RESEARCH ARTICLE

Distribution and Diversity of Mosquito Larvae from Kopargaon Teshil, Dist. Ahmednagar (M.S.) India

Ramdas Gokul Pawar[1], Kisan Dnyandeo Thete[2*], Laxmikant Vitthalrao Shinde[3]
[1]Associate Professor, Department of Zoology, S. S. G. M. College, Kopargaon, India
[2]Assistant Professor, Department of Zoology, Padmashree Vikhe Patil College, Pravaranagar, Tal- Rahata, Ahmednagar, India
[3]Associate Professor, Department of Zoology, J. E. S. College, Jalna, India

[*]**Address for Correspondence:** Dr. Kisan Dnyandeo Thete, Assistant Professor, Department of Zoology Padmashree Vikhe Patil College, Pravaranagar, Tal- Rahata, Dist- Ahmednagar, India
Received: 13 June 2017/Revised: 21 July 2017/Accepted: 28 August 2017

ABSTRACT- Mosquitoes are important groups of arthropods that inhabit freshwater habitats. The distribution pattern of adult mosquitoes is related to habitat preference of the immature stages. These habitats may be natural or man-made and temporary or permanent. Mosquitoes are carriers of number of diseases; mostly in the tropics, causing illness and death on a large scale. The survey was carried out during June 2015 to May 2016 from different ten villages of Kopargaon teshil (M.S.). Mosquito larvae were collected at different habitats, these are temporary and permanent, larvae collections were carried out regular month wise. A total 3627 mosquito larvae were collected of which were density of Culicinae were 90.21% and Anophelinae were 9.79%. During the study period seven mosquito species were identified, which are *Anopheles stephensi*, *Culex vishnui*, *C. pseudovishnui*, *C. quinquefasciatus*, *Aedes aegypti*, *A. albopictus* and *Armigeres subalbatus*. Their densities are *Anopheles stephensi* 9.79%, *C. vishnui* 13.51%, *Culex pseudovishnui* 10.34%, *Culex quinquefasciatus* 7.2%, *Aedes aegypti* 26.16%, *Aedes albopictus* 15.08% and *Armigeres subalbatus* 17.92% respectively. The mosquito larval fauna providing primary checklist of mosquito vector diversity from the study area.

Key-words- *Anopheles stephensi*, Aedes aegypti, Aedes albopictus, *Culex quinquefasciatus*, Density, Vector mosquitoes, Larval habitat

INTRODUCTION

The distribution pattern of adult mosquitoes is related to habitat preference of the immature stages. These habitats may be natural and man-made, temporary or permanent. More ever each species has specific needs and habitats [1]. The most important group of biting insects is mosquitoes. Their biting is a considerable nuisance in many parts of the world. More importantly, mosquitoes are carriers of number of diseases like malaria, dengue, chikungunya, elephantiasis etc, in study area, mostly in the tropics, causing illness and death on a large scale [2]. As per WHO, near about 500 million cases per year globally and in India with same. The world health organization estimates that 2000 million people at risk each year there are millions of infections and thousands of deaths [2]. Understanding the factors that regulate the size of mosquito populations is considered fundamental to the ability to predict transmission rates and for vector population control [3]. Larval habitats are important determinants of adult distribution and abundance [4]. Recent days developmental activities, especially in urban area associated with the rapid growth of townships have accentuated the problem of vector borne diseases, but now a day it migrated towards a rural area. With regards to vector proliferation, human ecology is responsible for the creation of a mosquitogenic environment; man is directly or indirectly creating such a situation [5].

During the rainy season, agricultural areas depending on rain have provision of ideal aquatic habitats that support high density of diverse mosquito species including vectors of malaria, filariasis, dengue etc. Thus, there is a need to address the problem of mosquito borne diseases in this area in order to reduce the risk of massive public health problems and economic loss due to sickness.

Now a day's Indian scenario of all regions are epidemic for mosquito borne diseases like malaria and dengue, which are regulated by climate. Dengue and chikungunya are the most common, widespread diseases in Marathwada and also Maharashtra since 2005–2006 [6]. The objective of this study was to describe mosquito aquatic habitats to determine larval abundance, density and habitat types of Kopargaon teshil. Larval control

Access this article online	
Quick Response Code	Website: www.ijlssr.com
	DOI: 10.21276/ijlssr.2017.3.5.7

through larvicides and environmental management are the main intervention method for malaria vector control around the world. Identifying the mosquito larval habitats has a critical role in each control program. Actually, it was difficult to find all potential breeding sites of mosquitoes over a large geographic area (e.g. at district level) based on field survey [7]. The present investigation was carried out to morphological identification of mosquito species and their prevalence for planning of mosquito vector control measures in this region. The study areas were shown the many cases of dengue and chikungunya last few years (News paper).

