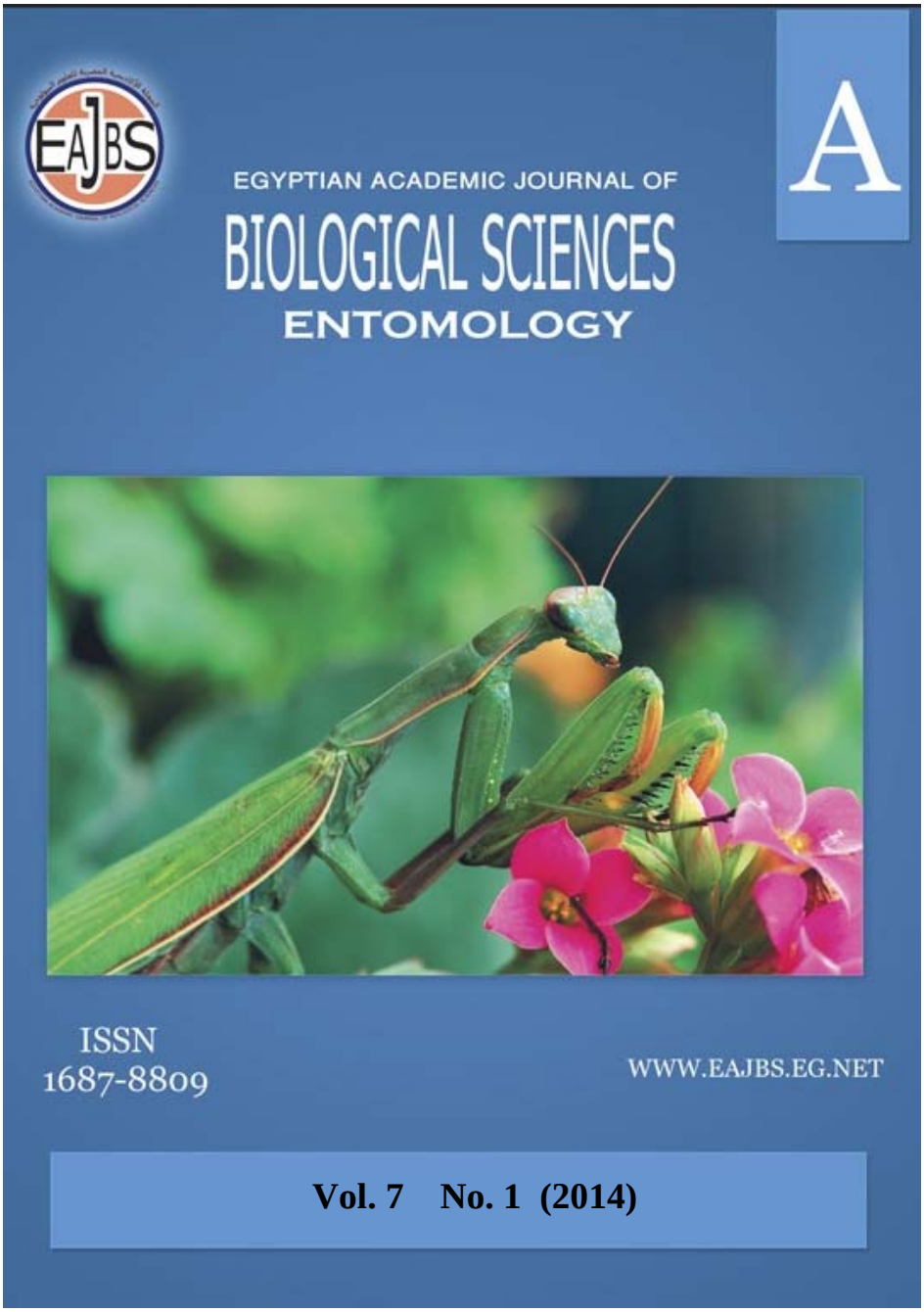

Egyptian Academic Journal of Biological Sciences is the official English language journal of the Egyptian Society for Biological Sciences, Department of Entomology, Faculty of Sciences Ain Shams University .

