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Mosquitoes

Diversity and Disease Vector: A Case Study of Parbhani City

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PREFACE

Mosquitoes belong to Order-Diptera, family- culicidae which contain about 3500 described species all over the world. Mosquitoes are soft bodied wide spread and diversified taxonomical group of Insects. They act as important vectors for many diseases like malaria, Japanese encephalitis, filariasis, yellow fever, dengue, chikungunya etc. Hence, any advance knowledge on their taxonomy, seasonal abundance and distribution have practical utility in adopting appropriate control measures of mosquitoes and solving the problem related to human health care.

In the present book, attempts have been made on taxonomical description, check list and distribution with intensity and density of mosquito species in Parbhani city of Marathwada region, Maharashtra. The results of the study showed presence of 7 species of mosquitoes in all selected sites of the city. Study also contains the seasonal varioations of mosquitoes. This work will be useful for students, teachers, officers and scientists in entamology.

- Hema D. Makne

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INTRODUCTION

Biodiversity refers to the ecological richness of the community and generally it is rich in tropical and subtropical countries. India ranks about 10th amongst the nations in terms of its diversity of species and world's top12 mega diversity nations. Insects show greater diversity due to their ability to adapt to the changes in the environment. Among all insects diversity of mosquitoes is of greater importance in terms of public health. These highly adaptable insects continue to coexist with man and transmit many diseases to more than 700 million people annually. Mosquito borne diseases currently represent greater health problems in tropical and subtropical climates and no part of the world is immune to this risk.

Mosquito cause physical, psychological and monetary loss to mankind as they affect man not only by inflicting irriating and painful bites but harming more by spreading deadly and highly debilitating diseases like malaria, dengu, chikungunya, filariasis, yellow fever and several types of encephalitis.

Malaria and other mosquito borne infections can be controlled by reducing mosquito breeding places, man and mosquito contact by adopting adequate protection from mosquito bites inside and outside the home and with effective treatment for malaria.

India is largest mega diverse developing country. It is well known for its biodiversity in plants, animal as well as culture. Due to the tropical location it shows three seasons like summer, mansoon and winter. It is also 2nd largest populated country in the world and definitely this population affects on environment as well as development. It also played role in global concerns like global warming, environmental change, global policies etc. The global environmental changes that are apparent today are mainly anthogenic due to the growing human population and its high activity of resource consumption (Vitouser 1994). Now a day human activities are affecting the whole earth ranging from the smallest organism to the alternation of global biogeochemical cycle, such as that of carbon. But no one can alert about this defiantly biota, gases, climate, means, a biotic and biotic factors affect vise-versa. Worldwide development affects ecosystem and creates so many problems. Now-a-days urbanization, industrialization, agricultural practices and development is growing phenomenon globally and India is not apart from this. After 50 years of freedom government not fulfill basic needs of people every were every one facing number of problem including basic health problem from East to West and North to South like water borne diseases, parasitic diseases, viral infections, AIDS, Vector-borne diseases

etc. Mosquito is one of the vector parasites of various diseases so it is important to study their survivalance and distribution in artificial as well as natural ecosystem.

Ecosystem is complex phenomenon regulated by both components i.e.a biotic and biotic. If the proper ratio fluctuates causes pollution or disorder in any type of ecosystem. These disorders some time exploit and spread harmful system for life on earth same way in the development of mosquito in water co2 is play an important role. We knew very well that some species like *Aedes* grown or develop only in clean water, which carries *chikenguneya*. But other genus like *Anopheles* and *culex* were well developed in sewage water.

In urban area number of breeding beds for mosquitoes those are already mentions in the next chapter. Simultaneously urban area is more polluted compare to rural area. The pollutants are classified into two categories on their nature non-degradable pollutants and biodegradable pollutants (Odum, 1971). The biodegradable pollutants include domestic sewage, heat etc. The domestic sewage can be rapidly decomposed by natural processes that enhance natural great capacity to decompose and recycle problems arise with the biodegrable pollutants when their input into the environment exceeds the decomposition or dispersal capacity. Like this way pollution or any a biotic change is affected on biotic factor and basically biodiversity of plant and animal in particular ecosystem.

Biodiversity:

Biodiversity is one of the important corner stones of sustainable development and represents the biological wealth of a given nation. The world is currently facing its greatest ever biodiversity crisis. Insects and plants are becoming extinct because of habit at loss, over exploitation, pollution, over population and the threat of global climatic change insect comprise the largest group of organisms and are involved in various vital “ecosystem services” such as pollinating, decomposition, herbivore and biological control as well as contributing directly to human based economy through silk, lac and honey production. As well as known, India is one among the twelve-mega biodiversity countries of the world and we also realize that 80% of the insects are endemic in India. World wide 98, 9749 species of Arthropod and India comprises 68,389 species means 6.90% of world arthropod population in India.

Basically class insects of Arthopoda are distinguished into two categories i.e. social and non-social. Mosquito belongs to non-social categories, but definitely it plays an role in ecosystem like food for aquatic organisms and next they are carrier of various diseases. Except this role today we don’t known the role of mosquito in an ecosystem concern to this

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role it is very important to study the distribution and diversity of mosquito in these ecosystems. It is very important in concern with development and human health. Our basic study of mosquito will be useful for other workers in the field of biodiversity, Para biology, health, ecology etc; our generated data forms the essential material, scientific study, evolutionary studies.

Mosquitoes:

Before commencing the study of any particular kind of mosquitoes it is necessary to know something of the general characters, like history and structure of this important family of insects.

Mosquito belongs to the class insecta, order Dieptera and family – culicidae. These insects have a pair of scaled wings, a pair of halters, a slender body and long legs. The females of most mosquito species suck blood from other animals. This blood sucking characteristic has made mosquitoes one of the most deadly vectors known to man, killing millions of people over thousands of years and containing to kill millions per year by the spread of diseases.

The size of mosquitoes varies but is rarely greater than 16 mm. Mosquitoes weight only about 2 to 2.5 mg. A mosquito can travel p to 1-2 km/h. Most species are nocturnal or down or evening feeders. Mosquitoes are believed to have evolved around 170 million years ago during the Jurassic era (199-144 million years ago) with the earlier known fossils from the cretaceous era (144-65 million years ago). They are thought to have evolved in south America, spreading initially to the northern continent Laurasia and reentering the tropics from the north (http://en.wikipedia.org/wiki/mosquito).

The family *culicidae* contains about 3,500 species in three subfamilies *Anophelinae* (3 genera), and *culicinae* (at least 37 genera), and the Toxorhynchitinae (1 genus). The genera include *Anopheles, Culex, Psorophora, Ochlerotatus, Aedes, Sabethes, Wyeomiya, Culiseta* and *Haenagoggus* within the sub family *Anophelinea* six subgenera are recognized: *Stethomiya*, *Lophopodomyia, Kerteszia, Nyssorhynchus* (all south American), *Cellia* (Old world only) and *Anopheles* (worldwide) (http://en.wikipedia.org/wiki/Mosquito). In the Spanish language, the word mosquito (little fly) dates back to about 1572. The word was adopted to replace the term "biting flies" to prevent confusion with the housefly.

In mosquito both male and female mosquitoes are nectar feeders, but the female is also capable of haematophagy (drinking blood). Females do not require blood for survival but they do need supplemental protein for the development and lying of their eggs prior to

sucking the blood, they inject a mild painkiller, which numbs the host to the pain from the "bite". The Toxrhynchites species of mosquito never drinks blood. This genus includes the largest of the extant mosquitoes, the larvae of which are predatory on the larvae of other mosquitoes. Mosquito's life cycle undergoes complete metamorphosis, going through four distinct stages: egg, larva, pupa and adult, a process than was first described by first Greek philosopher Aristotle (http://en.wikipedia.org/wiki/mosquito).

Female mosquito laid their eggs one at a time or together in rafts of a hundred or more eggs on the surface in fresh or any stagnant water. *Anopheles* and *Aedes* mosquitoes do not make egg rafts, but lay their eggs separately. Most eggs hatch in to larvae in about 48 hours.

The hatching eggs turn in to larvae that live in the water coming to the surface to breathe. Most larvae use siphon tubes going to the water surface for breathing and hang on or near the water surface. *Anopheles* larvae do not have a siphon and typically lie parallel to the water surface for breathing and hang on or near the water surface *Anopheles* larva do not have an siphon and typically lie parallel to the water surface. The mosquito larvae commonly called," Wigglers or wrigglers" must live in water from 7 to 14 days depending on the waters temperature. The pupae or "tumblers" are nearly as active as the larvae, but breathe through thoracic "horns" attached to the thoracic spiracles. Most larvae feed on microorganisms.

The pupae are lighter than water and float on the surface as the mosquito larva metamorphic in to an adult mosquito in about two days. The total time to go through all four stages depends on the temperature and the type of mosquito, but typically takes about 14 days or less in warmer weather.

Male mosquitoes are distinctly smaller than females with features such as feathered antennae and having no audible sound during flight. They are believed to able to track potential prey for tens of meters some people attract more mosquitoes than others apparently based on how they "smell" to a mosquito.

Distribution of Mosquitoes:

Near about 3500 species of mosquitoes are found world wide except Antarctica (Lehane 1991). The genus *Anopheles* is known by about 455 species from the world and distributed from tropical to temperate regions. There are about 70 anopheline species of mosquitoes which are malaria vectors of man and animals of which *Anopheles* 422, *culex* 715, Mansonia 23 and *Aedes* are 88. In India 230 species of mosquitoes are found in which genus *Anopheles* contain 58 no. of species genus *Aedes* contain 111 no of species, genus

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culex contain 57 no. of species and genus Manosonia contain 04 no. of species (www.mrcindia.org) out of 59 species of *Anopheles* 8 are act as vectors for malaria in India. While only 03 species of *Anopheles* acts as vector for malaria disease in Maharashtra. Among 57 *culex* in India 04 no. of mosquito acts as vectors for diseases, among 4 species of Manosonia only one species acts as vector for encephalitis disease and among 111 species of *Aedes* only one act as vector for dengue disease in Maharashtra State (Department of Malaria, Aurangabad).

Mosquito borne diseases:

According to WHO (1996) 30 new diseases have emerged in past 20 years. In addition there has been resurgence and redistribution of old diseases on global scale (Gubler and Kuno, 1997). In the year 2005-2006 outbreaks of chikungunya after 1963 in India is one of the best examples of redistribution of mosquito disease. It's not only the problem of the less developed countries but also for developed countries like U.S. when global warning is anticipated to have significant impact on the earth in the next centaury, one direct impact it could have on the distribution of Arthropod-borne diseases. Mosquito spread number of diseases globally, but India reported following diseases (WHO 1989).

