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SPECIES COMPOSITION AND LARVAL HABITATS OF MOSQUITOES (DIPTERA: CULICIDAE) IN ILORIN, NIGERIA.

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Abstract
A bi-weekly mosquito larval survey was conducted in potential breeding habitats, between January 2004 and December 2005, in Ilorin, Nigeria, to elucidate the mosquito fauna, their breeding habitats and relative contributions of such larval habitats to mosquito populations in the area. Nine species were encountered namely, *Anopheles gambiae* (31.56*%), Aedes aegpti* (23.61%), *Culex pipiens fatigans* (17.74%), *Culex pipiens quinquefasciatus (9.79%), Anopheles funestus* (9.47%), *Aedes palpalis* (3.26%), *Culex decens* (2.94%), *Anopheles nili* (1.06%) and *Anopheles pharaoensis* (0.61%). Three of these species, Ae. aegypti, An. gambiae and Cx. p. fatigans, had dominant densities (> 5%) and constant distribution (80.1 – 100%), and therefore were regarded as the principal mosquito species in the area. Most of the mosquitoes increased significantly ($P < 0.05$) in abundance during the rainy season, reaching a peak between June and September. Domestic containers and Temporary Ground Pools were the most active breeding sites, as they had both the highest number of species and individuals. Except An. gambiae and *Cx. p. fatigans* which bred actively in all habitat types, the mosquito species showed significant preferences for certain breeding sites. The public health implications of the occurrence of these mosquito species and associated breeding sites, as well as, management strategies were discussed.

Keywords: Aedes, Anopheles**, Breeding, Culex, Density, Population.**

Introduction
Mosquitoes serve as vectors of some of the most important human diseases including malaria, yellow fever, dengue fever, etc. (Brenda *et al*., 2000). Malaria alone is responsible for about 1.2 million deaths annually worldwide (Tropical

Diseases Research, 2004). In Nigeria, the disease accounts for 30% of childhood mortality (Olukosi *et al*., 2005), and it has been estimated that poor families in the country spend up to 25% of their income on direct and indirect prevention and treatment of malaria (Onwujekwe *et al*., 2000). Therefore the need for the control of mosquito-transmitted diseases is sacrosanct. Vector control is becoming increasingly important as a result of the widespread distribution of drug-resistant strains of malaria parasites (Okogun, 2005). Presently, malaria control in Nigeria focuses more on methods that kill or deter adult mosquitoes (Nigeria First 2003), such as the use of insecticide-treated bed nets and indoor residual spraying. These mosquito control strategies, though effective, are insufficient to eliminate malaria transmission from most endemic parts of Africa (Killeen *et al.,* 2000), for reasons ranging from the emergence of insecticide resistance (Chandre *et al*., 1999), to difficulties in attaining adequate population coverage (Lengeler and Snow 1996). Additional mosquito control strategies, particularly those that could complement existing anti-adult methods, are therefore required to develop truly integrated malaria control programmes. The adoption of such integrated control programmes, especially larviciding and elimination of larval habitats is now being canvassed (Killeen *et al*., 2004). This becomes necessary as human activities associated with settlement, agriculture, and other environmental alterations have resulted in the proliferation of larval habitats (Sabesan, 2001). Despite proven successes in other parts of Africa (Utzinger *et al*., 2001), mosquito larval control strategies have seen little application in Nigeria mainly because of a dearth of knowledge on the ecology of mosquito larvae and their breeding sites in the country (Adefolalu, 2004). This study, therefore, attempts to fill this information gap by determining the mosquito fauna, their breeding habitats and the relative contributions of such larval habitats to mosquito populations within Ilorin metropolis.

Materials and Methods

The Study Area

Ilorin, the capital of Kwara state, Nigeria, is located within Longitudes 4^o 30\` and $4^o$ 45\` E and Latitudes 8^o 25\` and $8^o$ 40\` N, covering an estimated land area of 75 Km^2 with an estimated population of 1.4 million people as at 2006 (The World Gazetteer, 2006). The general relief of the area is undulating, consisting of a few ridges reaching up to 120 meters above sea level, separated by well defined wide slopes. The area is drained by large rivers, that normally flow all year round. Two of these rivers, Asa and Agba, have been dammed to provide portable water for irrigation and household purposes. The soils of the area are typically coarse sandy and the water table fluctuates between 2 to 3 metres. The climate is tropical, with mean annual temperature, relative humidity and rainfall of 27^oC, 76% and 1,800 mm, respectively. The climate is marked by two distinct seasons, i.e., wet and dry. The rainy season which usually starts from April lasts till November. As precipitation is concentrated within 4 to 5 months, periodic runoffs exist, resulting in uncountable collections of surface water of various sizes and durations. Between December and February is the dry harmattan period, which is completely without rain, but dust-laden and cold winds blow in from the northeast.

Identification of breeding sites

The city was searched for water pools of different types that could serve as mosquito larval breeding habitats. Such breeding sites were grouped on the basis of size, duration, source and level of organic pollution, into the following: Domestic Containers (cans, plastics, bottles, tyres, household water storage containers, etc.); Temporary Ground Pools (puddles, rock pools, tyre tracks, ditches, domestic run-offs, etc.); Large Water Bodies (lakes, swamps, streams, rivers and canals) and Drains and Septic Tanks.

