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A preliminary entomological investigation on mosquito species in Surguja District Chhattisgarh, India

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Abstract

This study was carried out to know about the various species of mosquito in Surguja district during June 2021 to May 2022. Larvae and adult mosquitoes were also studied to know the species of mosquito currently. In this study, 15 mosquito species belonging to a total of 3 genera were found which are as follows *Aedes*, *Culex* and *Anopheles* (64.39%) which was a highly hegemonic genera which was followed by *Culex* (25.07%) and *Aedes* (10.52%) respectively. *Aedes albopictus*, and *Culex. Quinquefasciatus* were found completely investigative period. Vectors of dengue, chikungunya, and malaria were also studied during study period.

Keywords: *Aedes*, *Anopheles*, *Culex*, Vector, Surguja

1. Introduction

India is a biodiversity rich country, which is one of the twelve major biodiversity rich nations of the world. The biodiversity of insect is a great significance due to their biological indicator qualities. Mosquitoes are clinically economic important group of insects that spread various types of vector borne diseases such as dengue, chikungunya, malaria, Japanese encephalitis, filariasis in our country. Taxonomically mosquitoes are included under the order Diptera, suborder Nematocera and family culicidae and anophelidae. *Culex* and *Aedes* genus are included under culicidae while *Aedes* included anophelidae with three and half thousand insect species [1] The diptera order of insects is a largest order of arthropods in to which more than 8500 species found which includes a large numbers of vectors of various diseases [2]. Around 3150 species of mosquito found have been found around the world in various researches, mosquitoes are found almost all over the world except in snowy places [3]. That is to say that the zoogeographical distribution of mosquitoes is almost everywhere except Antarctica [4]. Mosquitoes such as *Aedes* basically found in tropical and subtropical regions but have now successfully adapted to live in colder regions. Eggs from some strains of mosquitoes in temperate regions are more tolerant to colder areas than eggs from warmer regions [5] Its capable of withstanding the low temperature and snowfall of the snow as well as able to tolerate freezing temperatures, adults can survive the whole winter in suitable microhabitats [6]. Mosquitoes are found in different geographical area of the world. Greater diversity of mosquito species is found in the Neotropical region which is 31% of the total mosquito species. After that 30%, 22%, 22, mosquito species is found in Oriental, Afrotropical, and Australian region respectively, while the lowest only 5% species diversity has been recorded in the nearctic region [7] Mosquitoes are found in all types of environment specially related with water in India such as stagnant water, sewage water, septic tank etc. By the uses of appropriate vector control methods to reduce the spread of vector borne diseases. It's essential to monitor the spread of vector-borne mosquito population [8]. To proper adequate knowledge of species diversity and its zoogeographical distribution pattern in a particular area is essential to manage mosquito population to control the diseases. Mosquitoes are such only family of all types of insects that effect human health everywhere [9]. A large population of the world is affected by malaria diseases every year, so there is essential to

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identify different species of mosquito such type of studies are conducted from time to time in different areas of our country, but there has been a lack of such study in Surguja district hence in the present study has been made to investigate the mosquito species in Surguja district Chhattisgarh.

2. Material and methods

2.1 Study area

The present entomological investigation was carried out at Surguja district which is tribal dominated district located in the northeast of the state of Chhattisgarh the total area of the district about 5732 sq. km., the latitudinal extension is 23°37'25" to 24°6'17" north latitude and the longitudinal extension is 81°34'40" to 84°4'40" east longitude. Surguja district is surrounded by tropical dry deciduous forest. The composition of forest are basically Haldu (*Haldina cordifolia*) Mahua (*Madhuca longifolia*) Semal (*Bombax ceiba*) Salai (*Boswellia serrata*) Amla (*Emblica officinalis*) Dhaora (*Anogeisus latifolia*) Ber (*Ziziphus zujuba*) Amaltas (*Casia fistula*) Teak (*Tectona grandis*) Sal (*Shorea robusta*) Khair (*Acacia catechu*) Harra (*Terminalia chebula*) Bamboo (*Dendrocalamus stricus*) and Tendu (*Diospyros melanoxylon*)

2.2 Collection and identification

The present investigation was carried out during June 2021 to May 2022 at Surguja district Chhattisgarh. The site for sample collection of larva and adults of mosquitoes was selected on the basis of geographical location in all the six blocks of Surguja. Total ten sites were selected A fixed collection site selected in the selected place for sample collection in addition to the above samples were also collected randomly from the selected site the following methods were used to collect mosquito samples ^[1]. Mechanical and oral aspirator ^[2] Mosquito collection by spray seat in which white cloth is spread throughout the room and mosquitoes are collected by spraying pyrethrum all the corners of room ^[3]. Early morning and evening mosquitoes are taped through CDC light. Mosquitoes are collected from indoor by spraying 0.6% solution of pyrethrum and aerosol. Mosquitoes are caught with the help of forceps and transferred to a test tube then covered with a mesh cloth. Adult mosquitoes biting resting stage were collected between 6.30 pm and 8.00 pm. Near human dwellings and cow sheds with the help of human landing and aspirator method. And these collected mosquitoes are preserved in plastic vials for further specific identification. Dipper method were used for undeveloped mosquitoes ^[10]. And the adult mosquitoes developed from these are stored in vials and identified.

