Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 4, Issue, 04, pp.105-107, April, 2012

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

RESIDUAL AND OUTDOOR MOSQUITO DISTRIBUTION AND ABUNDANCE IN SOME PARTS OF CALABAR URBAN, NIGERIA

Arong, G. A.*, Oku, E. E., Okon, O. E. and Ikono, M. C.

Department of Zoology and Environmental Biology, University of Calabar, Nigeria

ARTICLE INFO

Article History:
Received 08th January, 2012
Received in revised form
07th February, 2012
Accepted 14th March, 2012
Published online 30th April, 2012

Key words:
Aedes, Anopheles,
Culex,
Indoor and Outdoor.

ABSTRACT

Mosquito is a vector of many human and animal diseases especially in the tropics. A study of the indoor and outdoor distribution and abundance in Calabar was conducted between May and August, 2011. A total of 142 mosquitoes collected showed a composition of *Aedes aegypti, Ae vittatus, Ae domesticus, Ae simpsoni, Ae metalicus, Ae leutocephalis, Ae africanus, Ae taylori, Anopheles gambiae, An. maculipenis, An. rupites, An. Coustani, Culex quinquefaciatus, Cx annuloris, Cx tigripes, Cx decens*. Abundance from the four study areas sampled were Bateba 23.02%, Goldie 23.31%, Uwanse 23.87% and Unical hostels 29.79%. More mosquitoes were collected outdoor, 71.13% than indoor, 28.87% and a higher number was collected between 5pm–8pm than 5am–8am. Mosquito distribution differed significantly between time of collection, sample location and the environments ($P<0.05$). It was observed that human induced environmental changes can have impact on the distribution of mosquito species and it was therefore concluded that mosquito is widely distributed in areas of poor sanitation levels and prevalence of standing water bodies for its breeding.

INTRODUCTION

Mosquito is of immense important as a source of food for some creatures like fish, turtles, tadpoles, some birds, bats as well as other invertebrates like dragonflies. Its importance to mammals range in dynamics of diseases transmission as it is a vector of human and livestock disease. Mosquito borne-diseases are the major health problems in Nigeria as other parts of sub-Saharan Africa. The sub family *Anophelinae* is the major vector of human diseases (Okegun *et al.,* 2005) and the relative abundance of Anopheles species in both natural and artificial breeding sources indicates a higher potential for malaria transmission. (Adeleke *et al*., 2008). Consequently, malaria accounts for the highest mortality rate among other tropical infection (WHO, 1994). Statistics shows that malaria account for 300,000 deaths from 20 million clerical cases annually while 20 -10% of hospital admission are due to malaria (Adelere *et al.,* 2010). Apart from malaria other mosquito-borne infections have also accounted for the huge economic loss, social disgrace, low productivity, absenteeism, sleeplessness, among others in many parts of the country (Anosike, 2003). Human-induced environmental changes have a major impact on the distribution of mosquito species and associated diseases (Brown 2004). *Mansonia africana*, *M. uniformis* and *Cx quinequefasciatus* has been incriminated efficient vectors of filariasis (Wanji *et al.,* 2009). *Anopheles gambiae,* the major vector in Africa is an efficient transmitter of filariasis. *Ae. aegypti* and *Ae. albopictus* are known vectors yellow fever in Africa. These two have been incriminated in harbouring filarial worms and could transit the infective stage to the potential host (Gillet, 1972, Amusan 2004). Anopheles species commonly found in artificial containers include, *An. punitipenis*, which is a major vector in the forest part of the southern Nigeria. All mosquitoes breed in water as the immature must have standing water to develop. However the physiochemical composition of the water bodies are complicated and determined the condition and fauna composition, they include salt, dissolve organic and inorganic matter, degree of eutrophication, turbidity and presence of suspended mud. Others include presence or absence of plants, temperature, light and shade, hydrogen ion concentration, presence of food substance, other insects and arachnids.

Often mosquito species have their own preferred habit base on condition and location of the water body (Iwuala, 1979). Such locations have been classified to include group pools including springs, rivers, ditches and hoof prints. The composition fauna of a pool is influenced by the temporary or permanent nature of the ponds. Rock pools form a distinct class distinguishable into the rock pools cut or bored bamboos, motor vehicles tyre and tubes, barrels closed tanks, earthen wares of varying sizes, rain water drains and rock edge pools (Hopkins, 1953). The purpose of this study is to determine the distribution, relative abundance and and peak periods of mosquitoes in outdoor and indoor environments in Calabar.

