A STUDY TO ASSESS THE STATUS OF MOSQUITO BREEDING IN LARVAL HABITATS IN RUMASSALA HILL IN GALLE DISTRICT, SRI LANKA

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INTRODUCTION

The chemical control interventions are usually targeted against adult mosquito vectors expecting a rapid reduction in diseases transmission. However it has been realized that the highly mobile flying adult insects can readily detect and avoid such interventions. (Killeen *et al*, 2002) Unlike adults, mosquito eggs, larvae and pupa are confined to small aquatic habitats where they cannot readily escape control measures directed against larvae and pupae (Tadesse *et al*, 2011).

Many studies report on the importance of assessing the breeding ecology of mosquitoes, their species-specific use of different larval habitats, identification of most productive habitats, prevalence of larvae correlated with physical and biological properties of larval habitats for effective management of larval population (Tadesse *et al*, 2011, Muturi *et al,* 2007, Suganthi *et al*, 2014).

Rumassala hill in Galle district, Sri Lanka, visited frequently by local and foreign tourists, is a suburban area having in its surrounding forest patches bordering the sea on its south western side. It contains potential natural larval habitats due to hilly and uneven nature of its landscape and also artificial larval habitats due to recent urbanization. Systematic scientific studies on mosquito species and their breeding ecology have not been carried out at Rumassala, although filariasis is a common disease among inhabitants and Dengue cases have also been reported.

The present study was designed to investigate the prevalence and abundance of mosquito species and their utilization of larval habitats at Rummassla hill, Galle district.

METHODOLOGY

The study was carried out from January to July 2014 in 8 sampling sites at Rumassala hill in Galle district and each sampling site was approximately 80 m^2 and was located 100meters from each other. Considering the variation in the terrain, four sampling sites were located in the coastal forest area while the remaining four were located in the nearby residential area. Monthly collections of immature mosquito stages were carried out from 52 larval habitats of the 8 sampling sites, using the standard 13 cm diameter ladle with 90 cm wooden handle and 3 ml dipper using the WHO recommended standard techniques in collecting larvae. Third and fourth instar larvae and pupae in the collections were counted and reared up to adult stage in the laboratory and identified using standard keys. Larval identification was not attempted since it requires years of experience, skill and practice. Data analysis was performed using MINITAB Version 17.1 and ANOVA was used to determine differences in larval counts during sampling months, species present and habitats types.

RESULTS AND DISCUSSION

Mosquito breeding was observed in 11 larval habitat types within the 8 sampling sites during the study period from January to July 2014. They included fallen coconuts, leaf axils, tree

holes, rock pools, discarded items, boats, baskets, flowerpots, ponds, house drains and rock holes. Of these, fallen coconuts and tree holes were restricted to the forest patches while house drains, baskets, flower pots and ponds were found only in the residential area. Breeding sites sampled monthly had 680 mosquito larvae (L_3 and L_4 stages) and on rearing them under laboratory conditions, 663 emerged as adult mosquitoes (Percentage emergence 97.5%). The emerged adults belonged to 7 species of mosquitoes (figure1).
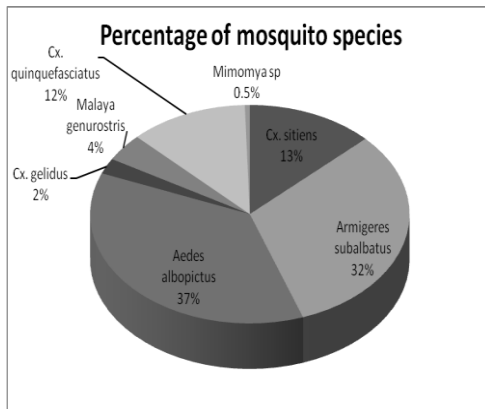