Mosquito-borne diseases:

1) Malaria
2) Lymphatic Filariasis
3) Yellow fever
4) Dengue and dengue haemorrhagic fever
5) Japanese encephalitis
6) Chikungunya

1) Malaria:

Malaria is an infectious disease caused by the parasite called Plasmodia. There are four identified species of this parasite causing human malaria, namely, *Plasmodium vivax, P. falciparum, P. ovale and P. malariae*. It is transmitted by the female *anopheles* mosquito. It is a disease that can be treated in just 48 hours, yet it can cause fatal complications if the diagnosis and treatment are delayed. It is re-emerging as the No.1 Infectious Killer and it is the Number 1 Priority Tropical Disease of the World Health Organization.

The Malarial Vectors:

All human Malaria is transmitted through ***anophelines*** (genus *Anopheles*) only, but not all ***anophelines*** are vectors of malaria. To become a vector, one has to be susceptible to

malaria progeny, be anthropophagic and have enough longevity to become infective to human. These are 444 formally named species and 40 unnamed members of species complexes recognized as distinct morphological or genetic species of *Anopheles*. In India, 58 *Anopheles* hav3e been described, six of which have been implicated to be main malaria vectors, namely *An culicifacies, An dirus*, *An Fluviatilis*, *An minimus*, *An sundaicus* and *An stephensi.*

2) Filariasis:

Filariasis has been a major public health problem in India next only to malaria. The disease was recorded in India as early as 6th cnetury B.C. by the famous Indian physician, Susruta, in his book "Susruta Samhita". In 7th century A.D. Madhavakara described signs & symptoms of the disease in his treatise "Madhava Nidhana" which hold good even today. In 1709, Clarke called elephantoid legs in Cochin as "Malabar legs". The discovery of microfilariae (mf) in the peripheral blood was made first by Lewis in 1872 in Kolkata.

Filariasis is a chronic disease and has got social, economic and physical hazards. A person having chronic filariasis suffers from a social stigma and the affected person tends to be segregated from the society. Acute attacks of filariasis cause temporary disability. Chronic manifestations are irreversible.

Filariasis leads to irreversible chronic manifestations, which are responsible for social stigma besides causing considerable economic loss and severe physical disability to the affected individuals. Acute attacks of filariasis frequently traumatize the patients with transient episodes of disability, often confining the patients to bed rest for a few days.

Filariasis Vectors:

Filariasis is caused by several rounds, coiled and thread-like parasitic worms belonging to the family filaridea. These parasites after getting deposited on skin penetrate on their own or through the opening created by mosquito bites to reach the lymphatic system. The disease is caused by the nematode worm, either Wuchereria bancrofti or Brugia malayi and transmitted by ubiquitous mosquito species *Culex quinquefasciatus* and *Mansonia annulifera/M. uniformis* respectively. The disease manifests often in bizarre swelling of legs, and hydrocele and is the cause of a great deal of social stigma.

Brugian filariasis:

Lymphadenitis (swollen and painful lymphnode) occurs episodically, most commonly affecting one inguinal lymph node at a time. The infection lasts for several days and usually heals spontaneously. The frequency of episodes may vary from 1-2 attacks per year to several attacks per month. Sometimes lymphadenitis is followed by a characteristic

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retrograde lymphangitis. The infection may spread to the surrounding tissues, and occasionally involves the whole thigh or entire limb. The infected lymph node may become an abscess, ulcerate, and heal with fibrotic scarring. The acute clinical course with its complications may last from several weeks to 3 months. Characteristically, elephantiasis involves the leg below the knee but occasionally it affects the arm below the elbow. Genital lesions or chyluria (milky colour urine) do not occur in brugian filariasis.

Bancroftian filariasis:

The lymphatic vessels of the male genitalia are most commonly affected in bancroftian filariasis, producing episodic funiculitis (inflammation of the spermatic cord), epididymitis and orchitis. Adenolymphangitis of the extremities is less common. Hydrocele is the most common sign of chronic bancroftian filariasis, followed by lymphoedema, elephantiasis and chyluria. The swelling involves the whole leg, the whole arm, the scrotum, the vulva or the breast. The fluid of hydrocele and chyluric patients may contain microfilariae, even when they are absent from the blood. Chyluria occurs intermittently and is more pronounced after a heavy meal. It is often symptomless, but some patients complain of fatigue and weight loss, resulting from loss of fat and protein.

Lymphatic filariasis (LF):

Lymphatic Filariasis (LF), commonly known as elephantiasis is a disfiguring and disabling disease, usually acquired in childhood. In the early stages, there are either no symptoms or non-specific symptoms. Although there are no outward symptoms, the lymphatic system is damaged. This stage can last for several years. Infected persons sustain the transmission of the disease. The long term physical consequences are painful swollen limbs (lymphoedema or elephantiasis). Hydrocele in males is also common in endemic areas.

Due to damaged lymphatic system, patients with lymphoedema have frequent attacks of infection causing high fever and severe pain. Patients may be bed-ridden for several days and normal routine activities become difficult. Such attacks not only cause acute physical suffering but also directly impede the earning capacity of the individual. Lymphatic filariasis is estimated to be one of the leading causes of disability worldwide. Elimination of the disease is an important tool for poverty alleviation and economic development.

3) Dengue:

Dengue is the most important emerging tropical viral disease of humans in the world today. It is estimated that there are between 50 and 100 million cases of dengue fever (DHF) each year, which required hospitalization over the lat 10-15 years. DF/DHF has become a leading cause of hospitalization and death among children in the south East Asia region of WHO following diarrhoreal diseases and acute respiratory infections. All four-dengue virus infections may be a symptomatic or may lead to undifferentiated fever, dengue fever (DF) or dengue haemorrhagic fever (DHF) with plasma leakage that may lead to hypovolemic shock Dengu shock syndrome (DSS).

Dengue Disease is endemic in 100 countries of tropical and subtropical regions. First recorded outbreak of dengue in India is believed to hav3e occurred in 1812 widespread outbreaks are being reported increasingly since last one decade from different parts of the country. Unplanned growth in housing sector under the pressure of unmeant need of population growth, rapid industrialization, increased commercial activities and increasingly frequented places of congregation in absence of an adequate surveillance mechanism, vector preventive and control measures, public awareness and enforcement programmes, more and more are are becoming receptive for dengue virus.

The dengue Vector:

The principal mosquito vector, *Aedes aegypti*, is wide spread over South-East Asia. *Aedes aegypti* is most frequently found in or near human habitations and prefers to feed on human s during the daytime dengue virus replicates in mostquito vector (Huangu et al 1991). The pathogen transfer may involve the passage of the disease-causing organism through the body of the vector and the transmission becomes more complex when the parasite invades the vector tissue and replicates before inoculation into new hosts. Often the salivary glands of the vectors are the site of multiplication and ecologically this must be considered as optional site of pathogens as they can build their large numbers immediately before the vector deposits it in to tissue of new animal host (3rd global meet on parasite disease Abstract and programme Page No.86, Abstract No.98)

4) Yellow Fever:

Yellow fever, which has a 400-year history, occurs only in tropical areas of Africa and the Americas. It has both an urban and jungle cycle. It is a rare illness of travelers any more because most countries have regulations and requirements for yellow fever vaccination that must be met prior to entering the country (http://www.cdc.gov/ncidod/dvbid/yellow fever/index.htm).

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Every year about 200,000 cases occur with 30,000 deaths in 33 countries. It does not occur in Asia over the past decade it has become more prevalent. In 2002 one fatal yellow fever death occurred. In the United States in an unvaccinated traveler returning from a fisting trip to the Amazan. In May 2003, 178 cases and 27 deaths caused by yellow fever were reported in southern Sudan. In Americas 226 of jungle yellow fever have been reported with 99 eoliths (Promed-12-22-03).

5) Japanese encephalitis:

Japanese encephalitis is a disease of public health importance because of its epidemic potential and high case fatality rate. It is mosquito borne zoonotic disease. It is primarily the disease of rural agricultural areas where mosquitoes proliferate in case association with pigs and other animal reservoirs. Its epidemic has also been reported in peri-urban and urban areas where similar conditions may exist (Government of Maharashtra public health Department Directorate of Health Services).

In India, the disease was first reported in the mid 1950's from Vellore in TamilNadu State, where cases of encephalitis like illness were seen. Serologically proven to be due to Japanese encephalitis or closely related to it. Over the next decade, 52 cases of encephalitis presenting at the Christan Medical College, Vellor were identified to be Japanese Encephalitis. Around the same time extensive serological surveys in South India revealed widespread Flavivrus activity.

6) Chikungunya:

The name is derived from the Swahili word meaning "that which bends up" in reference to the stopped posture developed as a result of the arthritic symptoms of the disease. The disease is not considered to be fetal. Chikungunya basically recognized as an urban disease, clinically very similar to dengue. The virus was first isolated from the serum of febrile human case in Tanzania in 1953. Chikungunya have spread to tropical parts of Africa, America and Asia.

In India first outbreak was recorded in Kolkatta in 1963 followed by East coastal area like Chennai, Pondichery, Vellore and Vishakapattanam in 1964. Later on it was recorded in 1965 in central part of India i.e. Rajmundri, Kakinada (A.P.) and Nagpur (M.S.). In Maharahstra State sporadic cases were reported in 1973, 1983 and 2000. Morbidity in Barsi, Maharashtra (1973) was about 37.5%, Recently the case of Chiungunya are reported from villages Mungi, Balamtakl and Madhi (District Ahamadnagar) Malegaon city (District

Nashik) and all 8 districts of Marathwada region in Vidharbh region 7 districts Akola, Washim, Buldhana, Yeotmal, Nagpur, Wardha and Chnadrapur.

The Chikungunya Vector:

Chikungyunya is caused by the chikungunya virus, which is classified in the family Togaviridae genus Alphavirus. Chikungunya is spread by the bite of an ***Aedes*** mosquito primarily ***Aedes aeggpti***. Humans are though to be the major source or reservoir of Chikunguniya virus per mosquitoes. Therefore, the mosquito usually transmits the disease by biting an infected person and then biting some one else (http://chppm/www.apgea.army.mil) (http://www.cdc.gov/ncidol/dvbid/index.htm).

Parbhani

Parbhani, earlier also known as Prabhavatinagar, is one of the eight district in the Marathwada region of Mahrashtra Stae of India. The district had a population of 1,527,715 of which 31.76% were urban as of 2001.

Parbhani district lies between 18.45 and 20.10 Worth Latitudes and 76.13 and 77.39 east Longitude (http://www.answer.com/topic Parbhani-district). The district is bounded on the north by Hingoli district, on the east by Nanded district, on the south by later and on the west by Beed and Jalna districts.