***Corresponding author:** gabrielarong@yahoo.com

MATERIALS AND METHODS

Collection of indoor residual mosquitoes

A white piece of linen material was spread on the floor while the doors with windows were closed. The Baygon was sprayed in all corners and hidings of the room. The doors with windows were opened after 30 minutes and all mosquitoes on the cloth were collected with fine forceps into labeled sample bottles. They were conveyed to the laboratory for identifications/sorting. Sample collection was three times a week and lasted for four months.

Collection of outdoor mosquitoes

Sample collection was three times a week and lasted from 5-8am and 5-8pm for four months. Mosquitoes that perched on humans sitting in the open and those on the wall were collected by gently placing a test tube, in which cotton wool moistened with chloroform was placed, on the adult mosquito. Mosquitoes collected were transferred into labeled sample bottles with forceps and transferred to the laboratory for sorting and identification. Mosquitoes collected were identified using (Anyanwu and Iwuala, 1999).

RESULTS

Sixteen (16.0) mosquito species were collected during the studies and three families were observed to be prevalent during the sampling. These included *Aedes aegypti, Ae vittatus, Ae domesticus, Ae simpsoni, Ae metalicus, Ae leutocephalis, Ae africanus, Ae taylori, Anopheles gambiae, An. maculipenis, An. rupites, An. Coustani, Culex quinquefaciatus, Cx annuloris, Cx tigripes, Cx decens.* In terms of abundance, *Anopheles gambiae* recorded the highest percentage prevalence of 16 (11.28%), C*ulex quinquefaciatus*, 15 (10.56%), *An. Maculiperis,* 12 (8.45%) *Aedes aegypti* and *Ae vittatus,* 11 (7.75%), *Ae domesticus,* 10 (7.04%), *Cx annuloris, Cx tigripes* and *An. Rutipes,* 8 (5.63%), *Ae simpsoni* and *Ae leutocephalis,* 7 (4.93%), *An. coustani, Ae metalicus, Ae africanus* and *Cx decens,* 6 (4.23%). The least in terms of abundance was recorded in *Ae taylori,* 5 (3.25%) (Table 1).The highest distribution was recorded in Unical hostel, 42 (29.79%), followed by Uwanse, 34 (23.87%), then by Goldie, 33 (23.13%) and the least percentage abundance was in Bateba, 32 (22.03%). (Table 2).

The dominant species of mosquitoes in the outdoor environment and the percentage composition in the four study areas were *Culex quinquefaciatus,* 11(10.89%),*Anopheles gambiae,* 10 (9.90%), *Ae aegypti*, *An maculipenis*, *Cx tigripes* and *Cx annuloris,* 8 (7.92%), *Aedes simpsoni* and *Ae leutocephalis,* 7 (6.93%), *Cx decens*, *Ae domesticus*, *Ae metalicus* and *An coustani,* 6 (5.94%), *Ae taylori* and *Ae vittatus,* 5 (4.94%) and the dominant species in the indoor environment were *An rutipes,* 8 (19.51%), *Ae africanus*, *Ae vittatus* and *An gambiae,* 6 (14.63%), *An maculipenis*, *Ae domesticus* and *Cx quinquefaciatus,* 4 (9.76%) and *Ae aegypti,* 3 (7.32%) (Table 3). The population of mosquito was higher in relative abundance in the outdoor environment, 101 (71.13%) when compared to that in the indoor environment, 41 (28.87%).