Entomology Journal publishes original research papers and reviews from any entomological discipline or from directly allied fields in ecology, behavioral biology, physiology, biochemistry, development, genetics, systematics, morphology, evolution, control of insects, arachnids, and general entomology.

www.eajbs.eg.net

Received :8/3/2014 Accepted :27/4/2014

Egypt. Acad. J. Biolog. Sci., 7(1): 173 – 178 (2014)

Egyptian Academic Journal of Biological Sciences
A. Entomology

ISSN 1687-8809

www.eajbs.eg.net

Distribution and abundance of dry season indoor mosquitoes in a tropical rural community

Amaechi, Ebube. C.[1]; Ohaeri, Carmelita. C. [2] and Ukpai, Onyinye. M [2]
1-Department of Zoology, University of Ilorin, Ilorin
2-Department of Zoology and Environmental Biology, Michael Okpara University of Agriculture, Umudike.
Email:ebubeamechi@yahoo.com

ABSTRACT

Mosquitoes have a world-wide distribution occurring mostly in sub-Saharan Africa where they cause considerable annoyance due to their bites also an important disease vector. The study was undertaken within a six week period in Asa-Obingwu a rural community, in Abia State South eastern Nigeria, to identify the different mosquito vector species and to determine the level of vector host association using blood meal status. In determining the distribution and abundance of mosquito in the study areas, indoor residual spraying using pyrethrum was adopted. The entire Knock down mosquitoes were collected and preserved in labeled bottles accordingly. The mosquitoes were there after identified to species level using dissecting microscope. The results showed that out of 613 mosquito knocked down during the study, 485 (79.1 %) were *Anopheles* specie, 77 (12.6%) were *Aedes* specie while 51(8.3 %) were *Culex* specie.The meal status of the different species encountered showed that *Anopheles* specie were more fed 324(66.8%) followed by *Culex* 19 (37.3%) and the least was *Aedes* 9(11.7 %)specie. These results were significantly different ($P<0.05$). The average indoor resting density showed that 4 *anopheles* mosquitoes were found in every house per night as compared to *Culex* (0.4) and *Aedes* (0.6) these findings were attributed to the presence of water bodies around the residential areas which were good breeding sites for the vector. The inhabitants were mostly individuals with poor knowledge of malaria transmission and control. It is therefore advocated that government intensify efforts at educating the rural populace on the dangers posed by the presence of the vector.

Keywords: Mosquitoes, vectors, Knock down, specie, meal status, breeding sites

INTRODUCTION

Mosquitoes are of tremendous health importance because of their ability to host and transmit various disease pathogens and parasites including viruses, protozoa and nematodes (Onyido *et al.*, 2010). Mosquitoes alone transmit diseases to more than 700 million people annually (Taubes, 1997).Various species of mosquitoes have a world-wide distribution occurring throughout the tropical and temperate regions where they cause considerable annoyance due to their bites, and are important disease vectors due to the poor socio-