The river Godavari flows through this district. The total area under irrigation is 1,85,000 hectors. The irrigation projects are major-1, medium-2, minor-42 and important projects 2 i.e.Purna Yeldari and Purna Siddheshwar.

The maximum temperature of Parbhani district is 42.6 Deg. C. Minimum 10.6 deg. C. The average rainfall is 957.2 mm and the total area under horticulture is 35,000 hectors. The district is at an average height of 357 mtr.from mean sea level.

In the urban area of Parbhani development is not suitable for natural ecosystem and good health. The city having no proper attention towards sanitation, drainage and damping (open) provide breeding bed for mosquitoes.

Poorly designed hand pumps leave open water collections that breed thousands of mosquitoes. Intermittent tap-based water supply which is now becoming a feature in may areas of cities, is furling people to store water in large containers, where mosquitoes can breed. Poorly organized road construction can also lead to mosquito breeding. Burrow pits accumulate water and serve as temporary breeding sites for mo**s**quito.

A) Urbanization and Vector-borne diseases:

Urbanization is seen as a driver of India's economic growth. Unfortunately, when the poor migrate to cities, they encounter a degrading environment much worse than their

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homes in rural India, due to a singular lack to provisions of low-cost housing slums inevitably arise, with their problems of inadequate water supply, drainage waste disposal and sanitation leading to recurrent outbreaks of mosquito borne diseases. Open drainage which is often mixed with sewage, is a feature of Prabhani. New construction pays scant regard to drainage, impeding the flow of water and creating conditions of water logging every mansoon. The burden of disease in slums can be gauged from the annual parasite index (API) the no. of smear-positive malaria cases per thousand population. The API calculated in a Delhi slum, during the course of a malaria Research center study in 1982, was 496.6. That is every second slum dweller had malaria that year {Indian Journal of Medical Ethics Jan-Mar.2007 (1)}.

B) Irrigation:

If the urban environment now breeds malaria which was so far considered a rural disease, the green revolution mismanaged irrigation and ill planned infrastructure development are contributing to the emergence of the typically urban diseases of dengue and chikungunya in rural areas, in addition to worsening the malaria situation. *Anopheles* and *culex* can breed in rice fields, slow-moving streams and pools; poorly designed hand pumps leave open water collections that breed thousands of mosquitoes. Intermittent tap based water supply, which in now becoming a feature in many areas of Parbhani cities, is forcing people to store water in large containers, where mosquitoes can breed.
[Indian Journal of Medical Ethics Jan-Mar 2007 (1)]

C) Road construction:

Poorly organized road construction can also lead to mosquito breeding. Burrow pits accumulate water and serve as breeding sites. In Parbhani congregation of construction workers often from malaria-endemic zones creates a reservoir of infection people get bitten because there is no proper housing and as they have no access to effective health care the infection spreads unabated. All of this amounts to a perfect recipe for a malaria outbreak. The roads of bus stand area are poorly constructed so that mansoons water is collected forming small water bodies where mosquito can easily breed. Many area of Parbhani having wasted, garbage or we could say the dirty places the mosquitoes are more in the no. Many public places have poor drainage system these area has many places where the water is collected there is no any proper maintenance so the percentage of mosquito are larger in that area. In front of houses the guaters are there which is not a closed type so the opened guator provide a good breeding bed for the mosquitoes. According to WHO

(1996) 30 new diseases have emerged in past 20 years. In addition there has been resurgence and redistribution of old diseases on global scale (Gubler and Kuno 1997).

In the last year 2005-2006 outbreaks of chikungunya after 1963 in India is one of the best examples of redistribution of mosquito disease. It's not only the problem of the less developed countries but also for developed countries like U.S. (King Richard et.al). When global warning is anticipated to have significant impact on the earth in the next centaury, one direct impact it could have on the distribution of arthropod-borne diseases.

Objective of the work:

Ever increasing population and lack of adequate health care facilities particularly for the urban masses are a matter of concern for India while on one side the country is proud of major achievements in science and technology including space and our march towards a knowledge, it is true on the other side that a large proportion of our population has no access to even safe drinking water, sanitation, health are like other major problems facing the country.

Yet another area of concern to the country is the spread of vector borne disease (VBDs) such as malaria, Filariasis, Japanese encephalitis and dengue to newer areas with mosquitoes, the vectors caring. The World Head Organization (WHO) and other international bodies highlights the threat posed by these VBDs to the world's population, in general and to India in particular. It is said that in India alone over two million cases of malaria are reported every year.

The urban area of Parbhani development is not suitable for natural ecosystem and good health.

The city having no proper attention towards sanitation, drainage and damping (open) provide breeding bed for mosquitoes. That's why there is a need to study the above subject and create awareness in people.

1) To assess intensity of mosquito-borne diseases
2) To identify the mosquito and find out distribution diversity from study area
3) To find out the requirement for good health

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REVIEW OF LITERATURE

Mosquitoes are important insects in ecosystem by so many ways, but what will its role in the ecosystem do not known other than a vector parasite. World wide mosquito reported as a vector parasite, The parasite like virus is transmitted from birds to humans by mosquitoes causes number of disease, which are commonly known as mosquito borne diseases like protozon, viral, parasite etc.

The worldwide Mosquitoes reported are near about 3200 species out of them 255 species of mosquito reported in India out of which 15 species of mosquito can be act as vectors for various diseases (Assistant director, Health Service-Malaria, Aurangabad). Mosquito are found everywhere, in other words, in anything that hold water. Literature indicates studies on various aspects related to mosquitoes, mosquito borne diseases, diversity of mosquito and effect of an climate impact on mosquito diversity and so on world wide all developing as well as developed countries are paying less or more attention towards such type of work like mosquito diversity, mosquito borne diseases climate change and its impaction biodiversity, human health wild life etc. Some NGO's are also engaged for better environment and human health. Number of workers is also engaged in various fields like "Climate change and it's impact on mosquito borne diseases (Poul R.Episton) Pinheiro, Valeria cristina soares, Tadei worked on frequency diversity and productivity study on the *Aedes aegypti* most preferred containers in the city of Manaus, Amazonas Brazil they studied April and July in two Manaus neighborhoods in which near about 87% contains rebreed outdoors.

For the identification of mosquito J. W. Knight and J. K. Nayar they identified four common *culex* species from Florida with isoenzyme analysis carried out the study.

In India also after the discovery of Sir Ronald Ross in 1897 implicating mosquitoes in malaria transmission created interest among entomologist for the futuristic studies. Subsequently work started organs Anophdes. A full-fledged research instituted started functioning under the name of the Malaria Survey of India, first at Kassudi and then at New Delhi. The main function of the institute was to train doctors in malariology giving then a smattering of knowledge of the malaria. But side by side with this the institute embarked upon problems of basics research such as taxonomy of Anophelene adults and larvae before a monographic work. Later on number of workers are devoted in varies field like biodiversity, taxonomy, parasite survey, epidemiology, immunology etc. Some of them are as N. Pamela Devi and R. K. Jauhari studies on climatic variables and malaria incidence in

Dehradun, Uttaranchal in their work. They found that higher positive correlation of association between monthly parasite incidence and climatic variable i.e. temperature, rainfall and humidity. They found highest significant correlation between rainfall and malaria incidence (Journal Vect. Borne Dis, March 2006). Panicker, K. N. M. Geeta Bai and their co-workers also studies on *Anopheles* subpictus, vector of malaria in coastal villagers of South-east India, in their study they found that *Anopheles* subpictus Grassi as a vector of malaria in the coastal villages of the Pondicherry and TamilNadu regions of India, where the disease has persisted for some years. A subpictus may be a complex of which 1 of the species has 9 high tolerance of saline conditions, in that case, A subpictus may be important as a vector of malaria only in coastal areas. (Publications of vector control antre). To study the biodiversity of mosquito from Darjeeling Himalayas a work was carried out by Gautam Aditya Mihir K. Parmanik to study the larval habitats and species composition of mosquitoes in Darjeeling Himalayas and they found an altogether immature of six mosquito species belonging to four genera Acda, Armigera, *culex* and Toxrhynchites. The species diversity index (till for mosquitoes between 0.87 and 1.53 (J Vect. Borne Dis, March 2006).

The work was also done to study different mosquito vectors like P.C.Kanojia done a ecological study on mosquito vectors of *Japanese encephalitis* virus in Bellary district, Karnataka. In his study he found that total 120113 mosquitoes collected at dusk belonged to 5 genera and 24 species, including 13 species those have already yielded JE virus in India. *Culex tritaenorhynchus* appears to have a major role in the transmission of JE virus in Bellary district (Indian J. Med. Res., August 2007).

Jagdish Kaur and Jagbir S. Kirti studied the *Culcidae* diversity in Haryana state. They reported a total number of 21 mosquito species referable to five genera *Anopheles* Meigen, *Aedes* Meigen, Mansonia Blanchard, Armigeres Theobald and *culex* Linnaeus. Three species have been reported for the first time form that state (J.Vecto Borne Dis September & December 2003).

The total *Anopheline* vector species in India was studied by Sarala K.Subbaro and she reported that *Anopheline* fauna in India is rich with 58 morphologically identified species distributed all over the country of there 9 species are responsible for transmission of malaria in various capacities which are *An Annularis, An. cullcffacies, An. direus, An. Fluviatilis, An. minimul, An. nivipes/Philippinensis, An. stephensi, An. Sundiacus* and *An.Varuna* (Malaria Research Centre (ICMR) 22 Sham Nath Marg, Delhi, India)

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B. N. Nagpal, Aruna srivastava and Rekha Saxena, carries out the work on taxonomy of *anopheles* species. These taxonomic surveys listed forty species and culminated in the publication of Fauna of British India. The important findings included in that survey was ii) disappearance of *An. Sundaicus* from coastal Orissa and appearance in Kuch Bhuj area ii) reappearana of An.Minimus in Northeastern region and Banbasa, Uttranchal iii) established the vectorial role of *An.culicifacies* in Orissa iv) Confirmation of *An. rivipes* and *An. dirus* in north eastern region etc. This information helped in reorganization of existing control strategies and for development of new tools for vector interventions.

The same group of researcher worked on GIR for mapping of malaria vectors, as reports on vector distribution are scanty as manual surveys are not only time consuming and labour intensive, but many areas are inaccessible. The authors intend to emphasize that this unique technique identities the favourable location for species prevalence and also identities the area which do not carry the breeding potention for the species. This approach can help in stratifying the areas into endemic and non-endemic area of species for building up cost effective and sustainable control strategy. The Malaria Research Centre used Indian Remote sensing satellite to identify breeding habitats of anopheline mosquitoes particularly *An. Culificacies* and other anophelines. It was found that tanks, ponds, streams are easily detectable by remote sensing while irrigation wells were rarely detectable. It was found that remote sensing could be used for change detection in ecology of an area at village level resulting into reduction increase in malaria endemicity. (Delineation of breeding habitats and landscape features suitable for *Anopheles cullicifacies*-Mlaria Research Centre).