MATERIALS AND METHODS

Study area- The survey was carried out during June 2015 to May 2016 from different localities of Kopargaon teshil, District Ahmednagar (M.S.) India. These are Kopargaon city, Dhamori, Kolpewadi, Derde, Pohegaon, Jawalke, Wari, Pumtamba, Dahegaon, Yesgaon which cover the maximum study area. The study area lies between N 19° 88' and E 74° 48', the climate of the region is influenced by the topography. It has an average elevation of 493 meters (1,617 feet) and lies on the banks of the Godavari River. An average temperature of Kopargaon teshil is near about 13.5^0C to 44^0C in summer and 7^0C to 32^0C in winter. A rainfall is moderate in the study area. There are around 79 villages in Kopargaon tehsil of Ahmednagar district of the state of Maharashtra.

Larval collection- Larval mosquitoes were collected at different habitats, which were composed of water storage tanks, plastic vessels, metal vessels, ceramic vessels, a tucker box, tires, coconut shell, temporary pools, ditches and drainage (gutters). All potential breeding sites of mosquitoes were sampled using standard mosquito larvae dipper, plankton net and pipette monthly for a period of twelve months from June 2015 to May 2016 in Kopargaon city, Dhamori, Kolpewadi, Derde, Pohegaon, Jawalke, Wari, Pumtamba, Dahegaon, Yesgaon.

WHO method for collection of larvae- The water bodies were surveyed and subsequently sampled using the plankton net, pipette of appropriate diameter depending on the size of the habitat. If the habitat was found positive for the larvae, they were collected and kept in the collection container for further processes. Collected larvae were preserved in 70% ethanol for identification. These larvae were identified morphologically using standard keys of Christopher [8], Barraud [9], Das *et al.* [10], Oo *et al.* [11], Nagpal and Sharma [12] and Smart [13]. The coordinates of each habitat were recorded using the study period. Through the study period temporary breeding sites as well as permanent cement storage tanks fixed for collection of mosquito larvae.

RESULTS

The habitat types found during this survey included water storage tanks, plastic vessels, metal vessels, ceramic vessels, barrels, a tucker box, tires, coconut shell, temporary pools, ditches and drainage (gutters). In which the temporary pools, ditches are dried after the rainy season, tire and temporary pools had very turbid water, while water storage tanks had clear water. The water storage tanks, ceramic vessels, barrels were mostly open. Temporary pools, ditches were located road side in rainy season.

A total 3627 of mosquito larvae were collected, of which were of subfamily Culicinae 90.21% (n=3272) and Anophelinae were 9.79% (n=355). In the habitats storage tanks, barrels, ceramic vessels had shown the higher densities of Aedes. During the study period seven mosquito species were identified and tabulated in Table 2, which included *Anopheles stephensi* 9.79% (n=355), *Culex vishnui* 13.51% (n=490), *C. pseudovishnui* 10.34% (n=375), *Culex quinquefasciatus* 7.20% (n=261), *Aedes aegypti* 26.16% (n=949), *A. albopictus* 15.08% (n=547) and *A. subalbatus* 17.92% (n=650).

Aedes aegypti was the most abundant species in the study area, comprising 26.16% (n=949) of total larval collection (Fig. 1). It was collected in all localities (Table 2). *A. subalbatus* larvae represent 17.92 % (n=650) of the total larvae (Fig. 1) and were second most common species collected in the study period.

Culex vishnui is also found in abundantly 13.99 % (n=480) of the total collection of larvae (Fig. 1) all localities. *A. albopictus* and *C. vishnui* are moderately abundant and represents 15.08% and 13.51% (n=574, n=490) respectively encountered in all localities. Although *An. stephensi* and *Cx. pseudovishnui* larvae collected in all the localities, its abundance was low comprising only 9.79% and 10.34% (n=355, n=375) of the total larvae collected (Fig. 2 and Table 2). *Cx. quinquefasciatus* shown the lowest density in the study area 7.20% (n=261).