Received :8/3/2014 Accepted :27/4/2014

economic conditions and favourable environmental and climatic conditions that favours the breeding of mosquito vectors (Appawu *et al*., 2001). Various species of mosquitoes have long been recognized as vectors of a number of numerous human infections both in sub Saharan Africa and in the tropics (Nwoke *et al*., 1993; Okogun *et al*., 2003; Lenhart *et al*., 2007; Adebote *et al*., 2008; Adeleke, 2008). *Anopheles* species is known to transmit human malaria parasite *(Plasmodium*) *Aedes aegypti* and some other species transmit yellow fever and dengue, while *Culex quinquefasciatus* have been known to transmit lymphatic filariasis (Onyido *et al*.,2010). Blood sucking habits of adult mosquitoes makes them susceptible to acquiring pathogens and parasites from the vertebrate host. This is seen in the unique feeding habits of mosquitoes whereby only the females bite man and other animals, while the males feed on plant juices only. After feeding on their host, either outside or inside houses, mosquitoes seek resting place in which to shelter during digestion of their blood meals. Studies in various habitats (micro and macro) in Nigeria have demonstrated the abundance of various mosquito species. They include mosquitoes of the genera *Anopheles*, *Culex, and Aedes* (Nwoke *et al*., 1993; Ekanem, 2001; Usip and Ibenga, 2003). Tropical areas including Nigeria have the best combination of adequate rainfall, temperature and humidity allowing for breeding and survival of *Anopheline* mosquitoes. Mosquito vectors breed in any available aquatic environment and different species have different habitat preferences e.g. rice fields, tree holes, pools, puddles, borrow pits etc. It has been observed that correct identification of these local vectors was necessary for effective control measures to be employed. Oduola and Awe (2006) reported that the spatial distribution of mosquitoes will contribute to the design of malarial vector control which is a major component of the global malarial strategies and still remain the most general effective measure to prevent malarial transmission. Inadequate knowledge on disease vector has been a bane to malaria control in Nigeria. This study is therefore aimed at providing baseline information on mosquito vector species composition and the level of vector-host association using meal status in some rural communities of Abia State, Nigeria

MATERIALS AND METHODS

Study Area:

The research work was carried out for a period of six weeks in a rural community of Asa Obingwu, Ukwa West L.G.A of Abia State which is located on latitude $05^{0}45^{1}$and$5^{0}23^{1}$ North of latitude and $7^{0}37^{1}$and $7^{0}19^{1}$East of the longitude and at an altitude of 122-183m above sea level. The area has a tropical climate. The wet season usually is from April to October while the dry season begins in November and ends in March. Total annual rainfall ranges from 1,800-2,190mm, and a mean daily air temperature range of 22^{0}C to 31^{0}C. The average relative humidity is about 80 % with about 85 % occurring during the rainy season. The study area consists of about 60 houses with over 500 people.

Community Mobilization:

Prior to the study, the Eze of the community was visited and informed on what we intend to do in the community. He granted our request after hours of discussion. Announcements were made publicly in the community through the help of the village town crier .This facilitated both access and co-operation of the people. With their permission, public sensitization in the community was conducted.

Procedure of Mosquito Collection:

In determining the distribution and abundance of mosquito in Asa-Obingwu community, thirty houses were randomly selected. A room occupied by residents the previous night was used where indoor collection using pyrethrum collection method was adopted and collections of adult mosquitoes were made in the morning before 8am. Prior to spraying, all

animals were evacuated, all food covered and small furniture removed from the room. White sheets were then laid to completely cover the floor and also ensuring that the sheet is spread under the table. All windows and doors closed. The targeted room was sprayed from outside with pyrethrum-based Rambo through the openings below doors and later inside (clockwise) on ceiling and walls until the room was filled with the insecticidal mist. After 10 minutes the room was opened and the sheet were carefully picked up at the corners by about five individuals.

Mosquito Preservation and Labeling:

All knockdown mosquitoes were collected in day-light with force and preserved in an eppendorf tube containing silica-gel with the collection date, village name and household number clearly labelled on the tube. Mosquitoes were put in the tube in order to prevent the delicate body parts of the insect such as palp, antenna, wings and legs which are of significant importance in identification. In the laboratory, mosquitoes collected were identified to species using dissecting-microscope.

