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DIVERSITY OF AEDES SPECIES IN ERODE DISTRICT

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ABSTRACT

Insects comprise little more than two third of known species of all kind of animals. They are found in almost all types of environment. Insects affect man's interest in a number of ways and several insects have a parasitic relationship with human such as the mosquito. Mosquitoes are diversified taxonomical group of insects. The distribution pat-tern of adult mosquitoes is related to habitat preferences of the larval stage. The Oriental region, which includes, India is regarded as one of the richest biogeography regions for mosquitoes of the world. Along with the most often considered climate change parameters like temperature, rainfall, humidity other parameters such as atmospheric particle pollution and wind can also have an impact on mosquito population, diversity and diseases transmission.

INTRODUCTION

Mosquitoes are the vectors of a variety of hazardous diseases including pathogens of Japanese encephalitis, malaria, dengue and filariasis **(Kettle, 1995)**. In the New world, the introduction of yellow fever has had a comparable impact **(Crosby, 2006).** Insect life histories show adaptations to withstand cold and dry conditions. Some temperate region insects are capable of activity during winter, while some others migrate to a warmer climate or go to a state of torpor **(Debbie Hadley, 2012)**. Their role in the ecological food chain is well recognized by many aquatic ecologists. Vector borne diseases refer to illness caused by pathogens and parasites in human populations, and account for over 17% of all infectious diseases **(WHO, 2014).** Outbreak of these vector-borne diseases occurs due to many causes such as environmental and biological factors which alter the habitats.

Dengue transmitted by *Aedes aegypti* is the common cause of fever in travelers returning from Caribbean, Central America, South America, and South Central Asia. Dengue can be fatal, but with good treatment, less than 1% of patients die. The frequency of mosquito transmitting diseases increases in the states probably due to major ecological changes in the India.

In Malaysia the outbreak of dengue cases is one of the major problems which seemed to be a global issue. In India for the first time outbreak of dengue was reported in the State of Assam. In 2010, 96million apparent dengue was recorded globally. India alone contributed 34% of the global total. Presently dengue is second serious Arbo viral diseases of Asia, South and Central America and Africa.

Outbreak of mosquito-borne diseases results from non-simultaneous introduction of vector and pathogen. Based on the data of National Vector Borne Diseases Control Programme the number of cases reported 2013 was about 74,454 for dengue with 167 deaths and 18,639 for chikungunya. Industrialization and urbanization has also resulted in mosquitoes switching hosts from monkey to human beings, from cattle to human and vice-versa. This study was carry out in Erode district, Tamil Nadu to identify the larval habitats and diversity of *Aedes* mosquito which is the major vector of Dengue.

MATERIALS AND METHODS

Erode district is extended between 10-35' and 11-60' of North latitude and76.49' and77.58' of East longitude. The temperature ranges from a maximum of 96 °F (36 °C) to a minimum of 80 °F (27 °C).

Natural and Artificial sites were chosen for mosquito collection. Adult collections were made using oral aspirator, mechanical aspirator and sweep net **(Herrel *et al*., 2001; Shortall *et al*, 2009; Florencio *et al*., 2014).** The standard dipper 400ml **(WHO, 1975)** and metal larval scooper was used for the collection of the mosquito larvae. Adult mosquito collections were carried out from indoor and outdoor resting, while larval collections were made in water holding in and around human habitats during May 2012 -May 2014.

Adult mosquitoes were transported to laboratory and anesthetized with ethyl acetate and mounted on a minute pin under a binocular stereo microscope. Adults collected in the field

were assigned the code Resting Collection (RC) and numbered on pinning asRC1, RC2, RC3, etc., with the date of collection and collection site and habit or habitat.

Larval samples collected from each of the habitat were maintained separately with a code number for the collection site and habitat. Larval skin of fourth-instar larvae were removed from each of the larval sample and preserved in 70% alcohol with the respective code for identification using Hoyer's medium **Belkin(1962).** Associated pupal skins were also mounted by using the same medium. Collected specimens were identified in vector control research centre, Pondicherry by using the works of **Christophers, (1933); Barraud, (1934); Bram, (1967); Huang, (1972** and **1979);Sirivanakarn, (1976); Rao, (1981 and 1984)** and **Reuben *et al*., (1994).**

PHYSICOCHEMICAL ANALYSIS

Water temperature was measured using a thermometer. pH and TDS were also recorded with the help of HM digital meter.