This survey and monitoring work was carried out in different ten villages of Kopargaon teshil, out of which in Kopargaon city recorded high density of mosquito larvae 21.53% (n=781). Especially Kopargaon city was shown the highest density of an *Ae. aegypti* and *Ar. subalbatus* 18.55% (n=173) and 24.01% (n=156) respectively out of all the localities. The *An. stephensi* found highest density in Yesgaon 14.93 % (n=53), *Cx. vishnui* found highest density in Kopargaon city 24.29% (n=119) all of the localities. In study area Dahegaon and Wari village shown the lowest density of the mosquito larvae 6.51% (n=236), 6.59% (n=239). During the month August and September collected the highest number of mosquito larvae n=479, n=445 respectively, and in the month of January collected, the less number of mosquito larvae n=210, all the results tabulate in Table 1and 2 correspondingly and month wise collection and species density represented in Fig. 2 & 3.

Table 1: Month wise collection of mosquito larvae in 10 villages of Kopargaon teshil, 2015–2016

S. No.	Location	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total
1	**Kopargaon city**	57	68	123	69	76	58	48	40	52	73	52	65	781
2	**Dhamori**	26	39	49	47	32	23	36	21	26	26	31	28	384
3	**Kolpewadi**	37	46	53	62	42	19	28	24	24	22	37	21	415
4	**Derde**	22	24	33	38	26	17	23	14	24	21	23	17	282
5	**Pohegaon**	31	40	37	42	22	28	21	18	11	21	18	25	314
6	**Jawalke**	24	48	38	28	18	24	23	22	28	22	33	18	326
7	**Wari**	19	23	37	32	23	19	22	17	13	18	5	11	239
8	**Puntamba**	36	43	49	59	35	33	26	21	19	31	26	15	393
9	**Dahegaon**	22	25	33	28	19	22	17	15	9	16	13	17	236
10	**Yesgaon**	28	30	27	40	22	16	10	18	11	19	16	20	257
	Total	302	386	479	445	315	259	254	210	217	269	254	237	**3627**

Table 2. Distribution of the mosquito larval species ten villages of Kopargaon teshil

Species	Localities										n	%
	KC	**DM**	**KW**	**DD**	**PG**	**JK**	**WR**	**PM**	**DG**	**YG**		
An. stephensi	32	26	43	27	40	37	28	46	23	53	355	9.79
Cx. vishnui	119	53	73	43	39	43	19	38	39	24	490	13.51
Cx. pseudovishnui	92	47	52	24	23	37	26	32	21	21	375	10.34
Cx. quinquefasiatus	85	43	29	21	25	13	6	23	0	16	261	7.20
Ae. aegypti	176	93	88	81	92	110	69	118	59	63	949	26.16
Ae. albopictus	121	63	67	39	43	33	42	73	37	29	547	15.08
Ar. subalbatus	156	59	63	47	52	53	49	63	57	51	650	17.92
Total	781	384	415	282	314	326	239	393	236	257	3627	100

KC:Kopargaon city, DM: Dhamori, KW: Kolpewadi, DD: Derde, PG: Pohegaon, JK: Jawalke, WR:Wari, PM: Puntamba, DG: Dahegaon, YG: Yesgaon