Morphological identification of mosquitoes

The key of Gillies and Coetzee (1987) were used for the identification of *Anopheles* species, while the identification key of Gilleth (1972) was used for *Culex* identification and *Aedes* mosquitoes. *Anopheles* mosquitoes were identified by the palp which is long as the proboscis and pointed and by the number, the length, and arrangement of the dark and pale scales in small blocks on the veins of the wings. Male and female *Anopheles* mosquitoes were identified by examination of antennae, in which those with feathery (plumose) appearance are males and those with only short and inconspicuous antennal hairs are females. Other mosquito species identified were *Culex* and *Aedes.*

Data Analysis

Mosquito abundance was depicted in tables and difference in the weekly relative abundances were subjected to statistical analysis using student' s t-test and Analysis of Variance (ANOVA) to determine their levels of significance. All statistical tests were performed at 5% (0.05) level of significance

RESULTS AND DISCUSSION

Mosquito's identification

A total of 613 mosquitoes were sampled in Asa- Obingwu community, Ukwa West L.G.A of Abia State, Nigeria, comprising of 3 genera namely *Anopheles, Culex,* and *Aedes.* The higher proportion is the *Anophelines 485* (79.1%) compared to the *Culex* 51(8.3%), and *Aedes* 77 (12.6 %) The result is presented in Tables 1&2.

Table 1: Species composition of all mosquitoes in Asa Obingwu community of Abia State

	Species composition		
Period of collection	*Anopheles gambiae*	*Culex quinquefasciatus*	*Aedes aegypti*
Week 1	66	16	10
Week 2	71	4	6
Week 3	96	3	20
Week 4	120	8	20
Week 5	78	13	8
Week 6	54	7	10
Total	485	51	77

Table 2: Density of mosquito collected in Asa -Obingwu community of Abia State.

	Period of collection							
Genera	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Total	Percentage
Anopheles	66	71	96	120	78	54	485	79.1
Culex	16	4	3	8	13	7	51	8.3
Aedes	10	6	20	20	8	10	77	12.6
Total	92	81	119	148	99	71	613	100

Blood meal status

The numerical proportion of fed and unfed of *Anopheles* was 324 and 171 respectively as shown in Table 3.The Tables 4 and 5 also revealed the blood meal status of *Culex* and *Aedes* mosquito collected where 32 unfed and 19 fed were recorded for *Culx.* 9 *Aedes* were fed while 68 were unfed.

Table 3: Blood meal status of *Anopheles* mosquito

	Number (%)		
Period of collection	Fed	Unfed	Total
Week 1	44(78.6)	22(39.3)	56
Week 2	39(63.9)	22(36.1)	61
Week 3	63(59.4)	43(40.6)	106
Week 4	76(58.5)	54(41.5)	130
Week 5	66(75.0)	22(25.0)	88
Week 6	36(81.8)	8(18.2)	44
Total	324(66.8)	171(33.2)	485

Table 4: Blood meal status of *Culex* mosquitoes

	Number (%)		
Period of collection	Fed	Unfed	Total
Week 1	0(0)	10(100)	10
Week 2	3(100)	0(0)	3
Week 3	6(66.7)	3(33.3)	9
Week 4	1(100)	0(0)	1
Week 5	3(20.0)	12(80.0)	15
Week 6	6(46.2)	7(53.8)	13
Total	19(37.3)	32(62.7)	51

Table 5: Blood meal status of *Aedes* mosquitoes

	Number (%)		
Period of collection	Fed	Unfed	Total
Week 1	3(18.8)	13(81.2)	16
Week 2	0(0)	15(100)	15
Week 3	5(45.5)	6(54.5)	11
Week 4	1(9.1)	10(90.9)	11
Week 5	0(0)	12(100)	12
Week 6	0(0)	12(100)	12
Total	9(11.7)	68(88.3)	77

Average indoor resting density of mosquitoes in Asa Obingwu

The average indoor resting density of *Anopheline* mosquitoes in the study area per night was 4(four).*Culex* and *Aedes* show a resting density of 0.4 and 0.6 respectively, as shown in Table 6.