N. Pemola devi and R. K. Jauhari studied on mosquito species associated within same Wstern Himalayas phyto-geographic Zones in the Garhwal region of India and they reported thirty four species of mosquitoes across the three phytogeographic zones. They included 5 *genera, Aedes, Anopheles, Armigeres, culex* and *Uranotalnia* (Journal of Insect Science/www.insectscience.org). The diversity of mosquitoes from Pondichery was studied by A. R. Rajavel, R. Natarajan and K. Vaidyanathan. They reported 64 species of mosquito belonging to 23 subgenera and 14 genera. These are *Aedeomyia, Aedes, Anopheles, Armigeres, coquillettidia, culex, Ficallbia, Malaya, Mansonia, Mimomyia, Ochlerotatus, Toxorhynchites, Uranotaenia* and *Vennallina* (Vector Control Research center (ICMR), Pondicherry).

Not only the various states or parts of countries were studied by researchers, but on Andaman and Nicobar Islands also the study of diversity of mosquitoes are carried out by Rajavel AR, Natarajan R. The reported the Fifty-three mosquito species belonging to 20 subgenera and 18 genera were recorded in the mangroves of Andaman and Nicobar Islands. Together with species known from earlier records the mosquito fauna of Andaman and Nicobar Islands is updated to 107 species in 23 subgenera and 24 general (Division of Victor Biology & Control, Vector Control Research Centre (ICMR), Pondicherry.

The same authors studied the diversity of mosquito in the kundapur mangroves of Karnataka where they found 26 species of mosquitoes belonging to 16 subgenera and 11 genera and 17 species belonging to 11 sub genera and 7 genera were recorded in the mangroves of Kannur, Kerala along the West Coast of India. The genera recorded were *Aedes, Anopheles, Armigeres, Culex, Heizmannia, Lutzia, Monsonia, Ochlerotatus, Tripteroides, Uranotaernia* and *Verrallina.* Species common to both mangrove forests were *Ae. Albopictus, Ae. vittatus, An. Jamesi, Ar. Subalbatus, Cx. Gelidus, cx. Infantulus, cx Pseudovishnui, Cx. Sitiens, Cx. Tritaeniorhynchus, Oc. Wardi Dr. Alra* and *Ve. Luguhris.*

In Chennai study on mosquito Alex Eapen K. John Ravindran, M. A. Ansari and S. K. Subbarao carried out breeding and its control in rainwater harvesting structures. The rain water structures identified were mainly rain water harvesting (RWH) wells, trenches, junction pits, percolation trenches, Mosquito breeding was encountered in RHW, trends and junction pits, which constitutes 98% among all the RWH structures. *Anopheles*, *culex* and *Aedes* breeding were observed in RWH wells, junction pits and trenches. The vector mosquitoes identified from these habitats were *Anopheles*, stephensi, *Culex* quinque Fasciatus and *Aedes aegypti* (3rd Global meet on Parasitic Diseases, Proceeding 2004, Bangalore).

R. C. Dhiman found that distribution and degree of endemicity of malaria depends to a large extent on climatic factors, which support the development of mosquito vectors and malaria parasite, studied the climatic impact on malaria. *Plasmodium vivax* parasite requires minimum 14.5 to 15.5 degree centigrade temperature while parasite *falciparum* requires 16-18 degree centigrade from completion of progeny in mosquito vectors. The retrospective analysis of malaria versus total rainfall and RH in respect of Bikaner (Rajasthan), Banaskantha (Gujarat) and Tumkur (Karnataka) reveal that environment provided by the host. The current status of vector Borne diseases in south East Asia was studied by Ravi Kumar K. Perticularly Malaria, Filariasis, Dengue, Japanese enaphalitis, Kala Azac as they are major vector borne diseases in south East Asia.

Pelmoa Devi N. and R. K. Jauhari also studied the Biodiversity hotspots towards mosquito noccurrance at Pauri (Garhwal) in the State of Uttaranchal. They reported that there were 14 species of *Anopheles* and most species rich hotspots for Anophelines were 15, *culex* species; they were recorded from 25 and 26 spots. The hot spots, which were near to riverine area or thick-forested area showed more diversity of mosquitoes than those nearer to none, forested or thin forested area.

Thant Zin and N. J. Shetty studied on mosquito biodiversity in Mandya Taluk, Mandya District, Karnataka State. They found 12 species of mosquitoes representing 4 genera, *Anopheles*, *Culex*, Mansonia and Armigeres. The same N. J. Shetty and Myin Zu Minn studied the biodiversity of mosquitoes in Malavalli Taluka, Maindya District, and Karnataka State among the seven talukas in that district. The present study will discuss on Malavalli Taluka, 17 villages were selected for the study. The study revealed that there were 16 species in 5 genera and 2 subfamilies of family Culicid. Among the species most predominant species of mosquitoes are An. Subpictus *An. Culicifacies and Cx. Quique Fasciatus, Cx. Tritaeniorhynchus* of genus *Anopheles* and *Culex* respectively.

In Karnataka State the mosquito diversity in Rajiv Gandhi National Park (Nagarahole) was first time studied by the Yadurappa Satishkumar Nagabhushanrao Ganesh. They found 60 species belonging to 10 genera were recorded. Seventeen different larval habitats were identified in the national park genus *Culex* was predominant with a maximum 21 species followed by *Aedes* with 12 and *Anopheles* with 10 species respectively. Out of total number of species recorded, 14 are known to be vectors of different mosquito borne diseases in India (J.Ent. Res.Soc. 612): 1-13, 2004).

Seasonal prevalence of anophelines in the kumaon foothill region of Nainital district, S.N.Sharma and R.P.Shukla carried out Uttar-Pradesh. Their results revealed prevalence of 9 anophelines in the area. Species wise percentage composition was *An. Subpictus 40.5%, An. culcifacies 33.1%, An. vagus 11.1%, An. fluviatilis 6.9%, An. maculates 6.4%, An .annularis 1.5%, An. splendidus 0.3%, An. nigerrimus 0.*2 and *An. barbirostris 0.02%.*

The R. K. Jauhari, R. K. Mahesh carried out work on the ecological Mappin of breeding sites of mosquitoes in the Eastern Doon Valley. The study reports the results of a survey of the breeding groups of *Culicine* mosquitoes found in Eastern Doon Valley from feb.1999 to Jan.2000. The study reveals the occurrence of 10 species of mosquitoes. The findings of the study had been compared with the studies made by the earlier workers. The main principle of the study was based on the topographical features of each ecological

level, which relate to fluctuations in water level and allow newly immersed areas to be predicted (XIVth National Congress of Parasitology, Abstract book)

In Delhi the R. S. Sharma, N. Panigrahi, S. M. Kaul and Ashok Kumar studied the breeding infestation of dengue fever vector *Aedes aegypti* studies on seasonal prevalence of *Aedes aegypti* were undertaken in different localities of Delhi during 1998. The *Aedes aegypti* population was found to be prevalent in all the localities of Delhi. The room coolers and tyres were the most infected breeding habitats of *Aedes* in the city. Out of 20,2,211 habitats surveyed, 4,417 were found positive for *Aedes aegypti* (XIVth National Congress of Parasitology, Abstract book).Various workers also studied Mosquito borne diseases. *Aedes* survey at Chennai air and Kuldip Singh Gill, Sushilkumar Sharma, carried out Seaports. Over the years there has been a tremendous increase in international travel and freight through air, sea, road, railways etc. that may some time result in the invasions of yellow fever virus through *Aedes* mosquito. However, over the years the density of *Aedes* has increased tremendously due to various man made ecological changes. In order to gather up to date information on the vector control measures thereof, an *Aedes* survey was carried out at Chennai air and seaports during March, 1998 and it revealed the prevalence of *Aedes aegypti* and *Aedes albopictus* mosquito species. The *Aedes aegypty* and overall stegomyia species premises index at the air and sea ports were recorded to be 13.55%, 18.64%, 6.6% and 16.6% respectively. M.R.Parihar and Sharma P.N.working in Deptt studied the mosquito fauna and malaria vector in Udaipur district of Rajasthan. Of Zoology, Mohan Lal Sukhadia University, Udaipur. They reported a total of 10, 758 mosquitoes comprising five species of *Anopheles*, two species of *culex,* one species of *Aedes,* one species of *Mansonia* and one species of *Armigerus* from 22 villages of Udaipur district of Rajasthan from July 1998 to June 1999. These mosquito species have been recorded for the first time from Udaipur district, *Armigerus* was reported for the first time from Southern Rajasthan. Among the known malaria vector in India, *An annularis, An,. Stephensi and An. Culcifacies* were collected from Udaipur.Sathe et.al studied the diversity of mosquito from the southern Maharashtre region the study reaveled . Jagdish Kaur and Jagbir Kirti studied the culicidae diversity in Haryana state during 1997-2000, they found 21 species belonging to five genera (J. Vect. Borne Dis. 40, Sept & Dec. 2003, pp 112-114).

Concern to above subject and object very less or poor work has been done in Marathwada level and there fore there is a need to study systematically on diversity of Mosquito.

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MATERIAL AND METHOD

The following material and methods were adopted in completion of the work.

