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Diversity of mosquito fauna in three selected sites of athoor taluk, Dindigul district, TamilNadu

K.Ramesh Kumar and N.Nattuthurai

Department of Zoology, Vivekananda College, Tiruvedakam West. Madurai – 625214.

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ABSTRACT

In the present study, the mosquito density of three selected sites of Dindigul district viz., Sempatti, Chinnalapatti and J.K.Patti was surveyed. The results of the study indicate the presence of 10 species of mosquitoes which are grouped under four genera namely *Aedes*, *Anopheles*, *Armigeres* and *Culex*. The numbers of mosquitoes collected belonging to various species were low with an exception of *Culex quinquefasciatus*. The diversity measures (Shannon's and Simpson's) shows slight variation among the three selected sites studied. The Shannon's index for Chinnalapatti is slightly higher (1.883) when compared to Sempatti and J.K.Patti (1.804 and 1.804). The Simpson's index for Chinnalapatti is slightly higher (0.7994) when compared to Sempatti and J.K.Patti (0.7677 and 0.7579). In the study period, the maximum density of the mosquito population noted in the month of July and October. The minimum density of mosquito population obtained in the month of September.

Introduction

Biodiversity refers to the variability of both plants and animals. Broadly, it is the 'richness' of an ecological community. The diversity among insects has always been of keen interest, not only to Entomologist dealing with structure and function, but also to those who are engaged in different environmental programs. Relating to the biodiversity of insect richness, Prendergast et al., (1993) compared the coincidence of diversity hotspots of some different groups of insects (viz., Butterflies and Dragonflies) and examined the extent to which species rich areas for different taxa coincide and whether species-rich areas contain substantial numbers of rare species. It is relevant to note that India has been considered as one of the mega-diversity countries possessing a rich measure of all living organisms when biodiversity is viewed as a whole.

Mosquito constitutes the most important single family of insects that affect the human health everywhere. In spite of several attempts to control them, these remarkably adapted mosquitoes continue to successfully coexist with man, feeding on him and his domesticated animals (Pandian, 1998). Besides the blood loss, they are capable of transmitting many diseases like filariasis, malaria, yellow fever, Japanese encephalitis, dengue etc, (Dutta, et al., 2003; Service, 1983). The voracious feeding habit high fecundity rate, dispersal potential and successful exploitation of environment are the causes for proliferation of these mosquitoes throughout the world (Pandian, 1990).

Mosquitoes are found in all types of environments associated with water such as sewage water, stagnant water, septic tanks etc. There is an urgent need to check the proliferation of population of vector and non-vector mosquitoes in order to reduce vector borne diseases and their nuisance by using appropriate control methods. The breeding habitat is crucial for mosquito population dynamics, because it is the location where many important life cycle processes take place.

The processes are development of larva, emergence of adults, resting, swarming and mating of adults (Reuben, 1978).

As the density of vector and non vector has been increasing steadily, it is an essential to use all appropriate technological and management techniques to bring about an effective degree of control in a cost effective manner (Kumar et al., 2002). The management of mosquitoes requires to collect adequate knowledge about the species diversity and distribution pattern in a given area in order to evolve suitable strategy and to implement the same for the meaningful control of the population and in turn to reduce the menace and the incidence of the disease(Rajavel et al.,2001).

Though several studies have been conducted at various places in the world, particularly in India and in a few places in Tamilnadu, there is a need to study the bionomics of mosquitoes in all areas. Hence, an attempt has been made to survey the mosquito fauna in three selected sites of Sempatti, Chinnalapatti and J.K.Patti, Dindigul district, Tamilnadu

Materils and methods

Sampling sites:

The study was carried out Athoor Taluk, Dindigul District of Tamilnadu viz., Sempatti, Chinnalapatti and J.K.Patti for a period of six months from July 2010 to December 2010.