Table 6: Average indoor resting density of mosquitoes in Asa-Obingwu

Genera	Total Number collected	Number of room	Number of week	Average indoor resting density per number per day
Anopheles	485	20	6	4
Culex	51	20	6	0.4
Aedes	77	20	6	0.6

DISCUSSION

The result of the present study have demonstrated the relative abundance and blood meal status of *Anopheles gambiae*, *Culex quinquefasciatus* and *Aedes aegypti* encountered in Asa-Obingwu community, Ukwa West L.G.A, Abia State. This is the first time time such report is being studied in this study area. All species of mosquitoes reported in this study have also been reported by different studies in other parts of Nigeria (Ekanem, 2001; Okogun *et al*., 2003; Usip and Ibenga, 2003; Oduola and Awe, 2006; Lenhart *et al*., 2007; Adebote *et al*., 2008; Onyido *et al*., 2010). The higher proportion of *Anopheles* 485 (79.1%) when compared to *Culex* 51(8.3 %) and *Aedes* 77(12.6 %) in this study area is in accordance with the findings of Onyido *et al.,* 2010 and is in contrast with the report of Usip and Ibanga where *Culex* was the most abundance. Abundance of *Anopheline* is as a result of suitable environmental and climatic breeding conditions which favours their breeding of larva of the vectors. This was also reported in the findings of Minakaw *et al.,* (2002).The high indices of *Anopheles gambiae* in Asa Obingwu was due to the close proximity of residential areas to their farm lands which was most often a water logged area. The insurgence of *Aedes* and *Culex* may be as a result of water storage practice of individual in Asa Obingwu.The people of Asa Obingwu had the practice of storing water in earthen pots in a corner of their house. Adebote *et al*., (2008) suggested that the presence of earthen pot may facilitate the emergence of *Aedes.*

Man-made malaria in the study area may also be due to unavailability of pipe- borne water in the study area. Poverty and dearth of knowledge on the dangers posed by mosquitoes to man may also have played its role in the abundance of the mosquitoes in the study area. 85% of the villagers are farmers, and so illiterates. Inadequate information, on the risk posed to them by the vector (mosquito), has worsened their nonchalant attitude towards the management of malaria vector. Poor road network has made accessibility a problem which is quite discouraging for health workers and may have been the reason for the inadequate level of awareness and consequently the abundance of mosquitoes in the study area.

The blood meal status shows that the percentage of fed Anopheles mosquitoes is greater than that of the unfed which is in contrast with the findings of Mukabana *et al.,* (2002) where unfed dominate over the fed Anopheles. This is an indication of the fact that the inhabitants of Asa Obingwu are prone to malaria infection since Anopheles has been incriminated as an efficient vector of malaria (Adeleke *et al*., 2010).

The people in this study area are less prone to disease transmitted by *Culex* and *Aedes* mosquitoes because in this study the percentage of unfed *Culex* (67.7%) and *Aedes* (88.3 %) is significantly greater than the fed Culex (37.3%) and fed Aedes (88.3%). *A.* gambiae is the most abundant of the three groups of mosquitoes collected in Asa Obingwu community but further Molecular characterization of *An.* gambiae *s. l* is necessary in order to determine sibling species in the complex. Conversely, *Aedes aegypti* has the lowest abundance. Average Indoor resting density of Anopheles was four .This shows that 4 *Anopheles* mosquitoes would be found in one house per night in Asa Obingwu. This is quite a significant number which also indicates the rate at which the inhabitants of every house will be infected with malaria

parasite. The Identification of *Anopheles gambiae*: the major vector of malaria in Africa and high host-vector association in Asa Obingwu community suggest possibilities of high malaria transmission risk indices in the community. This calls for all stakeholders involved in the concerted effort to promote malaria vector control tools such as long lasting insecticide treated bed nets that will reduce risk of exposure to malaria.

REFERENCE

Adebote, D.A., Oniye, S. J. and Muhammed, Y.A. (2008). Studies on mosquitoes breeding in rock pools on inselbergs around Zaria, Northern Nigeria. J. Vector Borne Diseases, 45: 21-28.