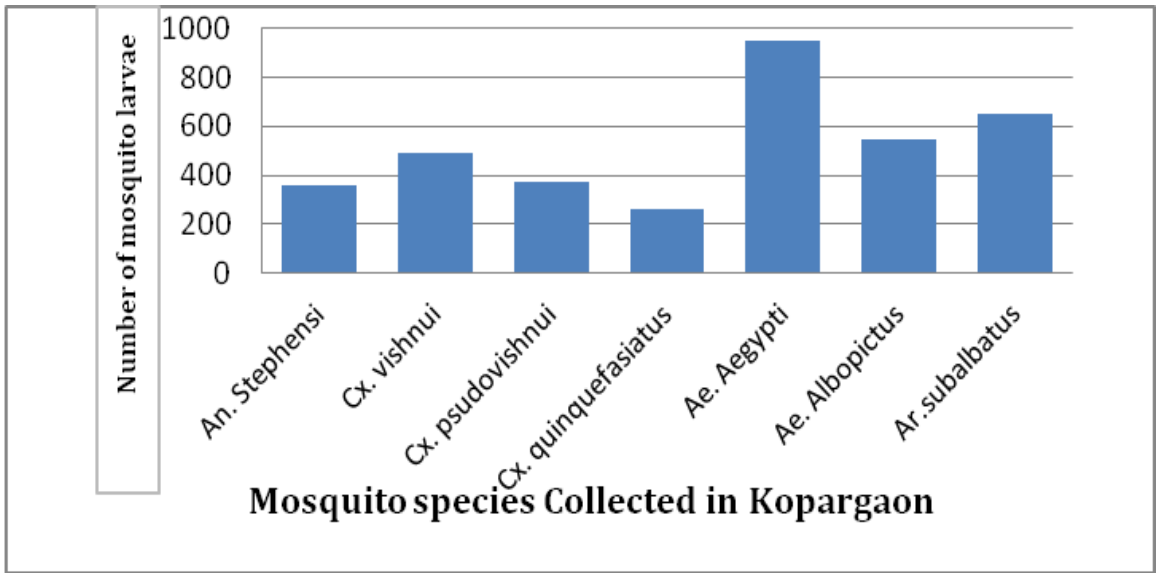

Fig. 1 Frequency of mosquito larvae collected in Kopargaon teshil

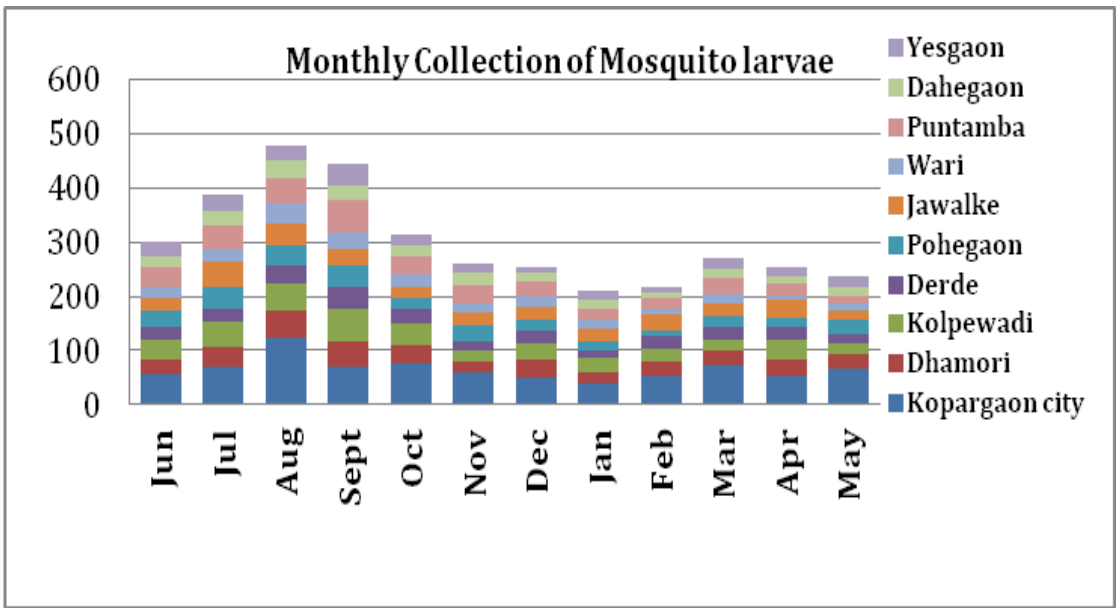

Fig. 2 Abundance of Mosquito larvae in villages of Kopargaon teshil

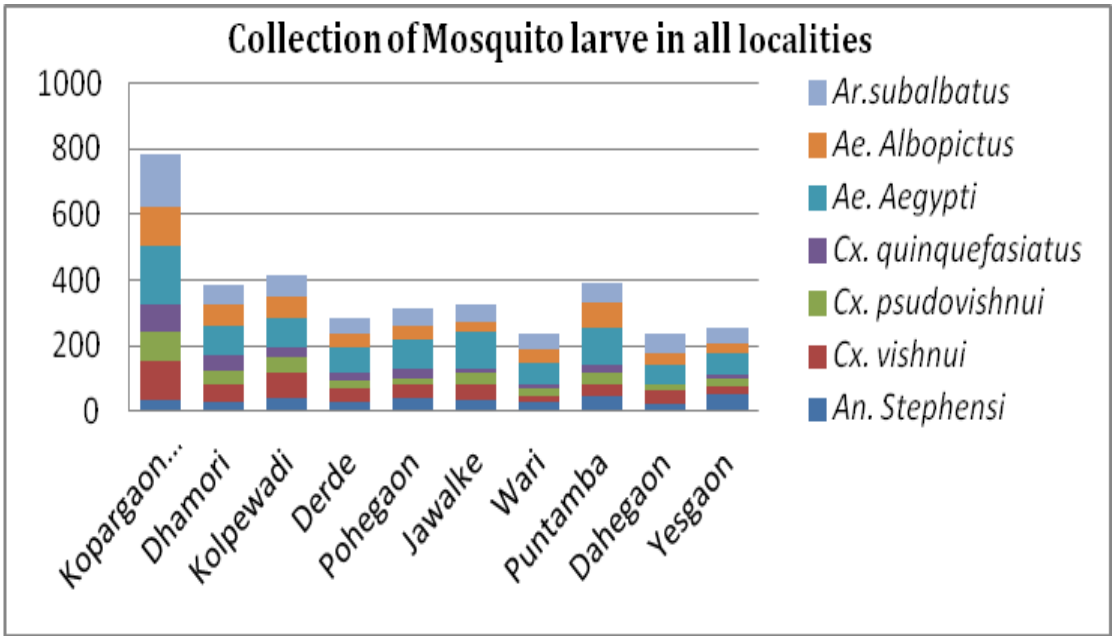

Fig. 3 Species abundance of Mosquito larvae in all localities of Kopargaon teshil

DISCUSSION

The present study was conducted to indicate the prevalence mosquito vectors and their distribution in Kopargaon teshil (M.S.), India. The survey revealed the prevalence of seven mosquito species *An. stephensi*, *Cx. vishnui*, *Cx. pseudovishnui*, *Cx. quinquefasciatus*, *Ae. aegypt*i, *Ae. albopictus*, and *Armigeres subalbatus*.

During the study period, we understand the ecologies of mosquito larvae, their habitat and distribution. The different habitats which were sampled during the study periods water storage tanks, plastic vessels, metal vessels, ceramic vessels, barrels, a tucker box, tires, coconut shell; temporary pools were found Culex and Aedes species. The Anopheles was found in temporary turbid pools, ditches and gutters. In general larval control of mosquitoes is less prevalent in temporary habitats than it is in large permanent habitats [14]. 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 [15,16]. Because small and sunlight habitats have higher water temperature, mosquito larval developmental time may be shortened if the wormer habitat produces more food resources [4]. Culicinae larvae were collected in diverse habitat types. The Culex and Aedes mosquito breed in a small habitat. but they have been not able to breed with Anopheles mosquito because of the temporary pools, gutters had very