Table 1: Relative abundance and species composition of mosquitoes collected in Calabar

Mosquito species	No. collected	Percentage prevalence
Aedes aegypti	11	7.75%
Ae vittatus	11	7.75%
Ae domesticus	10	7.04%
Ae simpsoni	7	4.93%
Ae metalicus	6	4.23%
Ae leutocephalis	7	4.93%
Ae africanus	6	4.23%
Ae taylori	5	3.52%
Anopheles gambiae	16	11.27%
An maculipenis	12	8.45%
An rutipes	8	5.63%
An coustani	6	4.23%
Culex quiquefaciatus	15	10.56%
Cx annuloris	8	5.63%
Cx tigripes	8	5.63%
Cx decens	6	4.23%
Total	142	

Table 2: Mean distribution of mosquito in the different study areas

Mosquito species	Bateba	Goldie	Unical	Uwanse	Total
Aedes aegypt	2.5	2.5	3.1	2.9	11
Ae vittatus	1.8	2.3	3.7	3.2	11
Ae domesticus	2.0	1.7	3.3	3.0	10
Ae simpsoni	1.2	1.7	1.9	2.2	7
Ae metalicus	0.0	1.4	2.6	2.0	6
Ae leutocephalis	2.0	2.4	1.6	1.0	7
Ae africanus	2.1	0.0	1.9	2.0	6
Ae taylori	1.2	1.6	0.0	2.2	5
Anopheles gambiae	3.0	5.0	7.0	1.0	16
An maculipenis	3.8	2.4	2.5	3.3	12
An rutipes	1.9	2.3	1.1	2.7	8
An coustani	2.0	2.0	2.0	0.0	6
Culex quinquefaciatus	3.0	3.0	5.0	4.0	15
Cx annuloris	2.1	2.4	1.9	1.6	8
Cx tigripes	2.6	1.4	2.2	1.8	8
Cx decens	1.5	1.7	2.5	1.0	6
Total	32.7	33.1	42.3	33.9	142

Tables 3: Distribution of mosquito between indoor and outdoor environments

Mosquito species	Outdoor	Indoor
Aedes aegypti	8 (7.92)	3 (7.32)
Ae vittatus	5 (4.95)	6 (14.63)
Ae domesticus	6 (5.94)	4 (9.76)
Ae simpsoni	7 (6.93)	- (0)
Ae metalicus	6.(5.94)	- (0)
Ae leutocephalis	7. (6.93)	- (0)
Ae africanus	- (0)	6 (14.63)
Ae taylori	5 (4.95)	- (0)
Anopheles gambiae	10 (9.90)	6 (14.63)
An maculipenis	8 (7.92)	4. (9.76)
An rutipes	- (0)	8 (19.51)
An coustani	6. (5.94)	- (0)
Culex quinquefaciatus	11 (10.89)	4 (9.76)
Cx annuloris	8 (7.92)	- (0)
Cx tigripes	8 (7.92)	- (0)
Cx decens	6 (5.94)	- (0)
Total	101 (71.13%)	41 (28.87%)

Correlation analysis showed that the distribution of mosquito species correlated positively in outdoor and indoor environments ($P<0.05$).

DISCUSSION

The study reveals that the abundance of mosquito depends on highly modified environments and its composition depends on species prevailing environmental factors and that of the habitat. This observation agrees with (Amusan *et al.*, 2004).

Table 4: Mosquito distribution between environments with time

	No. outdoor		No. indoor	
Species	5-8am	5-8pm	5-8am	5-8pm
Aedes aegypt	5	3	1	2
Ae vittatus	3	2	3	3
Ae domesticus	6	0	2	2
Ae simpsoni	6	1	0	0
Ae metalicus	4	2	0	0
Ae leutocephalis	4	3	0	0
Ae africanus	0	0	4	2
Ae taylori	3	2	0	0
Anopheles gambiae	7	3	1	5
An maculipenis	3	5	3	1
An rutipes	0	0	2	6
An coustani	3	3	0	0
Culex quinquefaciatus	7	4	1	3
Cx annuloris	5	3	0	0
Cx tigripes	2	6	0	0
Cx decens	4	2	0	0
Total	62	39	17	24

Such prevailing environmental conditions may have influenced their distribution and abundance which was both temporal and spatial in Unical Hostels and Uwanse. This observation has also be reported by (Wanji *et al*, 2009). Mosquito breeding sites are numerous in Uwanse and Unical hostels due to environmental adaptations, varied human activities, poor sanitation level and indiscriminate disposal of discarded household materials which confirms Mafiana (2008) who reported that increase in environmental modification as a result of urbanisation is usually being accompanied by creation of more breeding sites for mosquitoes. The result of 32.7% composition of mosquitoes in Bateba is presumed to be due to a cleaner environment and predation by dragon fly and any other natural enemies as they were observed feeding on mosquito larva during the sampling.

