BRACKISH WATER MOSQUITO PROBLEM OF VYPEEN ISLAND, COCHIN, KERALA

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Abstract. A preliminary study has shown that the marshy terrain and brackish water bodies associated with mangrove forests contributed profuse breeding of mosquitos in Vypeen island, causing a severe menace to the island population. A total of 14 species belonging to four genera *viz, Aedes, Anopheles, Armigeres* and *Culex* was recorded from different habitats. *Culex sitiens* was found to be the predominant mosquito in all the perennial breeding habitats. The extent of different habitats in the production of mosquitos, and its possible abatement, using environmental and/or biocontrol methods are discussed.

INTRODUCTION

The magnitude of the mosquito menace in the Vypeen island of Cochin, Kerala forced the people even to approach the judiciary for their right to live in a mosquito free environment, leading to a direct confrontation with the administration. The island, being situated in a low lying area inundated with brackish water, favors the formation of many potential breeding grounds for different mosquito species. *Culex sitiensa*, voracious man biting mosquito is known for its ability to breed in brackish water and distributed in the coastal areas of the Oriental region, East Africa, Australia and Fiji (Barraud, 1934). Experimental infection and successful development of *Brugia malayi* parasite was observed in *Cx. sitiens* by Iyengar (1938). Later, natural infection with infective stage larvae of *Wuchereria bancrofti* had been reported in this species from East Africa (Mosha and Magayuka, 1979). As this species has greatly involved in creating a nuisance in Vypeen island, a known endemic focus of lymphatic filariasis, the present study was undertaken to discern the nature of mosquito problem, and also to suggest suitable remedial measures.

MATERIALS AND METHODS

Study area

Cochin city is situated 9° 58' 30" N latitude and 76° 18' 20" E longitude. It includes many surrounding islands. One of the important islands adjacent to north of Fort Cochin is Vypeen. It lies between the backwater on the east, the Arabian sea on the west, and Cranganur and Cochin bars on the north and south. The present study was restricted to one of the six village panchayats in the island *viz* Elamkunnapuzha panchayath (Puduvypeen), where the mosquito problem was reported to be very high. The total area of this panchayath is 11.66 km^2 with 8,971 houses and a population of 47,878.

The soil is mainly of alluvium type. In some parts of this area soil is sandy in texture varying from sandy loam to pure sand. Mangroves are found in abundant throughout the island, and some of the major species include, *Aviciinnia officinalis, Rhizophore mucronata* and *Bregaria cylindrica.* Other plants such as coconut, casuarina and arecanut are also found in large numbers. Fishing and agriculture are the major occupation of the people. There are innumerable ponds and canals, besides shallow channels crisscrossing the entire area. The edges of the channels and ponds are thickly covered with mangroves.

Tropical humid climate prevails in this area. During the past five years the mean maximum temperature was 32.57°C (May) and the mean minimum temperature was 22.22°C (January). Rain fall is due to both south-west (August-September) and north-east (October-December) monsoons and the former contributes the maximum. The annual rainfall ranged between 2,800 mm and 3,600 mm in the past years.

Methods

A survey was carried out in Vypeen island during the post monsoon period of the year 1994 and

prepared a detailed map of the island. All mosquito breeding sources were identified. Different mosquitogenic habitats were sampled for the immatures of mosquito species. The proportion of area positive for breeding and daily adult emergence were estimated. Pupae collected were kept separately for emergence to confirm the species.

Indoor resting mosquitos were collected from randomly selected stations by spending 15 minutes in each house, in the early hours of the morning. Man landing collections were conducted between 18.00 and 22.00 hours at different points of intervals from the bar mouth of Cochin. Mosquitos collected in the field were brought to the laboratory and identified. About ten percent of all the wild caught mosquitos were dissected for filarial infection. All types of water bodies were searched for the commonly available fishes to explore the possibilities of utilizing them as bio-control agents against mosquito breeding.

RESULTS

The major mosquito breeding habitats in Vypeen island include (i) perennial breeding grounds *viz* mangrove pools, marshy grounds, channels, ponds, coir pits, casuarina pits, cement tanks, cement lined drains, septic tanks and wells, and (ii) transient peri-domestic habitats *viz* grinding stones, water meter chambers, coconut shells, broken bottles, plastic containers, flower jars, mud pots, tires etc, The breeding surface area of different types of perennial habitats and the estimated daily emergence mosquitos are given in Table 1. Marshy grounds contributed to the highest mosquito emergence followed by channels, mangrove pools, coir pits, cement lined drains, casuarina pits, cement tanks and wells.

A total of 14 species belonging to four genera were recorded from different habitats (Table 2). The breeding of *Cx. sitiens* was found in most of the perennial habitats. *Cx. sitiens* was in large numbers (98.9%), within six km from the bar mouth of Fort Cochin and they were fewer beyond this distance. Six species of mosquitos belonging to four genera were collected from indoor resting collections. *Cx. sitiens* was the predominant species and the per man hour density (PMD) varied from 13.5 to 193.5 in different stations, with the average being 107.03. The other species collected, with the PMD in parentheses include *Cx. quinquefasciatus* (27.39), *An. subpictus* (7.16), *Ae. aegypti* (11.36), *Ae. albopictus* (6.57) and *Ar. subalbatus* (2.39). Four species of mosquitos belonging to four genera were obtained from man biting mosquitos collections. *Cx. sitiens* was found to be the most abundant species constituting 97.27% of the total mosquitos collected. The other species recorded in order of their abundance include *Cx. quinquefasciatus* (1.28%), *Ar. subalbatus* (0.85%) and *An. subpictus* (0.33%). None of the mosquitos dissected was found to be infected with filarial parasites. However, it is not possible to arrive at a conclusion on the transmis-

Table 1

Breeding status of various habitats and estimated mosquito emergence in Vypeen Island.