turbid water, while water storage tanks had clear water. Several mosquito species belonging to genera Anopheles, Culex and Aedes are vectors for the pathogens of various diseases like malaria, filariasis, Japanese encephalitis, dengue fever, dengue hemorrhagic fever and yellow fever [17].

During survey most of the collected mosquito larvae were important vectors for malaria, filariasis, chikungunya and dengue. These vectors included *An. stephensi*, *Cx. quinquefasciatus*, *Ae. aegypt*i, and *Ae. albopictus* respectively. Malaria, chikungunya and dengue have been documented as a predominant mosquito borne diseases in this area.

Due to the water shortage most of the people store the water in storage tank, barrels, earthen pots etc. these containers if not properly covered, could serve as breeding sites for disease vectors i.e. *Ae. agypti* and *Ae. albopictus.* The high density of *Ae. agypti* in Kopargaon tehsil indicate that risk of dengue and chikungunya in this area. Recently an outbreak of dengue and chikungunya was detected in the study area and few deaths are also recorded (daily news Paper).

CONCLUSIONS

To study of mosquito larval fauna providing a primary checklist an investigation was carried out on a collection of mosquito larvae in Kopargaon tehsil (M.S.), India. Hence it is necessary to assess the distribution, diversity and density of mosquito larvae. The mosquito species present in this area predispose the inhabitants of this area to risk of infections of mosquito borne diseases. This can call for accelerated information of mosquito control in this area especially during the rainy season encompassing the integrated vector management approaches.