MATERIAL

1) **Test Tubes:** The test tubes of size 15x 1.5cm and 14.5 x 2.5 cm (length & diameter) were used for handling the adult mosquitoes.
2) **Specimen tube:** Specimen tube of size,6x2cm,5x2cm and 4x2cm (length and diameter) were used for preserving the adults and handling larvae and pupae of mosquitoes. The open end of specimen tube was covered by muslin cloth.
3) **Suction tube:** The suction tube designed by malaria dept. has been used for collecting adult mosquitoes. The suction tube has three components, an upper glass tube, middle diaphragm and lower rubber tube. It is used for storing the mosquitoes temporarily.
4) **Insect net:** Insect hand net made up of aluminium handle 70 cm long, circular iron ring of 22 cm diameter and ordinary mosquito bag of 70 cm in depth was used for collecting adult mosquitoes.
5) **Dipper:** The dipper was used for collecting mosquito larvae from natural habitat. The device is wide mouth flask with flat strip as a handle at edge on wide mouth.
6) **Plastic containers:** Plastic containers of one litre capacity was used for collecting the sample of larvae/ pupae from the natural habitat.
7) **Camel hair brushes:** Camel hair brush no.0 has been used for preparation of slides while, the brush no. 1 & 2 has been used for handling mosquitoes.
8) **Camera Nikon D 3100:** Nikon D 3100 camera was used for taking the photographs of the mosquitoes.
9) **Slide box:** Slide boxes were used for keeping the permanent slides safely.
10) **Slides and Cover slips:** Ordinary slides and cover slips were used for preparing the whole mounts and other body parts.
11) **Microscope:** Almicro binocular microscope with objective 10x,45x,100x were used for describing the mosquito species.
12) **Chemicals:** Following chemicals were used for preparation of slides and preserving the insects.
    1) 10% KOH
    2) 30% TO 100% Ethyl alcohole grades.
    3) Glacial acetic acid

4) Xylene
5) DPX/ Canada Balsum

METHODS:

Parbhani is one of the eight districts in the Marathwada region of Maharashtra state of India. Parbhani district lies between 18.45 and 20.10 north Latitudes and 76.13 and 77.39 East Longitude (http://www.answer.com/topic parbhani district). The district is bounded on the North by Hingoli district. The survey of mosquitoes was made from Parbhani city from June 2012 to June 2013 from twenty one fixed localities. Larvae and adult mosquitoes were collected from these localities and each locality was sampled at least once in each month

Mosquito sampling

1) The Adult mosquitoes were collected using aspiratory, flash light, mosquito repellent, insecticide like coil, net, liquid etc. for indoor and aspirator flash light for outdoor during morning hours (06.00 – 08.00 a.m.) randomly. Collection of immature mosquitoes was also made on the same day by dipping and netting methods as per WHO (1975) guidelines.
2) Species were confirmed from adults that emerge in the laboratory and some of them are preserved in insect preservative at laboratory.
3) Identification of Mosquitoes: Identification is based on larva and adult characters using standard taxonomic keys and catalogs (Christophers 1933, Nagpal and Sharma 1995), Ramchadnra Rao (1974), Renert (1974), Sirivanakarn (1976) and Huang (1979).
4) Data analysis: The analysis of data i.e. Intensity and density of mosquitoes were calculated using stastical methods as follows

$$\text{Density of Mosquitoes} = \frac{\text{No. of mosquitoes collected at given spot}}{\text{No. of spots examine}}$$

$$\text{Intensity of Mosquitoes} = \frac{\text{Total no. of mosquitoes collected (specific species)}}{\text{No. of spots from where species collected}}$$

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DIFFERENT LOCALITIES OF PARBHANI CITY

Trimurti Nagar Area

Pratap Nagar Area

Pardeshwar Temple Area

Boralkar Nagar Area

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Rajiv Gandhi College Area

Global Sciences Academy Area

Khan Area

Ambedkar Nagar

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Near Iti Area

Subhekar Nagar Area

Kakde Nagar Area

Pingalgadha Nala

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Near BSNL Office

Neeraj Hotel Area

Bus Stand Area

Railway Station Area

(ISBN: 978-93-91768-76-8)

V. N. M. A. University Area

Shankar Nagar Area

Near Jijamata Uddyan Area

Near Feroz Cinema Hall

Dhar Road Area

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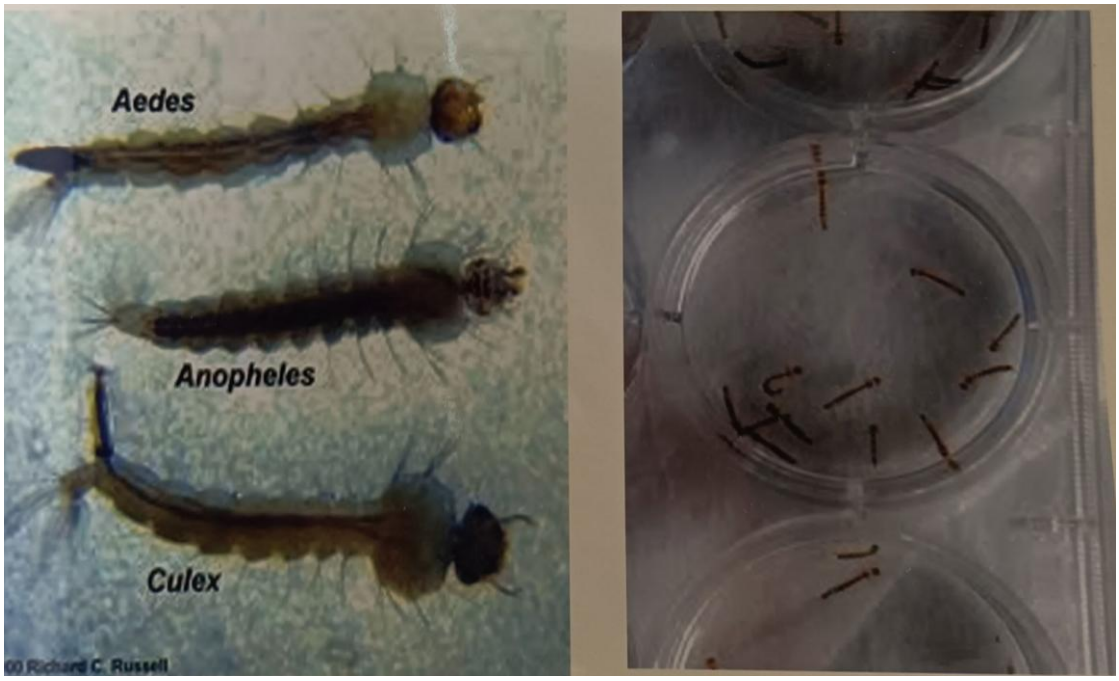
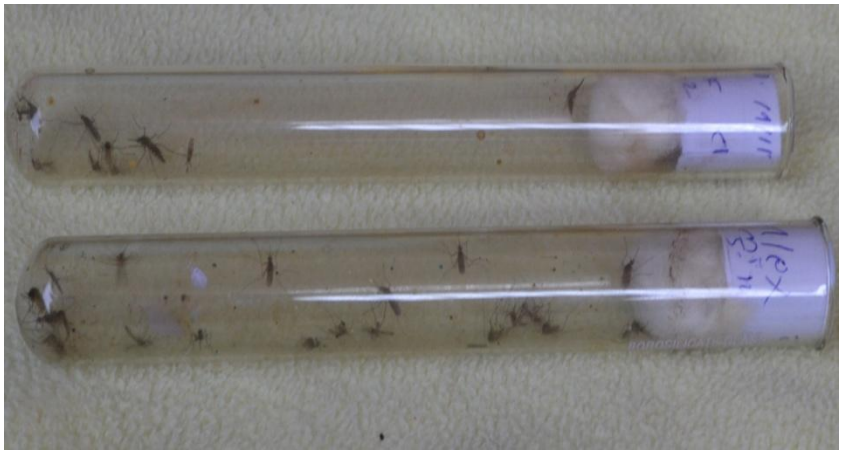
Mosquitoe Collection Equipments



Collected Mosquitoes Larvae



Collected Mosquitoes

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RESULT AND DISSCUSSION

Worldwide urbanization, Industrialization and agricultural development is a growing phenomenon, it causes change in life style and adverse effects on natural ecosystem. When natural ecosystem disturbs their structure gets complexes and they will harmful for human being widespread poverty, year round tropical climate environmental disturbance due to war or natural disaster and lack of public health infrastructure are all factors that promote uncontrolled mosquito breeding and are conductive to outbreaks of mosquito borne diseases. The continued practice of open drainage system, indiscriminate disposal of water and industrial effluents into water bodies and added to this, the increased migration from rural areas have resulted into large slums in Parbhani city creating an environment unsuitable for healthy living.

The deteriorating public health infrastructure in Parbhani city exaborates the problem of vectors of dengue fever and yellow fever are able to exploit artificial sources of water such as water storage pots, tires, or old containers, in garbage polluted waste water also provides a suitable breeding site for ***Culex*** mosquitoes that transmit lymphatic filariasis. The effect of environmental change emerging parasitic diseases has been reviewed recently. The types of vegetatation and ground cover determine the vector species that occurs following deforestation, with natural and human built water storage facilities playing a major role. Agriculture has pervasive local effects on vector borne diseases by affecting the availability of breeding sites for different species of vectors. A number of land use issues that affect the incidence of mosquito borne diseases have been identified including deforestation, land cultivation and various water storage, distribution and irrigation structure and practices (Vol.17, 2004 GLOBAL CHANGE AND VECTOR BORNE DISEASES 151)

The results of the study are dependent on area-to-area and climatic conditions. The available information on life history of most Marathwada mosquito to species was used for classification of species into functional groups over all urban areas of Parbhani comprises mainly three genuses like ***Anopheles, culex and Acdes***. There was no report of new species from the same area. As per available information very less work regarding the topic except Malaria department no one can conduct the said topic for study or research. Parbhani is one of the important cities in Marathwada due to its educational and transportation influence. The result indicated from Parbhani was reported eight species of mosquito including three major genuses.

Altogether 7885 mosquitoes were sampled for this dissertation. This collection included 21 spots from parbhani city during repeated visit to same collection spots. These spot chosen from the view of Residential, Educational and public places where more chances to mosquito borne disease transmitted. These repeated collection and number of mosquitoes shown in table (Table No.1) with their respective genus and species. The urban areas show more dominate to ***Anopheles***, ***culex*** then ***Aedes***. Simultaneously survey also carried out regarding mosquito borne diseases from residential areas, that time I have found that 29.412% people are aware about mosquito borne diseases and they take care to avoid mosquito population in their surrounding. This study area provides 100% breeding beds for mosquitoes. In the sense of mosquito diversity study places spots shows different size of population of mosquito regarding genus and species diversity seen in spot 1 Trimurti nagar, it shows only *Anopheles* population. If you see spot No. (19) Jijamata Uddyan spot No. (13) BSNL office area, bus stand area, V. N. M. Agricultural University area, Shankar nagar area, Feroz Cinema Hall area, Dhar road area, all shows richest in *Anopheles, culex* diversity. The spot No. (2) Pratap nagar shows highest density of *An. stephansi* as compare to other species found in the area. While spot No. (21) Dhar road shows total absence of *An. Stephansi* species. The highest density of *An. Culcificies* was found at spot No. 13 near BSNL office, while lowest density was found at spot No. (15) Bus stand area. The spot No. (6) near Global Science Academy show highest density of *Anophales subpictus* while lowest density of the species recorded at spot No. (12) Pingalgad nala and the total absence of the species was recorded at spot No. (19) at Jijamata Uddyan Gavane Chowk. The *An. Stephestes* was highest at spot No. (20) at Feroz Cinema Hall area. The *culex fatigens* was highest at spot No. (16) Railway Station area while lowest at spot No. (6) Near Global Science Academy. The density of *culex amigeres* was highest at spot No. (20) Feroz Cinema hall area, while lowest at spot No. (9) near I.T.I. institute and spot No. (16) Railway station area while totally absent from spot No. (6) near Global Science Academy and spot No(.8) Ambedkar nagar.

