Executive summary of the UGC Approved Minor Research Project

Entitled: "Ecological studies on mosquito species and community perception regarding the mosquito borne diseases in Sullia Taluk of Dakshina Kannada District".
Name of the Principal Investigator: Sri Ishwara Prasad K.S.

The **First chapter titled "Introduction"** provides a brief plan of the subject matter of the proposal, research objectives, techniques and scope of the study. The ecology and distribution of various mosquito species are important in the determination of mosquito abundance and associated diseases prevalence. Some aspects of human ecology greatly influence mosquito distribution, species relative abundance and their survival. The effects of land use change by humans have long been recognized as a factor in the exacerbation of mosquitoes and mosquito-borne diseases. These alterations can be water retention systems, deforestation, agricultural development, canal irrigation and urbanization. In addition to these alterations human behaviour associated with each of these landscape modifications may contribute significantly to vector and disease transmission.

India is ranked fifth in terms of mosquito biodiversity after Brazil, Indonesia, Malaysia and Thailand. The Indian mosquito fauna includes 393 species divided among 49 genera and 41 subgenera. Subfamily Anophelinae contains 61 species in one genus followed by subfamily Culicinae with 332 species in 11 tribes and 48 genera. Tribe Aedini of subfamily Culicinae contains the highest number of species (176 species in 33 genera.

Mosquitoes are capable of breeding in a variety of environments. Many mosquitoes are generalists and choose a variety of oviposition sites, whereas others are specialists and choose unique habitats for laying eggs. The specialist mosquitoes tend to disappear after land use changes (e.g. deforestation), but generalists are able to survive in a wide range of habitats. There are several types of oviposition sites, which can be categorized into ground water sites or container sites. Ground water sites include rivers, lakes, ground pools and many more. Container sites include artificial containers (such as tires, bottles, cups, jugs) or natural containers (such as fallen leaves, tree holes, tree stumps and plant axils). Mosquitoes are able to breed in permanent water, semi-permanent water or temporary pools. Mosquito larvae can be found in numerous habitats. Each habitat produces specific mosquito species and show a seasonal progression of species.

One approach to surveillance is to identify key environmental factors that predict the presence of vector populations, and then use these factors as markers to predict

the presence of significant larval densities. A quantitative description of larval demography can produce data useful for the control of larval population. The biological and physico-chemical attributes of the aquatic environment may alter adult vector competence.

Socioeconomic conditions of a community have direct bearing on the problem of diseases. Public suffers from malaria as is not taken very seriously. General public is unaware of malaria related symptoms and so promptness in treatment is not realized. People are still confused over symptoms of various mosquito borne fevers and its preventive measures. Major part of population is poor in disease assessment, attitudes towards healthy life style and knowledge of mosquito control strategy. Appropriate health education messages to public are important. Efforts are being put by government to control mosquito breeding and disease prevalence. In addition to that government is also running awareness programmes through media, despite diseases are not under controlled. One of the important components of Vector borne disease control programme is to impart awareness about mosquito bite prevention in the general community.

According the District Vector Borne Disease Control Board, there were 6,215 and 5660 cases of malaria has been reported from Sullia taluk in the years 2012 and 2013. The other vector borne diseases like dengue was also common in the taluk. In 2013, 141 cases of dengue were detected and two deaths occurred because of dengue fever. The mosquito-borne disease has reached epidemic proportions in Sullia taluk. Of the affected areas, Kamila, Panja, Katta, Guthigaru, Kayambadi villages of this taluk are the severely affected regions. Hence, for the development of a suitable health education approach and for the success of community based programmes, it is also necessary to understand the level of knowledge and perception of the community about mosquitoes and their breeding habitats, diseases transmission, the preventive measures taken and how best the people can participate in the control efforts. Therefore the present study entitled **"Ecological studies on mosquito species and community perception regarding the mosquito borne diseases in Sullia Taluk of Dakshina Kannada District" is taken up with the following objectives**

1. To survey the mosquito species diversity and breeding habitats of the study area.
2. To study the physiochemical parameters of mosquito breeding habitats
3. To study the level of knowledge and perception of the community regarding mosquito borne diseases

The **second chapter titled, "materials and methodology"** gives information about the demographic features of the study area and methods used for the study. Sullia (12°33′29″N 75°23′21″E) is a taluk in the Dakshina Kannada district of the state of Karnataka, India (Figure 2.1). It is bordered by Puttur in the north, Kodagu District in the east and south and Kerala in the west. It has a total area of 826 sq km. Sullia town as its taluk headquarters. The topography of the region is marked by evergreen forests (43282 hectares) in the Western Ghats range in South India and rocky terrains situated 949 meters above the sea level. Kumaradhara and Payaswini are major rivers traversing the taluk. The region has fertile land and rich water resources. The monsoon comes during the months of June to September. The post-monsoon season occurs from October to January. The pre-monsoon or dry season occurs from February to May.

Sample collections of immature stages of mosquitoes were done twice a month in five localities of Sullia taluk namely Sampaje, Aranthodu, Guthigaru, Sullia town, and Bellare from June 2015 to May 2016. The larval and pupal mosquitoes were collected using dippers holding 300ml water from the different mosquito larval habitats. The mosquito larvae were then taken to the laboratory and reared in plastic rearing containers or in white enamel trays **(**15 cm x 10 cm x 5 cm) filled with water taken from the field. As the adults emerge, they were collected using a mechanical aspirator. The mosquitoes inside the cages were fed with 40% sugar solution soaked in cotton. The larvae were identified using standard keys and was confirmed by dissecting larva through the observations of mentum, pectin teeth, comb plate and other morphological characters.