DIVERSITY INDEX

Collected data was statistically analyzed by using Shannon-Weaner index, Simpson's index, Pielou's Evenness, Dominance and Margalef's index were calculated by the software PAST 3.x **(version 2013).**

RESULTS AND DISCUSSION

A total of four species *Aedes (Aedimorphus) vexans, Aedes (Fredvardsius) vittatus, Aedes (Stegomyia) aegypti and Aedes (Stegomyia) albopictus* were collected from natural and artificial sites of the study area. The diversity of mosquitoes in the study area shows the availability of breeding habitats, resting places and favourable climatic factors like temperature and rainfall. Temperature support survival of mosquitoes and rain-fall favours breeding grounds.

Mosquitoes utilize a variety of sources including natural and water in all form of discarded containers. However, the lowest mosquito diversity was recorded in the breeding habitats such as ground pool near bamboo garden, river bed-pool and waste cups **(Service, 1976).** It has been widely documented that many mosquito species use artificial habitats for breeding **(Ramalingam, 1976; Lee *et al*, 1982; Seng** and **Jute, 1994, Nam *et al*, 1998** and **Thavara *et al*, 2001).**

Aedes species vector of dreadful diseases were collected both from indoor and outdoor places (natural and artificial sites).While *Ae. albopictus* secondary vector of different parts of India. *Ae.albopictus* were found as resting adults near ground pool of palm tree and near cattle shed. *Ae.albopictus* is known to be a container breeder and it was collected all through the study period in both natural habitats like ground pool palmtree, tree hole. In the present study *Ae.albopictus* were also collected from the man made artificial habitats like discarded tyre, grinding stones and broken mud pot. Flower pots in gardening areas are the major breeding places for mosquitoes Larvae of *Ae.albopictus* was also collected from the flower pots in gardens near human dwellings. It is also one the desired habitat as defined by **Jomon, (2009)** and **Saleeza *et al,* (2011).** Temperature of these sites ranges between 19.00±2.24- 27.28±1.84 and the pH recorded was6.94±0.17 - 7.16±0.30. Similar to the current findings *Ae.albopictus* was found as the predominant species throughout the study in Erode district, Tamil Nadu by **Rajeswari and Nagarajan (2017).**

Ae.aegypti is known to be a primary vector of dengue and chickungunya. In the study period *Ae.aegypti* was collected during the dusk, near houses, temples, grinding stones, tree holes, inside discarded tyres and bushes. Earlier studies also have revealed that water parameters possibly affects the tree hole insect population **(Petersen** and **Chapman, 1969).** Larvae were also collected from discarded articles like tyre, grinding stones and artificial habitats like mud pot and flower pots where the pH falls between 6.9 $\pm$ 0.17 -7.16 $\pm$ 0.30. Related to the present findings **Amala *et al, (2011)*** found two species *Ae.aegypti* and *Ae.albopictus* from grinding stones. **Karim *et al,* 2013** reported mosquito diversity from tree hole in Dhaka city. The same *Ae.aegypti* and *Ae.albopictus* were recorded from tree hole in Thanjavur **(Thangamathi *et al,*2014).** Suitable temperature, humidity, sunlight and sufficient organic materials inside the grinding stones creating a best mosquito breeding site. **Kirti** and **Kaur**, (2014) reported *Ae.albopictus and Cx.quinquefasciatus from the mud pots.* **Rajeswari and Nagarajan, (2017)** documented *Ae.aegypti* larvae from the natural and discarded container in Erode district, Tamil nadu. *Ae.aegypti* larvae was found in natural habitat, tree hole with the temperature of 25.46 ± 2.15 and pH was 7.16 ± 0.11.

Resting adults of *Ae.vittatus* were found during dusk near grinding stones, discarded tyres. *Ae.vittatus* larvae were obtained from the ground pool, ground pool near palm tree, coconut shell, discarded tyre, grinding stone and flower pots which forms the predominant larval habitat. Temperature and pH recorded were ranges between22.43 ± 2.26 - 27.28 ± 1.84 and

6.9 ± 0.17 -7.06 ± 0.12. Rock pools with algal growth supported *Ae.vittatus*. Immatures of *Ae.vittatus* were also collected from the natural water sources like rock pool. Similar observation was made by **Aditya *et al,* (2006).** The results relate with **Harding *et al,* (2007)** who reported *Ae.aegypti* occurred mainly inCar tyres and *Ae.nocturnus* was found in tyre track pools. Like **Jomon, (2009)** suggested *Ae.vittatus* prefers to breeds in different natural and artificial containers. These findings were coinciding with **Amala** and **Anuradha**, **(2012)** who collected *Ae.albopictus* and *Ae.vittatus* in rock pool. **Misvar Ali *et al,* (2014)** observed two species *Ae.aegypti* **and** *Ae.albopictus* in rock pool.