The *Aedes aegypti* was very less recorded from the city it show it's highest density at spot No (10) Subhedar nagar and lowest at spot No. (2) Pratap nagar and spot No. (11) Kakde nagar, while totally absent from the spot No. (1) Trimurti nagar, spot No. (3) Pardeshwar Temple, spot No. (4) Boralkar nagar, spot No. (5) Rajiv Gandhi Agricultural College area, spot No(. 6) near Global Science Academy spot No. (7) Khan area near Mahabeej Office, spot No. (8) Ambedkar Nagar, Spot No. (12) Pingalgad Nala, spot No. (10)

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Neeraj Hotel, spot No. (16) Raiway station area, spot No. (19) Jijamata Uddyan, spot No. (20) Feroz Cinema hall area. The specis *An. stephensi* show it's highest intensity (15.90%) in the month of July 2012 while lowest intensity (6.5%) was show at the month of May 2013. The *An. culicifacies* show it's highest intensity (11.72%) in the month of Sept. 2012 while lowest intensity (3.68) at the month of Nov. 2013.The highest intensity (16.66%) of *An. subpictus* was recorded in the month of July 2012 while lowest intensity (16.62%) in the month of Agust while lowest intensity (2%) shown in the month of Sept. 2013.

The *Culex fatigens* show it's highest intensity (11.07%) in the month of Aug. 2013 while lowest (5.14%) in the month of Feb. 2013. The *Culex armigers* show it's highest intensity (3.87%) in month of Feb. 2013 and lowest intensity (3.87%) in the month of May 2013. The *Aedes aegypti* species was highest (8%) in the month of March 2013 while lowest (1%) at Jan. 2013.

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FINDINGS AND CONCLUSION

Taxonomy plays a crucial role in the field of applied biology including public health, national defence, pest management, environmental problem, wildlife management, nutritional science, forensic science and several other fields in identifying the species. Human health is affected by variety of organisms which include insects, other arthropods, nematodes, protozoans etc. The insects related to epidemiology include houseflies, ratflea, tse-tes fly and mosquitoes etc.

Among the insect vectors, mosquitoes play an important role since they cause fetal diseases like malaria, filariasis, dengue, yellow fever, chikungunya etc.

The density and distribution of mosquito indicate in the tables with respective spot. If we see about the scenario of mosquito borne diseases from Parbhani through survey, it shows 94.118% peoples are suffered with mosquito borne diseases like malaria, fever, elephantiasis, chikungunya and only 5.883% find out free from mosquito borne diseases. Out of them only 35.295% peoples are try to avoid or prevent mosquito population as well as mosquito borne disease regarding our study I find out some findings.

Study findings:

1) *Anopheles* is common genus in Parbhani urban area.
2) Awareness in people is very less.
3) 94.118% peoples are suffered with mosquito borne diseases. 35% people are aware and try to prevent mosquito borne disease and breeding sites of mosquitoes.
4) Parbhani city is suitable for mosquito development due to its unplanned development.
5) Municipal Corporation also not take attention about health and hygiene of people, and proper development of city.
6) *Aedes* is very less reported from Parbhani.
7) Near about 80 Rupees expenditure for healthy man regarding mosquito biting precaution coil, liquid, net and other etc.
8) 95% peoples spend their 2% income on mosquito borne diseases some time more than 2%.

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CONCLUSION

1) To create awareness in people.
2) Need to action properly towards planned development.
3) Reduce breeding sites of mosquitoes.
4) Prevention is better than cure.
5) To do work on life cycle, prevalence, population development, diversity, its control etc. of mosquito.
6) Any way i.e. biologically or ecofriendly controlled the mosquito population, it is very important strategy for mosquito borne disease free society.
7) Some part of district reported dengue, but case is not reported from urban.
8) Definitely in future it will be big problem for urban people as well as rural people.
9) It is right time to take action.

Table 1: Mosquito Population at Trimurti Nagar during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**35**	15	20		-	-	-	-
August	05.08.12	**48**	18	16	14	-	-	-	-
Sept.	02.09.12	**25**	10	08	-	07	-	-	-
Oct.	02.10.12	**20**	08	07	05	-	-	-	-
Nov.	04.11.12	**18**	07	05	06	-	-	-	-
Dec.	02.12.12	**10**	06	04	-	-	-	-	-
Jan.	06.01.13	**25**	12	05	03	05	-	-	-
Feb.	02.02.13	**15**	09	03	02	01	-	-	-
March	03.03.13	**20**	08	05	05	02		-	-
April	07.04.13	**12**	07	03	02	-	-	-	-
May	02.05.13	**10**	06	03	01	-	-	-	-
June	16.06.13	**18**	08	06	03	01	-	-	-
Total		**256**							

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Table 2: Mosquito Population at Pratap Nagar during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**102**	52	-	50	-	-	-	-
Aug.	05.08.12	**130**	25	30	27	19	20	09	
Sept.	02.09.12	**100**	32	41	-	-	27	-	-
Oct.	02.10.12	**58**	07	10	09	26	03	03	-
Nov.	04.11.12	**38**	09	07	08	14	-	-	-
Dec.	02.12.12	**21**	10	08	03-	-	-	-	-
Jan	06.01.13	**18**	07	05	04	02	-	-	-
Feb	02.02.13	**20**	06	06	05	02	01	-	-
Mar	03.03.13	**21**	12	07	02	-	-	-	-
April	07.04.13	**16**	07	04	04	01	-	-	-
May	02.05.13	**21**	08	05	05	02	-	-	01
June	16.06.13	**22**	10	06	04	02	-	-	
Total		**567**							

Table 3: Mosquito Population at Pardeshwar Temple during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**30**	10	5	-	-	15	-	-
Aug.	05.08.12	**19**	08	02	03	04	02		--
Sept.	02.09.12	**35**	**-**	-	12	09	08	06	
Oct.	02.10.12	**19**	**-**	-	-	06	06	07	
Nov.	04.11.12	**15**	04	04	-	-	02	07	-
Dec.	02.12.12	**20**	07	06	04	03	01	-	-
Jan	06.01.13	**15**	06	06	-	03		-	-
Feb-	02.02.13	**18**	09	05	01	02	01	-	-
Mar-	03.03.13	**25**	11	-	14	-	-	-	-
April	07.04.13	**21**	08	07	05	01	-	-	-
May	02.05.13	**18**	07	05	06	-	-	-	
June	16.06.13	**23**	10	08	05	-	-	-	-
Total		**258**							

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Table 4: Mosquito Population at Boralkar Nagar during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**38**	**-**	-	-	22	16	-	-
Aug	05.08.12	**52**	**-**	15	20	-	17	-	-
Sept	02.09.12	**30**	**-**	-	12	18	-	-	-
Oct	02.10.12	**45**	**-**	-	28	17	-	-	-
Nov	04.11.12	**40**	**-**	-	28	12	-	-	-
Dec.	02.12.12	**35**	**-**	-	12	11	12	-	-
Jan.	06.01.13	**17**	07	02	-	08	-	-	-
Feb.	02.02.13	**20**	09	03	-	05	03	-	-
March.	03.03.13	**35**	06	04	02	12	06	05	-
April	07.04.13	**26**	09	-	-	10	06	01	-
May	02.05.13	**24**	05	02	-	12	03	02	-
June	16.06.13	**31**	08	09	-	10	-	-	-
Total		**393**							

Table 5: Mosquito Population at Rajiv Gandhi Agri. College area during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**45**	**-**	-	16	17	12	-	-
Aug.	05.08.12	**57**	**-**	18	19	-	21	-	-
Sept	02.09.12	**26**	**-**	12	-	08	6	-	-
Oct	02.10.12	**52**	**-**	17	-	20	15	-	-
Nov	04.11.12	**50**	**-**	21	-	19	10	-	-
Dec.	02.12.12	**41**	**-**	21	-	12	8	-	-
Jan.	06.01.13	**28**	11	10	07	-	-	-	-
Feb.	02.02.13	**31**	10	08	09	-	-	-	-
March.	03.03.13	**49**	17	10	12		-	-	-
April	07.04.13	**34**	10	12	08	03	03	-	-
May	02.05.13	**32**	17	10	03	02	-	-	-
June	16.06.13	**28**	15	-	13	-	-	-	-
Total		**473**							

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Table 6: Mosquito Population at Near Global Science Academy during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**61**	18	20	10	13	-	-	-
Aug.	05.08.12	**121**	34	45	42	-	-	-	-
Sept	02.09.12	**49**	12	10	17	-	-	-	-
Oct	02.10.12	**31**	10	8	9	-	-	-	-
Nov	04.11.12	**36**	-	07	07	12	10	-	-
Dec.	02.12.12	**31**	-	10	09	08	04	-	-
Jan.	06.01.13	**39**	-	19	10	09	02	-	-
Feb.	02.02.13	**43**	-	13	15	10	05	-	-
March.	03.03.13	**28**	11	10	7	-	-	-	-
April	07.04.13	**23**	6	7	5	-	-	-	-
May	02.05.13	**27**	-	10	08	09	-	-	-
June	16.06.13	**34**	02	09	10	08	05	-	-
Total		**523**							

Table 7: Mosquito Population at Khan Area near Mahabej Offce during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**17**	**-**	7	-	-	-	-	-
Aug.	05.08.12	**34**	**-**	-	-	24	10	-	-
Sept.	02.09.12	**23**	**-**	8	-	10	05	-	-
Oct.	02.10.12	**25**	**-**	10	-	05	10	-	-
Nov.	04.11.12	**30**	**-**	09	03	05	07	06	-
Dec.	02.12.12	**21**	**-**	04	3	07	05	05	-
Jan	06.01.13	**26**	10	09	06	01	-	-	-
Feb.	02.02.13	**31**	10	09	08	03	-	-	-
March	03.03.13	**34**	08	08	09	12	-	-	-
April	07.04.13	**42**	18	10	03	10	01	-	-
May.	02.05.13	**26**	03	09	-	12	02	-	-
June	16.06.13	**31**	09	05	-	14	03	01	-
Total		**340**							

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Table 8: Mosquito Population at Ambedkar Nagar during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**28**	15	-	13	-	-	-	-
Aug.	05.08.12	**34**	-	-	-	24	10	-	-
Sept.	02.09.12	**20**	20	-	-	-	-	-	-
Oct.	02.10.12	**32**	17	15	-	-	-	-	-
Nov.	04.11.12	**30**	12	11	-	-	7	-	-
Dec.	02.12.12	**29**	9	07	-	-	13	-	-
Jan-	06.01.13	**28**	14	08	03	03	-	-	-
Feb.-	02.02.13	**36**	12	07	10	07	-	-	-
March	03.03.13	**32**	13	03	04	10	02	-	-
April	07.04.13	**25**	11	04	03	07	-	-	
May.	02.05.13	**19**	07	05	05	02	-	-	-
June	16.06.13	**23**	10	07	03	03	-	-	-
Total		**336**							

