniatus* (Leicester)
9.	*Anopheles (Cellia) subpictus* (Grassi)
10.	*Anopheles (Cellia) tessellates* (Vander wulp)
11.	*Anopheles vegas*
12.	*Armigeres (Armigeres)subalbatus* (Coquillett)
13.	*Culex (Culex) bitaeniorhynchus* (Giles)
14.	*Culex (Culex) fuscocephalus* (Theobald)
15.	*Culex (Culex) gelidus* (Theobald)
16.	*Culex (Culex) infula* (Theobald)
17.	*Culex (Culex) pseudovishnui* (Colless)
18.	*Culex (Culex)quinquefasciatus* (Say)
19.	*Culex (Culex) tritaeniorhynchus* (Giles)
20.	*Culex (Culex) vishnui* (Theobald)
21.	*Mansonia (Monsonioides) annulifera* (Theobald)
22.	*Mansonia (Monsonioides) uniformis* (Theobald)

Table 2: Region wise diversity of adult mosquito species collected fromAthikulam during September 2011 – February 2012

Name of species	Southern region	Northern region	Eastern region	Western region
Aedesaegypti	+	+	+	+
Aedesalbopictus	-	-	+	+
Aedeslineatopennies	+	-	+	+
Aedespallidostriatus	-	+	+	+
Aedesvittatus	-	-	+	+
Anopheles barbirostris	+	+	-	+
Anopheles pallidus	+	+	+	+
Anopheles peditaniatus	+	-	+	+
Anopheles subpictus	+	+	+	+
Anopheles tesculates	+	-	-	-
Anopheles vegas	+	-	-	+
Armigeressubalbatus	-	+	+	+
Culexbitaeniorhynchus	-	+	+	+
Culexfuscocephalus	-	-	+	+
Culexgelidus	+	+	+	+
Culexinfula	-	+	+	+
Culexpseudovishnui	+	+	+	+
Culexquinquefasciatus	+	+	+	+
Culextritaeniorhynchus	+	+	+	+
Culexvishnui	+	+	+	+
Mansoniaannulifera	+	+	+	-
Mansoniauniformis	+	+	+	+
Total	15	15	19	20

+ - Present; - Absent

Table 3: Species richness of the mosquitoes recorded inAthikulamduring September 2011 - February 2012.

	Species richness					
Name of the Species	Sep -11	Oct- 11	Nov- 11	Des- 11	Jan -12	Feb -12
Aedesaegypti	+	+	+	+	+	+
Aedesalbopictus	-	-	+	+	-	-
Aedeslineatopennis	-	-	-	+	-	-
Aedespallidostriatus	-	+	+	+	-	-
Aedesvittatus	-	+	-	+	-	-
Anopheles barbirostris	-	-	-	-	+	+
Anopheles pallidus	-	+	+	+	-	-
Anopheles peditaniatus	-	-	-	+	-	-
Anopheles subictus	+	+	+	+	+	+
Anopheles tesculates	-	-	-	+	-	-
Anopheles vegas	-	-	-	+	-	-
Armigeressubalbatus	-	-	+	+	-	-
Culexbitaeniorhynchus	-	-	+	+	-	-
Culexfuscocephalus	-	-	-	+	-	-
Culexgelidus	+	+	+	+	+	+
Culexinfula	-	-	+	+	-	-
Culexpseudovishnui	-	-	+	+	-	-
Culexquinquefasciatus	+	+	+	+	+	+
Culextritaeniorhynchus	-	-	+	+	+	+
Culexvishnui	-	+	+	+	-	-
Mansoniaannulifera	-	-	+	+	-	-
Mansoniauniformis	-	+	+	+	-	-
No. of Species	4	9	15	21	6	6

+ - Present; - Absent

Table 4: Species composition of the mosquitoes recorded inAthikulam during September 2011 - February 2012.

Name of the Species	Species diversity						Total number of individuals
	Sep -11	Oct- 11	Nov- 11	Dec- 11	Jan -12	Feb -12	
Aedesaegypti	23	32	45	61	17	4	182
Aedesalbopictus	0	0	2	8	0	0	10
Aedeslineatopennis	0	0	0	16	0	0	16
Aedespallidostriatus	0	8	3	20	0	0	31
Aedesvittatus	0	3	0	5	0	0	8
Anopheles barbirostris	0	0	0	0	95	56	151
Anopheles pallidus	0	4	10	19	0	0	33
Anopheles peditaniatous	0	0	0	13	0	0	13
Anopheles subictus	50	107	48	68	76	82	431
Anopheles tesculates	0	0	0	5	0	0	5
Anopheles vegas	0	0	0	8	0	0	8
Armigeressubalbatus	0	0	28	92	0	0	120
Culexbitaeniorhynchus	0	0	7	26	0	0	33
Culexfuscocephalus	0	0	0	5	0	0	5
Culexgelidus	233	262	115	57	69	51	787
Culexinfula	0	0	4	8	0	0	12
Culexpseudovishnui	0	0	22	23	0	0	45
Culexquinquefasciatus	337	264	203	87	131	55	1077
Culextritaeniorhynchus	0	0	43	119	79	59	300
Culexvishnui	0	14	21	37	0	0	72
Mansoniaannulifera	0	0	3	3	0	0	6
Mansoniauniformis	0	4	11	10	0	0	25
Total	643	698	565	690	467	307	3370
No. of Species	4	9	15	21	6	6	
Biodiversity index (α)	0.58	0.68	0.80	0.90	0.80	0.79	

the month of December (0.90) than the other five months. The biodiversity index was calculated for all the month was shown in the Table 4. This was because of the occurrence of new larval habitats, above the ground aquatic containers, ongoing agricultural practices and existence of varieties of host including cattle, fowl, chick and pig. The same result was reported in Mwea, Kenya where the diversity was more during the cultivation season [9]. The heterogenicity of the occurrence of the species is mainly due to availability of the suitable hosts and appropriate breeding habitats.

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