Adeleke, M.A., Mafiana, C.F., Idowu, A.B., Adekunle, M.F and Sam-Wobo, S.O. (2008). Mosquito larval habitats and public health implications in Abeokuta, Ogun State, Nigeria. *Tanzania Journal of Health Research*, 10(2):103-108

Adeleke, M.A., Mafiana, C.F., Idowu, A.B., Sam-Wobo, S.O. and Idowu, O.A. (2010). Population dynamics of indoor sampled mosquitoes and their implications in disease transmission in Abeokuta, South-Western Nigeria. J. Vector borne Disease 47:33-38.

Appawu, M. A., Baffoewilmort, A., Afari, E. A., Dunyo, S., Koram, K. A. and Nkrumah, F. K. (2001). Malaria vector studies in two ecological zones in Southern Ghana. African Entomology, 9(1):59-65.

Ekanem, M. S. (2001). Human Settlements and implications for mosquito breeding: The case of Uyo metropolis. Journal of Education and Environment.1: 129 - 135.

Gillies, M.T. and Coetzee, and M. (1987): A supplement to the *Anophelinae* of Africa South of the Sahara (Afrotropical Region). Journal of Medical Research, 55: 143-150

Gillet, J.D. (1972). *Common African Mosquitoes and their Medical Importance*. William Heinemann Medical Books Limited; London, 236pp.

Lenhart, A., Eigege, A., Kal, A., Pam, D., Miri, E., Gerlong, G., Onyeka, J., Sambo, Y., Danboyi, J., Ibrahim, B., Dahl, E., Kumbak, D., Dakul, A., Jinadu, M., Umaru, J., Richards, F., and Lehmann, T. (2007). Contribution of different mosquito species to the transmission of lymphatic filariasis in central Nigeria: implications for monitoring infection by PCR in mosquito pools. American Journal Tropical Medical Hygiene, 71(9): 222 – 232.

Minakaw, N., Sonye, G., Mogi, M., Githeko, A., and Yan, G. (2002). The effects of climate factors on the distribution and abundance of malaria vectors in Kenya. Journal Medical Entomology, 39: 833-841.

Mukabana, W.R., Takken. W., Seda, P., Kelleen, G.F., and Hawley, W.A. (2002). Extent of how digestion affects the success of amplifying by human DNA from blood meal of Anopheles gambiae. Bulletin Entomology Research, 92:233-239.

Nwoke, B.B., Nduka, F.O., Okereke, O.M., and Ehighibe, O.C. (1993). Sustainable urban development and human health septic tanks as a major breeding habitat of mosquito vectors of human disease in South Eastern Nigeria. Applied Parasitology. 34: 1-10.

Oduola, A.O., and Awe, O.O. (2006). Behavioral biting preference of Culex quinquefasciatus in human host in Lagos metropolis, Nigeria. J. Vector Borne Disease, 43: 16-20.

Okogun, R.A., Nwoke, E. B., Okere, A. N., Anosike, J.C., and Esekhegbe, A.C. (2003). Epidemiological implications of preferences of breeding sites of mosquito species in Midwestern Nigeria. Ann. Agric. Environ. Med. 10: 217-22

Onyido, A.E., Agbata, V.O., Umeanaeto, P.U., Obiukwu M.O., and Amadi, E.S. (2010). Malaria Burden and Vector Abundance in a Sub-urban Community in the Rainforest Zone of Nigeria. *Nigerian Journal of Microbiology*, 24 (1): 2224-2230.

Taubes, G.A. (1997). Mosquito bites back. New York. Times *Magazine*.24:40-46.

Usip, L. P. E., and Ibanga, S. I. (2003). Identification of breeding sites and prevalence of endemic foci mosquito vectors of parasitic infection in Uyo Urban, Akwa Ibom State, Nigeria. Acta Zoologia Simica, 49 (4): 522 – 524.