Mosquito sampling:

Mosquito collection was carried out in the selected sites using standard methods (WHO – 1975) only at night time. Random collection was also made while sampling fixed localities. Information about mosquito species, habitats etc., was recorded on a data sheet. Soon after collection, the mosquitoes were anaesthetized and killed by using ether and kept in separate vials, then sorted and identified with separated firstly by genera and thereafter by species. This procedure was adopted for each collection. The collected adult female mosquitoes were then identified by using the standard key by the experts available in Centre for Research in Medical Entomology (ICMR) Madurai.

Tele:

E-mail addresses: pnkramesh@gmail.com

Data analysis:

Different statistical tools were used in the present study, to know the Shannon-Weaver diversity index, Simpson's index, Margalef richness and Pielou evenness using PAST (Ver. 1.42). The number of individuals of each species present was recorded in the study sites. The Simpson's index (D) (Simpson 1949), Pielou evenness index (J) and Shannon' diversity index (H) were used (Shannon and Weaver, 1949).

Results and discussion

Mosquitoes had evolved by the Jurassic period, approximately 210 million years ago (Edwards, 1932). This was around the time continental drift began (Wilson, 1963), leading to the continental fragmentation and geographic isolation presumably promoting rapid speciation.

There are more than 3200 species of mosquitoes belonging to 37 genera recorded so far world over and are grouped in to three subfamilies, Anophelenae, Culicinae and Toxorhynchitinae, which consist of 3 genera, 33 genera and 1 genus respectively (Ward, 1992). Out of these, genus *Anopheles* consists of about 420 species, *Aedes* 950 species, *Culex* 800 species and *Mansonia* 25 species.

The voracious feeding habit, high reproductive and dispersal potential and successful exploitation of the environment are the causes of their rapid proliferation (Berlin, 1972). Moreover the distribution of mosquitoes is almost world wide as they range from equator nearly to the poles and from sea level to atleast 7000 feet altitude.

Some species are important as vectors of malaria, filariasis, yellow fever, dengue fever and other arboviral diseases (Ross 1965, Service, 1983 and Rai, 1999). In India vector mosquitoes belong to four genera viz., Anopheles (malaria), Aedes (dengue fever), Culex (filariasis and Japanese encephalitis) and Mansonia (filariasis).

The Indian mosquito fauna include 255 species grouped under 16 genera. Fifty eight species belong to genus Anophneles, 57 species to Culex, 111 species to Aedes and 7 species to Mansonia (Nagpal and Sharma,1995).

It has been reported that in Madurai there are 27 species of mosquitoes belonging to the genera Aedes, Anopheles, Armigeres, Culex and Mansonia (Pandian 1998).

Among these genera of mosquitoes Anopheles, Aedes and Culex are considered to be most important because of their potential ability in transmitting fatal diseases like Malaria, Dengue, Filariasis and Japanese encephalitis respectively.

In the present study, the survey conducted during the period of July 2010 – December 2010 shows that ten species belonging to four genera namely, Aedes, Armigeres Anopheles and Culex are prevelant in the study area.

Armigeres and Anopheles were represented by only one species. Aedes is represented by four species namely Aedes is represented by four species namely, Aedes (adenomorphus) vexans, Aedes aegypti, Aedes albopictus and Aedes vitatus. Culex is also represented by four species, Culex gelidus Culex vishuni, Culex quinquefasciatus and Culex tritaneorhyncus

Table 1.Provides the various diversity measures of mosquito fauna recorded in Sempatti during July 2010 to December 2010.The mosquito dominance was maximum in the month of September.

The Shannon's index was maximum (1.804) in the month of July and minimum (1.267) in the month of September. A maximum of Simpson's index value (0.7677) was observed in July and a minimum index value (0.5321) was noted in the month of September. The Dominance and diversity indices of mosquito fauna recorded in Chinnalapatti are given in Table 2.

The highest mosquito dominance was recorded in the month of September. The Shannon's index was maximum (1.883) in the month of October and minimum (1.488) in the month of September. The Simpson's index was maximum (0.7994) in the month of July and minimum (0.6288) in the month of September.

Table 3 provides the various diversity measures of mosquito fauna recorded in J.K.Patti during July 2010 to December 2010. The dominance of mosquito population was maximum in the month of September. High Shannon's and Simpson's diversity indices (1.804 and 0.7579) were calculated for the month of October and minimum (1.295 and 0.5415) in the month of September.