Table 9: Mosquito Population at Near I.T.I. Institute during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**36**	**-**	-	-	36	-	-	-
Aug.	05.08.12	**45**	10	-	12	-	-	-	-
Sept.	02.09.12	**31**	21	10	-	-	-	-	-
Oct.	02.10.12	**29**	16	13	-	-	-	-	-
Nov.	04.11.12	**25**	11	14	-	-	-	-	-
Dec.	02.12.12	**21**	7	14	-	-	-	-	-
Jan-	06.01.13	**37**	07	14	-	-	12		04
Feb.-	02.02.13	**46**	12	17	-	-	17	-	-
March	03.03.13	**52**	21	18	-	-	-	-	13
April	07.04.13	**28**	-	-	18	10	-	-	-
May.	02.05.13	**25**	-	-	13	12	-	-	-
June	16.06.13	**20**	8	4	-	-	5	2	-
Total		**364**							

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Table 10: Mosquito Population at Subhedar Nagar during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**18**	5	4	-	-	4	3	-
Aug.	05.08.12	**22**	04	06	-	-	08	04	-
Sept.	02.09.12	**39**	-	-	19	20	-	-	-
Oct.	02.10.12	**62**	27	25	-	-	-	-	10
Nov.	04.11.12	**29**	10	13	-	-	-	-	6
Dec.	02.12.12	**39**	12	17	-	-	-	-	10
Jan-	06.01.13	**35**	12	11	-	-	-	-	-
Feb.-	02.02.13	**28**	9	12	-	-	-	-	-
March	03.03.13	**32**	11	06	08	04	03	-	-
April	07.04.13	**30**	03	05	08	06	05	03	-
May.	02.05.13	**25**	09	03	06	-	07	-	-
June	16.06.13	**34**	10	08	-	-	08	08	-
Total		**393**							

Table 11: Mosquito Population at Kakde Nagar during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**35**	15	20	-	-	-	-	-
Aug.	05.08.12	**32**	07	12	-	-	-	-	-
Sept.	02.09.12	**30**	10	12	-	08	-	-	-
Oct.	02.10.12	**29**	07	09	-	13	-	-	-
Nov.	04.11.12	**28**	08	06	-	14	-	-	-
Dec.	02.12.12	**23**	05	09	05	-	04	-	-
Jan-	06.01.13	**21**	07	05	04	-	05	-	-
Feb.-	02.02.13	**28**	06	06	06	02	06	02	-
March	03.03.13	**24**	08	07	05	02	02	-	-
April	07.04.13	**20**	05	04	03	02	04	02	-
May.	02.05.13	**18**	04	03	02	03	05	-	01
June	16.06.13	**27**	13	07	05	-	02	-	-
Total		**283**							

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Table 12: Mosquito Population at Pinpalgadh Nala during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**35**	07	08	05	05	07	03	-
Aug.	05.08.12	**48**	09	07	09	09	08	06	
Sept.	02.09.12	**25**	07	05	05	-	03	05	
Oct.	02.10.12	**20**	04	05	06	-	04	02	
Nov.	04.11.12	**26**	08	06	02	-	06	04	
Dec.	02.12.12	**25**	10	12	-	03	-	-	-
Jan-	06.01.13	**28**	08	10	-	04	06	-	-
Feb.-	02.02.13	**30**	07	11	-	07	05	-	-
March	03.03.13	**32**	05	09	-	08	0	03	-
April	07.04.13	**30**	06	07	-	05	07	05	-
May.	02.05.13	**26**	09	08	-	04	03	02	-
June	16.06.13	**32**	10	07	-	06	05	04	-
Total		**322**							

Table 13: Mosquito Population at Near BSNL Office during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**59**	15	20	-	-	10	9	-
Aug.	05.08.12	**55**	10	13	15	-	13	4	-
Sept.	02.09.12	**50**	15	12	9	-	8	6	-
Oct.	02.10.12	**51**	12	10	08	-	10	09	02
Nov.	04.11.12	**73**	-	15	20	19	6	5	-
Dec.	02.12.12	**73**	31	26	16	-	-	-	-
Jan.	06.01.13	**53**	28	25	-	-	-	-	-
Feb.-	02.02.13	**40**	21	19	-	-	-	-	-
March	03.03.13	**42**	23	19	-	-	-	-	-
April	07.04.13	**40**	18	22	-	-	-	-	-
May.	02.05.13	**26**	10	07			09		
June	16.06.13	**32**	7	10	-	-	9	06	-
Total		**594**							

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Table 14: Mosquito Population at Neeraj Hotel area during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**39**	-	-	20	12	05	02	-
Aug.	05.08.12	**17**	8	5	4	-	-	-	-
Sept.	02.09.12	**17**	9	8	-	-	-	-	-
Oct.	02.10.12	**15**	7	5	3	-	-	-	-
Nov.	04.11.12	**13**	6	4	3	-	-	-	-
Dec.	02.12.12	**15**	07	04	-	-	04	-	-
Jan-	06.01.13	**20**	08	05	-	-	06	02	-
Feb.-	02.02.13	**32**	06	05	02	-	11	08	-
March	03.03.13	**25**	-	-	07	05	09	04	-
April	07.04.13	**20**	-	-	-	03	11	6	-
May.	02.05.13	**18**	**-**	-	-	05	08	05	-
June	16.06.13	**26**	**-**	05	07	-	09	05	-
Total		**247**							

Table 15: Mosquito Population at Bus Stand area during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**36**	**-**	-	12	8	07	07	02
Aug.	05.08.12	**43**	**-**	13	15	-	10	05	-
Sept.	02.09.12	**27**	**-**	12	8	7	-	-	-
Oct.	02.10.12	**40**	**-**	-	18	10	06	06	-
Nov.	04.11.12	**25**	**-**	-	08	07	05	05	-
Dec.	02.12.12	**18**	09	05	-	-	02	02	
Jan-	06.01.13	**20**	07	-	06	-	04	03	01
Feb.-	02.02.13	**22**	10	-	06	-	04	02	-
March	03.03.13	**25**	10	-	04	-	08	03	-
April	07.04.13	**23**	08	-	05	-	10	-	-
May.	02.05.13	**21**	08	-	07	-	05	01	-
June	16.06.13	**28**	13	-	08	-	05	02	-
Total		**328**							

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Table 16: Mosquito Population at Railway Station area during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**36**	**-**	-	12	08	14	02	-
Aug.	05.08.12	**45**	**-**	-	16	17	12	-	-
Sept.	02.09.12	**52**	**-**	17	-	20	15	-	--
Oct.	02.10.12	**50**	**-**	21	-	19	10	-	-
Nov.	04.11.12	**41**	**-**	21	-	12	08	-	-
Dec.	02.12.12	**36**	10	07	05	06	08	-	-
Jan-	06.01.13	**31**	04	08	09	05	05	-	-
Feb.-	02.02.13	**39**	-	09	10	10	10	-	-
March	03.03.13	**43**	05	10	15	13	-	-	-
April	07.04.13	**36**	02	14	08	12	-	-	-
May.	02.05.13	**27**	09	08	10	-	-	-	-
June	16.06.13	**34**	05	08	10	09	02	-	-
Total		**470**							

Table 17: Mosquito Population at V. N. M. Agri. University during the study period

Month	Date	Mosoquito Collection	*An. stephensi*	*An. culcifacies*	*An. subpictus*	*An. sephestes*	*Cu. fatigens*	*Cu. armigeres*	*Aedes aegyptyi*
July	01.07.12	**31**	**-**	01	-	-	20	10	-
Aug.	05.08.12	**21**	09	04	-	-	05	01	02
Sept.	02.09.12	**34**	09	12	-	-	-	08	05
Oct.	02.10.12	**30**	09	11	-	-	05	02	04
Nov.	04.11.12	**27**	08	05	-	-	06	04	04
Dec.	02.12.12	**23**	07	04	03	02	05	-	-
Jan-	06.01.13	**28**	05	06	06	03	08	-	-
Feb.-	02.02.13	**28**	06	08	07	04	04	-	-
March	03.03.13	**32**	08	10	04	03	07	-	-
April	07.04.13	**27**	08	06	03	05	05	-	-
May.	02.05.13	**24**	02	02	05	07	08	-	-
June	16.06.13	**31**	01	03	07	07	09	04	-
Total		**308**							

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Table 18: Mosquito Population at Shankar Nagar Area during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**35**	**-**	07	-	12	10	06	-
Aug.	05.08.12	**51**	**-**	15	-	10	12	11	-
Sept.	02.09.12	**28**	**-**	14	-	10	-	04	-
Oct.	02.10.12	**26**	**-**	09		07	05	05	-
Nov.	04.11.12	**22**	0	9	-	06	03	04	-
Dec.	02.12.12	**20**	08	05	02	-	05	-	-
Jan.	06.01.13	**18**	03	06	04	-	05	-	-
Feb.	02.02.13	**20**	05	06	06	-	03	-	-
March	03.03.13	**25**	07	05	05	-	02	06	-
April	07.04.13	**23**	05	08	06	-	04	-	--
May.	02.05.13	**20**	04	06	07	-	03	-	-
June	16.06.13	**30**	05	07	05	-	07	04	02
Total		**318**							

Table 19: Mosquito Population at Jijamata Uddyan Gavhane Chowk during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**95**	18	21	22	18	16	-	-
Aug.	05.08.12	**32**	12	07	-	26	-	02	-
Sept.	02.09.12	**64**	18	20	-	21	-	05	-
Oct.	02.10.12	**38**	10	12	-	11	-	05	-
Nov.	04.11.12	**31**	11	09	-	06	-	11	-
Dec.	02.12.12	**26**	10	05	-	-	07	04	-
Jan-	06.01.13	**28**	09	07	-	-	06	06	-
Feb.-	02.02.13	**22**	08	05	-	-	01	08	-
March	03.03.13	**36**	12	07	-	-	07	10	-
April	07.04.13	**25**	11	04	-	-	03	07	-
May.	02.05.13	**19**	07	05	-	-	02	05	-
June	16.06.13	**39**	09	09	-	-	10	11	-
Total		**455**							