The outdoor mosquitoes were found to be dominant in earthen wares of varying sizes, bamboos, motor vehicles, tyres and tubes, broken bottles, concrete basins, metal drums and variety of plastic containers, barrels and closed tanks and rain water drain encouraged mosquito abundance thus ideal habitat for its breeding, making it highly abundant in distribution, as earlier reported by Derraike, (2005). Highly modified environments such as urban areas and pre-urban areas provide reservoir and some advantage for container breeding mosquitoes, especially via the greater availability of artificial larval habitat. The present study also showed that most of the indoor species occurred in the night which implies that they are nocturnal in habitat. The study showed that out of the sixteen species of mosquitoes collected within the four study areas, *Anopheles gambiae* and *Culex quinquefaciatus* recorded the highest percentage prevalence. However, the relative higher parous rate of *Anopheles gambiae* in the indoor could have probably accounted for high prevalence rate of Malaria in Outpatient Department (OPD) in Calabar as also observed by (Adeleke *et al*, 2008). And it was observed that human induced environmental changes can have a major impact on the distribution of mosquito species and associated diseases, this is in confirmation with the report of Forattini *et al*, (1978) and with this a large number of vector borne pathogens are affecting human population.

Finally the present study therefore provides information on species composition, abundance and imparity of the indoor and outdoor mosquitoes with the view of understanding the possible implication of mosquito nuisances, and effective control strategies in Calabar.

REFERENCES

Adeleke, M. A., Mafiana, C. F., Idowu, A. B., Adekunle, M. F., Sam Wobo, S. O. (2008). Mosquito larval habitats and public health implication in Abeokuta, Ogun State. *Tanzania J. Health 10 (2)*. 103-8.

Amusan, A. A. S. (2004). *Distribution of mosquitoes (Diptera: culicidae) and transmission patterns in Ogun state;* Ph.D. thesis, University of Agriculture, Abeokuta, Ogun State pp. 336.

Anosike, J. C., Onwuli, C. O. E., Nwoke, B. E. B., Dozie, I. N. S. (2003). Laboratory investigation of the infection rates of *Anopheles gambiae* and *Anopheles funestus* in transmission of wuchereria bancrofti. *Nigeria J. Parasitol. 24,* 153-8.

Anyanwu, G. I., Iwuala, M. O. (1999). Mosquitoes breeding sites; distribution and relative abundance of species in Jos Plateau, Nigeria. *Med. Entomol. Zool. 50,* 34-38.

Brown, J. L., Dominik, J. W., Mornsey, R. L. (2004). Respiratory activity of recently isolated Egyptian strain of Rift valley fever. *Infect. Immune (98)* 33; 848-854.

Derraike, J. G. B. (2005). Mosquito breeding in container habitats in urban and periurban areas in the Auckland Region, New Zealand. *Entomotropica 20 (2)*: 93-97.

Forattini, O. P., Mossad, E. (1998). Culicidae vectors and anthropic changes in a Southern Brazil natural ecosystem. *Ecosystem Health 4,* 9-19.

Gillet, J. D. (1972). Common *African mosquitoes and their medical importance.* William Heinemann Medical Books Ltd, London, pp. 236.

Hopkins, G. H. E. (1953). Mosquitoes of the Ethiopian region I – larva bionomics of mosquitoes and taxonomy of culicinae larval. London: British Museum (*Nat. Hist.)* 8-14.

Iwuala, M. O. E. (1979). Cassava fermentation parts as major breeding foci for culicinae mosquitoes in Nsukka, Nigeria, *Nigeria Med. J., 9,* 327-55.

Okegun, J. C., (2005). Distribution of mosquitoes (*Diptera; culicidae)* and disease transmission patterns in Ogun State. Ph.D. Thesis (unpublished), University of Agriculture, Abeokuta, Ogun State, 336.

Wanji, S., Moto, F. F., Tongo, M. C., Tchuenter, F., Bilong, C. F., Njume, T. (2009). Spatial distribution, environmental and physiochemical characterization of anopheles breeding sites in the Mount Cameroon region. *J. Vector Borne 46;* 75-80.

W.H.O (World Health Organization) (1994): Guide on Medical Entomology on Malaria. Pt II. 224pp.

****