The diversity measures (Shannon's and Simpson's) shows slight variation among the three selected sites studied. The Shannon's index for Chinnalapatti is slightly higher (1.883) when compared to Sempatti and J.K.Patti (1.804 and 1.804). The Simpson's index for Chinnalapatti is slightly higher (0.7994) when compared to Sempatti and J.K.Patti (0.7677 and 0.7579).

It is well known that some of the mosquitoes which were originally zoophilic and sylvatic have adapted to feeding on humans and became peridomestic and even periurban due to deforestation. The involvement of man in certain host-parasite cycles will depend on the effect of his activities on the breeding sites of vectors, their capacity to adopt to new ecology and the presence of animal reservoirs as well as human behavior pattern. In India, *Aedes albopictus* a vector of dengue haemorhagic fever was a sylvatic species as found in the present survey. *Culex qunquefasciatus* is a primary vector of urban filariasis caused by periodic *Wucheraria bancroftii*.

In the study period, the maximum density of the mosquito population noted in the month of July and October. The minimum density of mosquito population obtained in the month of September.

Biodiversity conservation needs the base line data of all fauna and flora, even the lesser known groups, as all have to play their own role as producers, consumers, pollinators and decomposers. The diverse micro and macro climatic conditions, harbors a variety of invertebrate fauna including mosquitoes that play a significant role in conserving and maintaining biodiversity in the study area.

This study showed that diversity indexes used in environmental assessment, mainly to monitor changes in the diversity of organisms, could be applied to monitor mosquito species. Diversity indexes should be used to monitor mosquito vector species at many sites in relation to habitat type, latitude and land use and the databases generated throughout monitoring time should be used to forecast the effects of environmental change in mosquito populations. Once changes on adult mosquito species abundance are powerfully influenced by increase or removal of breeding places in the study habitats, the study of factors that regulate immature mosquito dynamics in the area is also a significant requirement. For the first time, extensive studies on diversity of mosquitoes in Peraiyur Taluk have been undertaken and it provides the first hand information on the diversity of mosquitoes in this area.

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Table: 1 Diversity indices of mosquito population in SEMPATTI

Diversity measures	July 2010	Aug 2010	Sep 2010	Oct 2010	Nov 2010	Dec 2010
Taxa S	10	9	10	10	9	10
Individuals	209	227	516	450	579	496
Dominance_D	0.2323	0.3446	0.4679	0.2688	0.2668	0.2617
Shannon_H	1.804	1.519	1.267	1.707	1.7	1.764
Simpson_1-D	0.7677	0.6554	0.5321	0.7312	0.7332	0.7383
Evenness_e^H/S	0.6072	0.5078	0.3549	0.5512	0.608	0.5837

Table: 2 Diversity indices of mosquito population in CHINNALAPATTI

Diversity measures	July 2010	Aug 2010	Sep 2010	Oct 2010	Nov 2010	Dec 2010
Taxa_S	10	9	10	10	10	10
Individuals	181	224	417	478	457	517
Dominance_D	0.2006	0.2357	0.3712	0.2181	0.2488	0.2464
Shannon_H	1.879	1.769	1.488	1.883	1.801	1.802
Simpson_1-D	0.7994	0.7643	0.6288	0.7819	0.7512	0.7536
Evenness_e^H/S	0.6548	0.6517	0.4428	0.6576	0.6055	0.6064

Table: 3 Diversity indices of mosquito population in J.K.PATTI

Diversity measures	July 2010	Aug 2010	Sep 2010	Oct 2010	Nov 2010	Dec 2010
Taxa_S	10	10	9	10	10	10
Individuals	250	326	574	539	613	598
Dominance_D	0.2587	0.2509	0.4585	0.2421	0.2779	0.256
Shannon_H	1.785	1.766	1.295	1.804	1.715	1.752
Simpson_1-D	0.7413	0.7491	0.5415	0.7579	0.7221	0.744
Evenness_e^H/S	0.596	0.5848	0.4056	0.6074	0.5555	0.5768