During larval collection, the physic-chemical parameters of the habitats, the water temperature, conductivity and total dissolved solids were determined at specific sites, using digital and EC/TDS hydrotester (HM digital COM-80)and p^H was measured using p^H Paper and portable pH metre. Physicochemical parameters such as, Total Dissolved Solids (TDS) concentrations of Nitrate (NO_3), Phosphate (PO_4), Calcium, Magnesium and Sodium of water samples was analyzed using portable water analysis kit. The water samples for dissolved oxygen were carried in 300ml BOD bottles and preserved in refrigerator at 4^oC for the analysis of dissolved oxygen. The dissolved oxygen was estimated by Wrinkler's method.

To know the community perception regarding the mosquito borne diseases questionnaire consisted of questions regarding information on various aspects of mosquito bite, why they perceived mosquitoes as a problem, where do the mosquitoes breed, when do

the mosquitoes bite, preventive measures against, personal measures being taken, whether government was doing something to reduce mosquitoes, what the government was doing, knowledge of diseases transmitted by mosquitoes, Knowledge of symptoms of various mosquito borne diseases, source of treatment, breeding places of mosquito, measures of prevention of mosquito bite, diseases transmitted by mosquito bite and service utilization for diseases were prepared. The questions were asked in local language and collected in questionnaire. The multi-stage random sampling method was used covering town, rural and interior villages of the study area.

The **third chapter titled, "results and discussions"** gives information on the results of the present project work and discussions and the analysis of the results. Mosquitoes of 20 species belonging to 10 genera namely *Culex* (5 spp.), *Anopheles* (4 spp.), *Armigeres* (3 spp.), *Stegomyia* (2 spp.), *Hulecoeteomyia*(1sp.), *Fredwardsius*(1sp.), *Lutzia* (1sp.), *Malaya*(1sp.), *Tripteroides*(1sp.), and *Toxorhynchites* (1 sp.) were recorded. The species recorded are *Anopheles fluviatilis,An. stephensi, An. annularis, An. maculates, Armigeres aureolineatus, Ar. subalbatus, Ar. flavus, Hulecoeteomyia chrysolineata, Fredwardsius vittatus, Stegomyia aegypti, St. albopicta, Culex quinquefasciatus Cx. gelidus Cx. mimulus, Cx. tritaeniorhynchus, Cx. uniformis, Lutzia halifaxii, Malaya genurostris, Tripteroides arenoides* and *Toxorhynchites splendens.* Mosquito species documented from larval collections from 14 different habitats across the five sites (Sampaje, Aranthodu, Guthigaru, Sullia town, and Bellare) of Sullia taluk. Among the different habitats surveyed, a maximum of 16 species of mosquitoes were documented from receptacles, followed by 9 species from ditches, 7 species from swamps and cisterns. Shannon- Weaver and Simpson's index were higher (2.736 and 0.9099) in post- monsoon season followed by monsoon (2.539 and 0.8859) and lower in pre-monsoon season (2.154 and 0.8435). These indices revealed that in the study area the post monsoon is the most productive season.

The relationship between the physico-chemical parameters of the larval habitats were compared with the mosquito species diversity. The number of mosquito species was maximum (15) in post-monsoon in receptacles which showed the highest mean temperature of 30ºC. Only one mosquito sp. was recorded from stream during pre-monsoon period.

The community perception studies revealed that out ofl 200 respondents 110 (55%) are males and 90 (45%) females. Knowledge regarding various symptoms of

mosquito borne diseases revealed that, 88.5% of the respondents knew that the mosquitoes are the vectors or transmitters of various communicable diseases. Only 11.5% individuals had no idea about the mosquito borne diseases. When disease transmission by mosquitoes was questioned, the respondents had a good knowledge of fever (57%) as a common mosquito borne disease symptom. Most of the respondents (76%) were also aware of the fact that prevention of mosquito breeding grounds especially near the houses, schools, hospitals, hotels, office buildings and indoor regions help to control the mosquito population and there by helps in controlling the spreading of mosquito borne diseases.

Conclusion:

Documentation of mosquito species and its general information on locations, densities, abundance and distribution may help to predict larval habitats, adult resting places and even to make preliminary recommendations for control programs. The high incidence of dengue and chikungunya may be due to the higher density of *Stegomyia albopicta* which is known to be a potential vector was abundantly found throughout the study sites and throughout the season. The role of physiochemical parameters lends a hand to identify the potential factors that support mosquito breeding. The study on community knowledge and perception has a potential to bring forward possible about the preventive measures, to maintain their personal hygiene and cleanliness of the surroundings they are living in. The importance of combining field surveillance activities with the community sensitivity may provide an inclusive tool for understanding of the frequency of mosquito borne diseases in the taluk. Land use changes, such as deforestation, urbanization and agriculture can affect mosquito abundance, diversity and community composition. The expansion of rubber plantation sites by converting forest area in Sullia taluk is the main cause for deforestation which resulted in a higher prevalence of mosquito-borne diseases, such as dengue and chikungunya. The results of the present study form a baseline for further studies about mosquito distribution patterns and its relationships with the incidence of diseases. Seasonal methodical survey can throw light on distribution of mosquito species in different habitat and their association with diseases in Sullia taluk, D.K. district.

Principal Investigator