Irrigated rice fields were found to be the most preferred habitat. Resting adults of *Ae.vexans* were collected in harvested paddy field, ground pool of bamboo garden. Larvae of *Ae.vexans* were collected from the natural habitat ground pool support theduring the survey period. Recorded temperature during the survey was 25.40±1.79 and recorded pH was 7.05±0.1. **Ramalingam, (1976)** and **Lee *et al,* (1982)** have noted the presence of *Ae.nocturnus* in shallow ground pool. Related observations were made by **Hoshi *et al.* (2014)** and they documented two species *Ae.albopictus* and *Ur.novobscura* from urban environment of Japan.

Among the four species diversity index Dominance and Margalef's richness recorded was high for *Ae. aegypti* 0.1941 - 1.935. 0.8536 highest Simpson index was recorded for *Ae. vittaus*. Shannon-H index was 2.117 for the species *Ae. albopictus.*

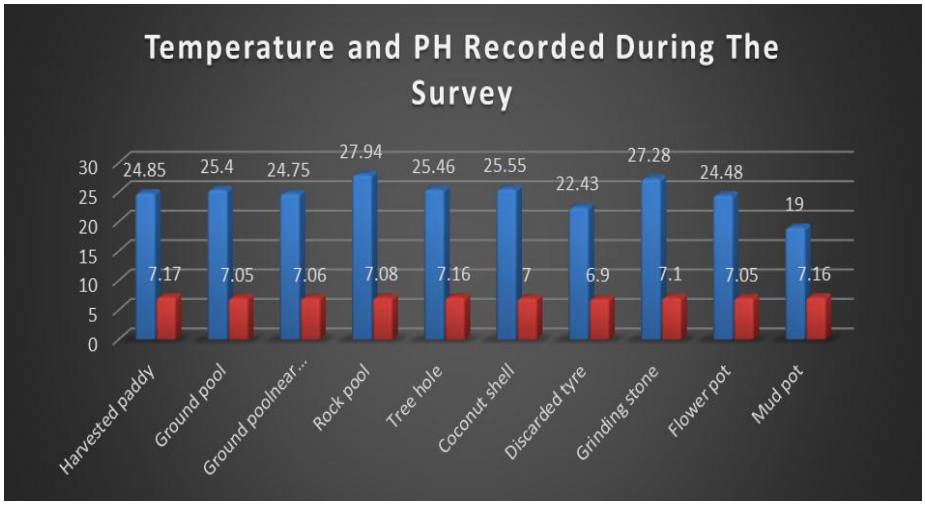
Table 1: Mean Values Of The Physico Chemical Parameters Of The During The Survey.

S.No	HABITATS	TEMPERATURE Mean ±SD	pH Mean ± SD
1	Harvested paddy	24.85±3.03	7.17±0.35
2	Ground pool	25.40±1.79	7.05±0.1
3	Ground poolnear palm tree	24.75±1.70	7.06±0.12
4	Rock pool	27.94±2.26	7.08±0.16
5	Tree hole	25.46±2.15	7.16±0.11
6	Coconut shell	25.55±0.84	7.0±0.115
7	Discarded tyre	22.43±2.26	6.9±0.17
8	Grinding stone	27.28±1.84	7.1±0.16
9	Flower pot	24.48±2.24	7.05±0.122
10	Mud pot	19.00±2.24	7.16±0.30

Table 2: Alpha Diversity Indices Of Mosquitoe Speciescollected In Erode District.

S.No	SPECIES	Dominance	Simpson_1D	Shannon_H	Evenness_e^H/S	Margalef
1	*Aedes vexans*	0.1785	0.8215	1.9	0.7426	1.733
2	*Aedes vittatus*	0.1464	**0.8536**	2.074	0.796	1.726
3	*Aedes aegypt*	**0.1941**	0.5059	1.964	**0.594**	**1.935**
4	*Aedesalbopictus*	0.1468	0.8532	**2.117**	0.6923	1.773

Graph 1: Mean values of temperature and p^{h} during the Survey.



Different Habitats Mosquito Larvae Where Collected During Survey.

Ground Pool

Rock pool

Tree Hole

Discarded Tyre

Mud Pot

Coconut Shell

Flower Pot

Grinding Stone

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