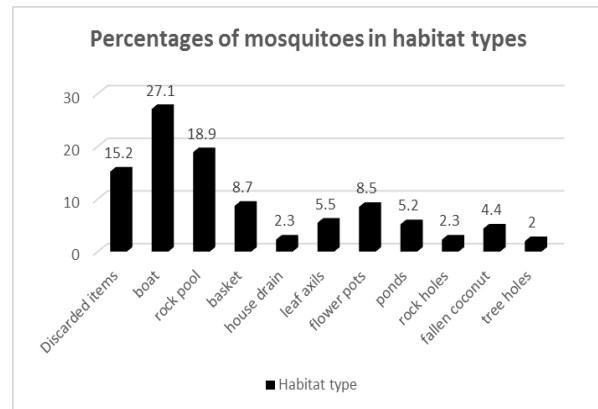**Figure 1.** Species distribution in study area

Figure 2. Percentage total of mosquito larvae in habitat types

Of these species *Aedes albopictus* and *Culex quinquefasciatus* were vectors of human diseases namely dengue and bancroftian filariasis and *Armigeres subalbatus* is a carrier of *Dirofilaria repens* causing parasitic infections in dogs. *Aedes albopictus* was the most abundant mosquito species (37%) followed by *Aedes albopictus* (32%). *Culex quinquefasciatus* and *Culex sitens* having respectively 12% and 13% were next highest among 7 species and the remaining 3 species, namely *Malaya genurostris, Culex gelidus* and *Mimomya* sp, had percentage abundances less than 5%. Previous studies on similar habitat types and using the same method of sampling in other locations in Galle also records the presence of the seven species and indicate the predominance of *Aedes albopictus* (53%), followed by *Aedes albopictus* in larval samples (14%) (Seneviratne, 2014)

Figure 2 indicates the total percentage of mosquito larvae in different larval habitat types. The highest percentage of larvae were observed in boats followed by rock pools and discarded items. Of these habitats, rock pools were natural habitats whereas boats and discarded items were artificial habitats. Baskets and flower pots had comparatively higher percentages of mosquitoes and the remaining habitat types had less than 5.5 % of larvae. Leaf axils, tree holes and fallen coconut were natural habitats, but had lower percentage of larvae probably because they held a smaller content of water during the study period.

Monthly variations in the total mosquito larvae from all habitat types indicate that the highest percentage of mosquito larvae were sampled in July 2014 and the lowest percentage of larvae were sampled in April 2014 (Figure3). Species wise fluctuation in mosquito larva with time (Figure 4) showed an upward trend throughout the sampling period of *Armigeres subalbatus* and highest percentages during the months of June and July. *Aedes albopictus* in contrast showed a downward trend from January to March but after March it showed an upward trend. Majority of *Aedes albopictus* was encountered in July from larval habitat types. The remaining species including *Culex quinquefasciatus,* vector of Bancroftian filariasis showed fluctuations throughout this time but contributed to less than 3% of the total sample every month. One reason for lesser percentages of *Culex quinquefasciatus* may have been clearing of house drains, a characteristic habitat of *Culex quiquefasciatus* by residents just after sampling began.
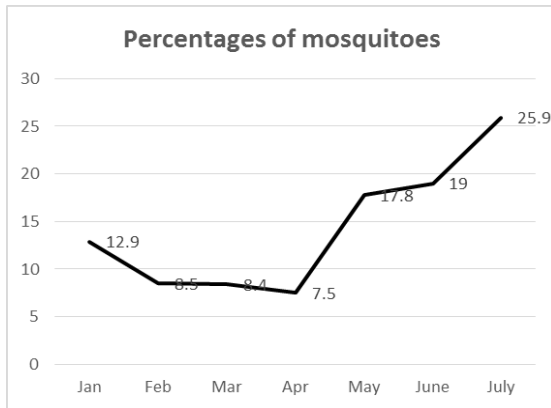
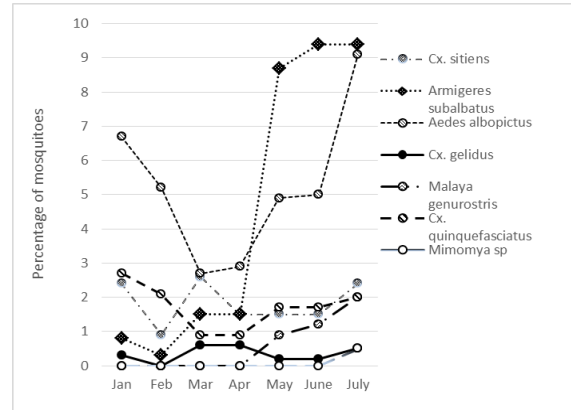**Figure 3.** Monthly variation in mosquito larvae