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Table 20: Mosquito Population at Feroz Cinema Hall area during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**25**	04	11	-	-	03	07	-
Aug.	05.08.12	**26**	05	10	-	-	07	02	-
Sept.	02.09.12	**22**	-	06	03	03	08	02	-
Oct.	02.10.12	**38**	-	12	06	10	03	07	-
Nov.	04.11.12	**27**	-	09	03	05	08	02	-
Dec.	02.12.12	**18**	07	05	-	-	04	03	-
Jan-	06.01.13	**20**	03	05	-	-	07	05	-
Feb.-	02.02.13	**21**	05	04	-	-	05	07	-
March	03.03.13	**25**	03	08	-	-	04	10	-
April	07.04.13	**28**	06	04	-	-	07	11	-
May.	02.05.13	**18**	02	02	-	-	05	09	-
June	16.06.13	**22**	02	04	-	-	06	10	-
Total		**290**							

Table 21: Mosquito Population at Dhar Road area during the study period

Month	**Date**	**Mosoquito Collection**	***An. stephensi***	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Cu. fatigens***	***Cu. armigeres***	***Aedes aegyptyi***
July	01.07.12	**28**	**-**	09	12	-	07	-	-
Aug.	05.08.12	**35**	**-**	12	11	-	-	-	-
Sept.	02.09.12	**39**	**-**	12	17	-	09	-	01
Oct.	02.10.12	**34**	**-**	24	05	-	05	-	-
Nov.	04.11.12	**32**	**-**	17	10	-	05	-	-
Dec.	02.12.12	**26**	**-**	-	06	05	06	09	-
Jan-	06.01.13	**29**	**-**	-	08	06	07	08	-
Feb.-	02.02.13	**31**	**-**	-	09	08	06	08	-
March	03.03.13	**31**	**-**	-	09	06	07	06	03
April	07.04.13	**24**	**-**	-	08	07	05	04	-
May.	02.05.13	**20**	**-**	-	07	06	03	04	-
June	16.06.13	**32**	**-**	-	10	08	08	06	-
Total		**361**							

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Table 22: Distribution of mosquitoes from the Month of July 2012 to June 2013

Sr. No.	Month	Mosquitoes species						
		Anopheles stephensi	***An. culcifacies***	***An. subpictus***	***An. sephestes***	***Culex fatigens***	***Culex armigeres***	***Aedes acgypti***
1	**July**	15.90	11.07	16.66	15.1	10.4	5.44	2
2	**Aug.**	12.23	6.11	15.64	16.62	11.07	4.88	2
3	**Sept.**	15	11.72	12.75	2	9.33	5	1.5
4	**Oct.**	12.18	11	8.6	13.09	6.83	5.11	2.25
5	**Nov.**	8.54	3.68	8.90	10.91	6.38	5.33	5
6	**Dec.**	9.68	9.36	6.18	6.33	5.86	4.6	6
7	**Jan.**	10.26	4.05	5.83	4.7	6.08	4.8	1
8	**Feb.**	13.38	10.57	6.85	6.41	5.14	6.42	Nil
9	**March**	10.47	7.58	7	7	5.58	5.87	8
10	**April**	8.22	7.56	1.13	5.85	5.46	4.87	Nil
11	**May**	6.5	5.27	6	6.33	4.64	3.87	Nil
12	**June**	7.75	10.68	6.92	6.66	6.2	5.25	2

Table 23: Comparative intensity of mosquitoes from July 2012 to June 2013 months

Sr. No.	Location	Mosquito genus	Density											
			July	Aug	Sept	Oct	Nov	Dec.	Jan.	Feb.	Mar	April	May	June
1)	Trimurti Nagar	*Anopheles*	16.6	22.85	11.90	9.52	8.57	8.57	11.90	7.14	9.52	5.71	4.76	8.57
		Culex	-	-	-	-	-	-	-	-	-	-	-	-
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
2)	Pratap Nagar	*Anopheles*	48.57	48.09	34.76	24.76	18.09	1%	8.57	9.04	1	7.6	9.52	1.04
		Culex	-	13.80	12.85	2.85	-	-	-	0.47	-	-	0.47	-
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
3)	Pardeshwar Temple	*Anopheles*	7.14	8.09	1	2.85	3.80	9.52	7.14	8.09	11.90	1	8.57	0.95
		Culex	7.14	0.95	6.66	6.19	4.28	0.47	-	0.47	-	-	-	-
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
4)	Boralkar Nagar	*Anopheles*	10.4	16.66	14.28	21.42	19.04	10.95	8.09	8.09	11.42	9.04	9.04	14.76
		Culex	7.61	8.09	-	-	-	5.71	-	1.42	5.23	3.33	2.38	-
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
5)	R.Gandhi Coll	*Anopheles*	15.71	23.80	9.52	17.61	19.04	15.71	13.33	14.76	23.33	14.76	8.09	1.73
		Culex	5.71	3.33	2.85	7.14	4.76	3.80	-	-	-	0.23	-	-
		Aedes	-	-	-	-	-	-	-	-	-	-	-	0.63

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6)	**Near Global Sciences Academy**	***Anopheles***		29.04	57.61	23.33	14.76	12.38	12.85	17.61	18.09	13.33	13.80	3.21
		Culex		-	-	-	-	4.76	1.90	0.95	2.38	10.95	2.38	-
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
7)	**Khan Area**	***Anopheles***	3.33	11.42	8.57	7.14	8.09	6.66	12.38	14.76	16.19	19.52	11.42	12.85
		Culex	4.76	11.42	2.38	4.76	6.19	3.33	-	-	-	0.47	0.95	1.90
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
8)	**Ambedkar Nagar**	***Anopheles***	13.33	11.42		9.52	15.23	10.95	7.61	13.33	17.14	14.28	11.90	10.95
		Culex		4.76	-	-	-	3.33	6.19	-	-	0.95	-	-
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
9)	**Near ITI**	***Anopheles***	17.14	21.42	14.76	13.80	11.90	1	1	13.80	18.57	3.33	11.90	5.71
		Culex	-	-	-	-	-	-	5.71	8.09	4.76	-	-	3.33
		Aedes	-	-	-	-	-	-	1.90	-	1.42	-	-	-
10)	**Subhedar Nagar**	***Anopheles***	4.28	4.76	18.57	24.76	10.95	13.80	16.66	13.33	13.80	0.47	8.57	8.57
		Culex	3.33	5.71	-	-	2.85	4.76	-	-	1.42	3.80	3.33	7.61
		Aedes	-	-	-	4.76	-	-	-	-	-	-	-	-
11)	**Kakde Nagar**	***Anopheles***	16.66	9.04	10.47	7.61	6.66	9.04	7.61	8.57	9.52	5.71	4.28	-
		Culex		6.19	3.80	6.19	6.66	1.90	2.38	4.76	1.90	4.76	3.80	11.90
		Aedes	-	-	-	-	-	-	-	-	-	-	-	0.95
12)	**Pingalgadha Nala**	***Anopheles***	9.52	17.14	8.09	7.14	7.61	11.90	10.47	11.90	10.47	8.57	10	10.95
		Culex	7.14	6.66	3.80	2.85	4.76	-	2.85	2.38	1.42	5.71	2.38	4.28
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-

13)	**Near BSNL Office**	***Anopheles***	16.66	18.09	17.14	14.28	25.71	34.76	25.23	19.04	20.00	19.04	8.09	8.09
		Culex	9.04	8.09	6.66	9.04	5.23	-	-	-	-	-	4.28	7.17
		Aedes	-	-	-	0.95	-	-	-	-	-	-	-	-
14)	**Neeraj Hotel**	***Anopheles***	15.23	8.09	8.09	7.14	6.19	5.23	6.19	6.19	5.71	1.42	2.38	5.71
		Culex	3.33	-	-	-	-	1.90	3.80	9.04	6.19	8.09	6.19	6.66
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
15)	**Bus Stand Area**	***Anopheles***	9.52	13.33	12.85	13.33	7.14	6.66	6.19	7.61	6.66	6.19	7.14	10.00
		Culex	6.66	7.14	-	5.71	4.76	1.90	3.33	2.85	5.23	4.76	2.85	3.33
		Aedes	0.95	-	-	-	-	-	0.47	-	-	-	-	-
16)	**Railway Station Area**	***Anopheles***	9.52	15.71	17.61	19.04	15.71	10.47	12.38	13.80	20.47	17.14	12.85	15.23
		Culex	7.61	5.71	7.14	4.76	3.80	3.80	2.38	4.76	-	12.85	-	0.95
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
17)	**V.N.M.A. University**	***Anopheles***	0.47	6.19	10	9.04	6.19	7.61	9.52	11.42	11.90	10.47	7.61	8.57
		Culex	14.28	2.85	3.80	3.33	4.76	2.38	3.80	1.90	3.33	2.38	3.80	6.19
		Aedes	-	0.95	2.38	1.90	1.90	-	-	-	-	-	-	-
18)	**Shankar Nagar Area**	***Anopheles***	5.42	11.90	11.42	7.61	7.14	7.14	6.19	8.09	8.09	9.04	8.09	8.09
		Culex	7.61	10.95	1.90	4.76	3.33	2.38	2.38	1.42	3.80	1.90	1.42	5.23
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-

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19)	**Near Jijamata Uddyan**	***Anopheles***	29.04	21.42	28.09	15.71	12.38	7.14	7.61	6.19	9.04	6.66	5.17	8.57
		Culex	16.19	0.95	2.38	2.39	5.23	5.23	5.71	4.28	8.09	4.76	3.33	10
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
20)	**Feroz Cinema Hall**	***Anopheles***	7.14	4.76	5.71	13.33	8.09	5.71	3.80	4.28	5.23	4.76	1.90	2.85
		Culex	4.76	4.28	4.76	4.76	4.76	3.33	5.71	5.71	6.66	8.57	6.66	7.61
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-
21)	**Dhar Road**	***Anopheles***	10	16.61	13.80	13.80	12.85	5.23	6.66	8.09	7.14	7.14	6.19	8.57
		Culex	3.33	-	4.76	2.38	2.38	7.14	7.14	6.66	6.19	4.28	3.33	6.66
		Aedes	-	-	-	-	-	-	-	-	-	-	-	-

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Mosquitoes
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About Book

Mosquitoes are epidemic burden to human being which causes severe health as well as wealth losses. Among the all insects, diversity of mosquitoes is of greater importance in terms of public health. They transmit dreaded diseases such as Malaria, dengue, filariasis and so on. This book is about the distribution of mosquitoes and mosquito borne diseases from Parbhani city. This well illustrated book contains seasonal abundance i.e. intensity and density of described mosquito species from Parbhani city. This book is written in simple, lucid language and easy to understand style. The book has been designed for students, teachers and scientist who are interested in the study of taxonomy of mosquito. This book is also helpful to create the awareness about mosquito borne diseases. It also provide bibliography for further references.

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