ACKNOWLEDGMENT

The authors are grateful to the Principal, S. S. G. M. College, Kopargaon for providing the necessary facilities during this work. Authors are also thankful to Dr. L. V. Shinde for identification of mosquito larvae and field workers those, who supported during this work.

REFERENCES

[1] Bruce -Chwatt LJ. Essential malariology. London: William Heinnemann Medical Books ltd., 1980; pp 1-354.
[2] Shinchi B, Gilmatam J. A survey of the mosquito fauna in Ulithi Athol, Yap state, Federated state of Micronesia Kangoshima University Resurch center for Pacific Islands. Occasional paper, 2003; 39: 111-14.
[3] Service MW. The importance of ecological studies on malaria vectors. Bull SOL Vector Ecol., 1989; 14: 26-38.
[4] Josep M, wangangi M, Ephantus J. Muturi Charles MMbogo Seasonal mosquito larval abundance and composition in Kibwezi lower Eastern Kenya. J. Vector Born. Dis., 2009; 46: 65-71.
[5] Dutta P, Mahanta J, Potential vectors of dengue and the profile of dengue in the North-Eastern region of India an epidemiological perspect. Dengue Bull., 2006; 30: 234-242.
[6] Laxmikant V. Shinde. Outbreak of dengue in rural area of Bhokardan (M.S.) India. J. Biosci. Discov., 2011; 2(1): 90-93.
[7] Hanafi-Bojd AA, Vatandoost H, Oshaghi MA, Charrahy Z, Haghdoost AA, et al. Larval habitats and biodiversity of anopheline mosquitoes (Diptera: Culicidae) in malarious area of Southern Iran. J. Vector Borne Dis., 2012; 49: 91-100.
[8] Christophers SR. The Fauna of British India including Ceylon and Burma. Vol. IV. London UK Taylor and Francis., 1933; pp: 1–360.
[9] Barraud PJ. The Fauna of British India including Ceylon Burma. Vol. V. London, UK Taylor Francis., 1934; 1–463.
[10] Das BP, Rajgopal RJ. Akiyama Pictorial key to the species of Indian Anopheline mosquitoes. J. Pure Appl. Zool., 1990; 2(3): 131-62.
[11] Oo TT, Kaiser A, Becker N. Illustrated keys to the anopheline mosquitoes Myanmar. J. Vector Ecol., 1977; 13(4-5): 535-45.
[12] Nagpal BN, Sharma VP. Indian Anopheles, Oxford and I.B.H. Publishing Co. Pvt. Ltd., 1995; pp. 1-416.
[13] Smart JA. Handbook for the identification of Insect of Medicinal Importance. Ed 2 Biotech. Book New Delhi, India. 2003; p. 1-295.
[14] Service MW. Mortalities of the immature stages of species of the Anopheles gambiae complex in Kenya comparison between rice field and temporary pools, identify. of predators and effects of insecticidal spraying. J. Med. Entomol., 1977; 13(4-5): 535-45.
[15] Derraik JGB, Slaney D. Container aperture size and nutrient preference of mosquitoes (Dipteria: Culicidae) in the Auckland region, New Delhi J. Vector Ecol., 2005; 30(1): 73-82.
[16] Thongsripong P, Green A, Kittayapong P, Kapan D, Wilcox B, et al. Mosquito Vector Diversity across Habitats in Central Thailand Endemic for Dengue and Others Anthropoda–Borne Diseases. PLOS Negl. Trop. Dis., 2013; 7(10): p. 2507.

[17] Narendiran S, Janani D, Keerthana M, Nivethitha KS, Nirmala DS, et al. Comparative Studies on *in- vitro* Phytochemicals Analysis and Larvicidal Efficacy of Medicinal Plant Extracts against *Culex quinquefasciatus*. Int. J. Life Sci. Scienti. Res., 2016; 2(6): 742-748.

How to cite this article:
Pawar RG, Thete KD, Shinde LV**:** Distribution and Diversity of Mosquito Larvae from Kopargaon Teshil, Dist. Ahmednagar (M.S.) India. Int. J. Life Sci. Scienti. Res., 2017; 3(5):1305-1310. DOI:10.21276/ijlssr.2017.3.5.7
Source of Financial Support: Nil, **Conflict of interest:** Nil