Figure 4. Monthly variation in larval species

When speices wise distribution in different larval habitats was investigated (Figure 5) maximum number of larval speices was encountered in boats. Boats had in descending order of abundance, *Cx.sitiens*, *Cx.qunquefasicatus*, *Armigeres subalbatus* and *Aedes albopictus.* In contrast to this study, Seneviratne (2014) reports 43% abundance of *Aedes albopictus* in boats in Galle district.
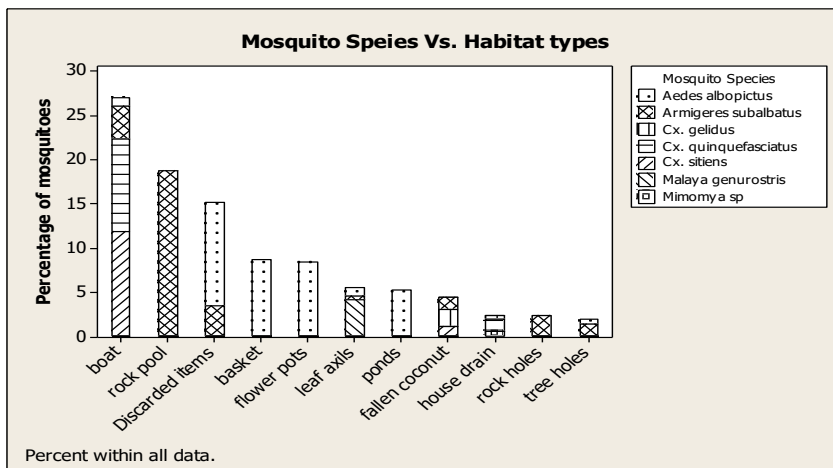

Figure 5. Species wise mosquito abundance in different larval habitats

Since maximum total of larvae were found in boats (Figure 2) and also the maximum total number of species were found within boats (Figure 5), boats can be considered as the most productive larval habitat type at Rummassala. *Aedes albopictus* was the only species found in ponds, flower pots and baskets. However, discarded items, a characteristic larval habitat of this species had the highest percentage of *Aedes albopictus*, similar to larval surveys conducted in Kandy, Kurunegala and Nuwara Eliya (Kusumawathi and Siyabalagoda, 2005, Weeratne, *et al.* 2013) Leaf axils and tree holes, had less than 2% of *Aedes albopictus*. Approximately 12% of the *Culex quinquefasciatus*, vector of Bancroftian filariasis, was found in boats docked near the coast line containing water rich in organic matter.

Monthly variation of the total number of mosquitoes was not significant at 5% significance level (p=0.111). However the abundance of mosquitoes varied significantly with species and the habitat types (p= 0.000 and p = 0.006 respectively at 5% significance level). Tukey test performed to prove which species were most abundant revealed that *Aedes albopictus* and *Armigeres subalbatus* were predominant species in sampling sites at Rumassala and that their abundance was significantly different from other mosquito species. Abundance in boats, rock pools and discarded items were significantly different from other habitat types.

CONCLUSIONS/RECOMMENDATIONS

Seven mosquito species, of which two vectors of human diseases, *Aedes albopictus* and *Culex quinqufasciatus*, were found in larval habitats during January to July 2014. High abundance of *Aedes albopictus,* may cause a threat to transmission of Dengue among people living at Rumassala. Species present did not utilize all larval habitat types, equally. Further studies coupled with water quality studies are required to characterize the larval habitats and determine the species- specific utilization of larval habitats. Boats were the most productive larval habitat in terms of larval abundance. Discarded items had the highest abundance of *Aedes albopictus.* Removal of discarded items, applying oil to the surface water in abandoned boats and draining of water from other larval habitat by the community or the health authorities can be considered as practices that will reduce mosquito breeding at Rumassala.

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ACKNOWLEDGMENTS