Sl No.	Type of habitat	Total surface area(m^2)	Breeding surface area(m^2)	Estimated daily emergence (in million)
1	Casuarina pits	606	496	0.48
2	Cement tanks	443	89	0.06
3	Cement lined drain	1,722	855	1.35
4	Channels	90,688	19,660	147.82
5	Coir pits	700	595	3.89
6	Mangrove pools	7,433	1,925	6.94
7	Marshy grounds	938,375	40,055	192.74
8	Ponds	271,136	18,671	37.90
9	Wells	269	43	0.01

Table 2

Mosquito species recorded from different habitats in Vypeen Island.

Sl No.	Mosquito species	Breeding habitats
01.	*Aedes (Stegomyia) aegypti* (Linnaeus, 1762)	BO, CS, CT, DR, GS, MP, TY, and WE
02.	*Aedes (Stegomyia) albopictus* (Skuse, 1894)	BO, CS, CT, DR, GS, MP, TY, and WE
03.	*Anopheles barbirostris* Van der Wulp, 1884	PO
04.	*Anopheles nigerrimus* (Giles, 1900)	CAP, PO and WE
05.	*Anopheles (Cellia) subpictus* (Grassi, 1899)	CA, CAP, PO, MP and WE
06.	*Anopheles (Cellia) vagus* (Donitz, 1902)	CA, CAP, and PO
07.	*Armigeres subalbatus* (Coquillett, 1898)	CD, CT, GS, MP, ST and TS
08.	*Culex bitaeniorhynchus* (Giles, 1901)	CAP and PO
09.	*Culex brevipalpis* (Giles, 1902)	WE
10.	*Culex (Lutzia) fuscanus* (Wiedemann, 1820)	CT, GS, PO and WE
11.	*Culex (Culex) gelidus* (Theobald, 1901)	COP, MP and PO
12.	*Culex quinquefasciatus* (Say, 1823)	CA, CD, CP, CT, DR, TI, TY WE and WMC
13.	*Culex (Culex) sitiens* (Wiedemann, 1828)	CA, CAP, CD, COP, MG, MAP PO and WE
14.	*Culex (Culex) whitmorei* (Giles, 1904)	PO

BO : Bottles, CA: Canals/Channels, CAP: Casuarina pits,
CD : Cement lined drains, CP: Cess pits, CT: Cement tanks,
CS : Coconut shells, COP: Coir pits, DR: Drums
GS : Grinding stones, MAP: Mangrove pooks, MG: Marshy grounds,
MP : Mud pots, PO: Ponds/Pools, ST: Septic tanks.
TI : Tins, TS: Tree Stumps, TY: Tyres,
WMC : Water meter chambers, WE: Wells

sion dynamics of lymphatic filariasis based on this preliminary observation.

DISCUSSION

Effective control of brackish water mosquitos in mangrove forests of marshy areas is very difficult, as the breeding habitats are inaccessible for routine larvicidal operation. However, under a similar situation in Florida, environmental control measures such as digging and draining, marshy filling and impounding have been effectively used for the past many years to control the salt marsh mosquitos such as *Ae. taeniorhynchus* and *Ae. sollicitans* (Carlson *et al*, 1991).

Environmental improvement is a long term

method. Till it is fully achieved, recurrent measures would have to be continued, but once the environmental improvement is fairly well achieved, the need for recurrent measures becomes greatly reduced (Rao, 1980). The various types of breeding habitats present in Vypeen island could be tackled to reduce mosquitos menace by incorporating different types of environmental manipulation and management measures.

The water logged marshy grounds and channels of different proportion have to be deepened, to make gradient and allow free flow of water. The silt removed from such areas could be utilized for filling up the vast shallow marshy areas and delinked channels. The silt may also be used as manure for agriculture purposes, wherever possible. The reclaimed land could be utilized for a afforestation program.

Domestic ponds and water bodies should be kept free from floating hydrophytes and other algal growth. Composite fish culture is an ideal solution in this type of habitat, as has been demonstrated elsewhere (Panicker *et al*, 1991), which would fetch monetary gain besides the freedom from mosquitos. The prawn culture may extended to all suitable habitats, which has already been practiced in the island. Some of the known indigenous larvivorous fishes found in various habitats of the island include *Aplocheilus* sp, *Chanos* sp, *Etroplus* sp, *Macropodus* sp, *Mugil* sp, and *Tilapia* sp. These fish could also be utilized for effective mosquito control especially in shallow waters.

The pits which are soaked with coconut husks should be lined up and flow of water has to be maintained to avoid water stagnation. Other pits and pools may be filled in with sand or domestic waste as a permanent measure of source reduction.

A comprehensive approach aimed at total development of the entire area giving due importance for information, education and communication (IEC) will only be a practical solution to contain the mosquito problem in this unique situation. Towards this directiion, co-ordinated efforts of various Governmental and non-Governmental agencies involving the target community have to be taken, to make the island free from mosquito menace.

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