2.3 Data analysis

The diversity of species richness represented by Species richness (S), Shannon-wiener index (H) and Shannon Evenness index (E) by the following formulae:

Species richness (S) = Total number of species

Shanon index (H) $s = \sum - (P_i * \ln P_i) i=1$

Where H = the Shanon diversity index

P_i = entire population fraction made up of a species i

S = numbers of encountered species

\sum = Total of species 1 to species S

Shanon Evenness Index (E) = $H/\ln(S)$

Where H= Shanon diversity index

(S) = Natural logarithm of species richness (S)

3. Results and discussion

A total of 1643 mosquito samples were taken in this study, in to which a total of 15 mosquito species of 3 genera i.e *Anopheles*, *Culex*, and *Aedes* found. Higher rank indicates species abundance first rank means that the species concerned is very high abundance while decreasing order of rank indicates low abundance it depicts on (Table 1) During the present investigation the dominancy were found in *Anopheles* i.e 64.39%, *Culex* 25.07% and *Aedes* 10.52% respectively. According to the genus the diversity of species depicted by Richness of species (S), Index of Shanon Weiner (H) and Index of Shanon Evernes Index (E) In (Table 2). The richness of species (S), richness of Evenes (E) resulted viz. 03,062; 03, 0.54 and 09, 0.73 *Aedes*, *Culex*, and *Anopheles* species increasingly In *Anopheles* maximum Shanon index was found (1.854) its which was found in *Culex* (1.351) and *Aedes* (1.121) respectively. Monthly the value of Shannon Wiener index was ranges from 1.0121 to 1.9345 and 1.0121 to 1.9154 from 2021and 2022 simultaneously. Highest value (1.9345) found in September and the lowest value was found in December (1.9345) from 2021 to 2022 the higher value (1.9154) was noted in September and lower value (1.0121) was noted in January. The Shanon index shows maximum parity for both study years. Evenes index value was ranged from 0.9016 to 0.9761, 0.9064 to 0.9746 for 2021 and 2022 respectively. Higher value was found in March while its downed or minimum in September. (Table 3). The maximum species richness showed by *Anopheles* genus then *Culex* and *Aedes* species respectively. In the context of above such type study are limited in Surguja district Fifteen species of mosquitoes has been noted from the 3 genus. The studies by some remarkable workers in the composition of *Anopheles* species notable difference found ^[11]. Observation of the present investigation found differ from the studied by ^[11]. The findings of the present investigation agreed with ^[12] and ^[14]. During the present investigation 15 mosquito species noted. The reason for this change its may be due to climatic factors, urbanization, pollution and some other notable factors. Findings of the present investigation agreement with ^[15, 16, 17]. Dominancy of species was noted *Culex quinquefasciatus*, *Ades albopictus*, *Anopheles subpictus*.by all the workers. The biodiversity indices in terms of Shanon and evenness index in the context of biodiversity index were resemblance with some repters ^[18, 19]. On the basis of findings obtained from the present investigation, it can be said that most of the species are common, reason for this may be major climatic changes, modified agricultural practices, increased industrialization. The present investigation may help in the future planning of control measures of vector borne diseases.

Table 1: List of Species of Mosquitoes collected from District Surguja during June 2021 to May 2022

S. No.	Name of mosquito species	Rank of abundance
1.	<i>Anopheles. aconitus</i>	2
2.	<i>Anopheles annularis</i>	3
3.	<i>Anopheles. culicifacies</i>	1
4.	<i>Anopheles fluviatilis</i>	4

5.	<i>Anopheles minimus</i>	6
6.	<i>Anopheles pulcherrimus</i>	9
7.	<i>Anopheles vagus</i>	5
8.	<i>Anopheles spelindidus</i>	7
9.	<i>Anopheles gigas</i>	8
10.	<i>Aedes albopictus</i>	2
11.	<i>Aedes aegypti</i>	1
12.	<i>Culex quinquefasciatus</i>	1
13.	<i>Culex. raptor</i>	3
14.	<i>Culex. ramakrishnii</i>	2
15.	<i>Culex mimeticus</i>	4

Table 2: Mosquito species diversity collected from District Surguja

Genus	S (Species richness)	E (Evenness Index)	H (Shanon Index)	N (No of specimens)
<i>Anopheles</i>	09	0.731	1.854	1058
<i>Culex</i>	03	0.545	1.351	412
<i>Aedes</i>	03	0.621	1.121	173

Table 3: Index of mosquito species diversity in district Surguja from June 2021 to May 2022

Month	2021		2022	
	H	E	H	E
January	1.0212	0.9621	1.0121	0.9609
February	1.0321	0.9652	1.0265	0.9634
March	1.4516	0.9761	1.4304	0.9746
April	1.6230	0.9618	1.5620	0.9605
May	1.7313	0.9712	1.7102	0.9703
June	1.8137	0.9710	1.8002	0.9704
July	1.8418	0.9701	1.8315	0.9703
August	1.8656	0.9016	1.8465	0.9064
September	1.9345	0.9441	1.9154	0.9423
October	1.8524	0.9701	1.8463	0.9709
November	1.7528	0.9723	1.7267	0.9712
December	1.0023	0.9623	1.0097	0.9614

H=Diversity index of Shanon Weiner, E = Diversity index of Evenness

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