Larval collection, processing and identification

Mosquito larvae were sampled bi-weekly from January 2004 to December 2005. Twenty five sampling stations (5 replicates each) in five different categories of larval habitat types, as listed above, were selected and visited throughout the study period. The sampling sites were primarily selected to represent the general breeding habitats of mosquitoes in the area and long-lasting enough to make periodic sampling possible. Sampling was done between 07:00hr – 12:00hr, using a standard 250 ml capacity dipper (WHO, 1992; Service, 1993). Where this was not possible, especially with Domestic Containers, water was pooled from a number of breeding sites to make-up this volume. Twenty dipper samples were taken randomly from each breeding habitat type, and the average of these samples was calculated. Sampling sites that were dry when visited were recorded as containing no larvae. Collected specimens were preserved using 4% formaldehyde solution and identification was done using Keys provided by Hopkins (1952), Gillies *et al*., (1968) and Gillet (1971).

Statistical analysis

The distribution of the species was determined as percent of habitat types in which a species was encountered, using the formula:

C = n/N x 100%

Where: C = distribution, n = number of habitats of the species, N = number of all habitat types.

The following distribution classes, as proposed by Margalit *et al.* (1987), were adopted:

C1 – sporadic appearance (0 – 20%); C2 – infrequent (20.1 – 40%); C3 – moderate (40.1 – 60%); C4 – frequent (60.1 – 80%); C5 – constant (80.1 – 100%).

The Density of the species was determined as percent of specimens of the species in the whole sample, according to the formula:

D = I/L x 100%

Where: D = density; I = number of specimens of each mosquito species; L = number of all specimens.

The following density classes were accepted after Margalit, *et al* (1987):

Satellite species (D < 1%); Subdominant species (1 < D < 5%); Dominant species (D > 5%).

Differences in abundance of mosquito species within and among breeding habitats, as well as, among monthly densities were determined using student 't-test'.

Results

Nine mosquito species, belonging to 3 genera, were encountered in the breeding habitats during the study period (Table I). These include 4 species of *Anopheles*, i.e. *An. gambiae, An. funestus, An. nili* and *An. pharaoensis*; 2 of *Aedes*, i.e. *Ae. aegypti* and *Ae. palpalis*; and 3 of *Culex,* i.e. *Cx. P. fatigans, Cx. P. quiquefasciatus* and *Cx. decens*. The anopheline mosquitoes constituted the most abundant genus (42.66%), followed by *Culex* (30.47%) and *Aedes* (26.88%) species.

Only 3 species, *Ae. aegypti, An. gambiae* and *Cx. p. fatigans*, were classified as constant (C = 80.1 – 100%) (Table 3). Majority of the species, i.e. *Ae. decens*, *An. funestus*, *An. nili* and *Cx. P. fatigans*, had moderate appearance (40.1 – 60%), and *An. pharaoensis* was infrequent (20.1 – 40%). According to density criterion, the same species that had constatnt distribution pattern (i.e. *Ae. aegypti, An. gambiae* and *Cx. Q. fatigans*) were within the dominant class (> 5%). Also, in this category were *An. funestus* and *Cx. P. quinquefasciatus*. Two species (*An. nili and Cx. decens*) were included in the subdominant class (1 < D < 5%), and the least encountered mosquito, *An. pharaoensis*, was a satellite species.

Temporal variation in larval abundance was substantial (Table 3). Overall, the density of the mosquitoes was significantly (P < 0.05) lower in the dry season (December – March) (11.99 larvae/dip) than rainy season (May – October) (24.10 larvae/dip). Mean monthly density increased from 21.50 larvae/dip in May to 29.66 larvae/dip in July, when peak mosquito abundance occurred. The larvae of *Ae. aegypti, Ae. palpalis, An. funestus, An. gambiae* and *Cx. p. fatigans* were encountered throughout the year, whereas those of other species were sampled mostly during the rainy season. While *An. gambiae* and *Cx. p. fatigans* reached their population peaks in the rainy season (July and September, respectively), *Ae. aegypti* peaked in the dry season (January – February). Population densities of the other species increased significantly (P < 0.05) in the rainy season.

Larval abundance varied substantially (P < 0.01) between the different habitats (Table 2). Temporary ground pools were the most active larval habitat (37.83%). Other habitats in decreasing order of productivity were Domestic containers (28.89%) > Drains (16.39%) > Large water bodies (12.27%) > Septic tanks (4.62%). All 9 species were sampled in Domestic Containers; 8 in Temporary Ground Pools; 7 in Drains; 5 in Large Water Bodies and only 2 in Septic Tanks. The most abundant species in Temporary Ground Pools and Drains was *An. gambiae*; *Ae. aegypti* in

Domestic Containers; *An. funestus* in Large Water Bodies and *Cx. p. fatigans* in Septic Tanks. The mean monthly abundance of larvae within and between the habitat types were significantly different ($P < 0.05$) (Table 4). While significantly ($P < 0.05$) higher numbers of larvae were collected during the rainy season (May – October) than in the dry season (December – March) in Domestic Containers, Temporary Ground Pools and Drains; Large Water Bodies and Septic Tanks tend to be uniformly active throughout the year. However, more mosquito larvae were collected in the dry season than in the rainy season in the Septic Tanks. Except in Septic Tanks, peak mosquito abundance in the larval habitats was attained in August.

An gambiae and *Cx. P. fatigans* were the most versatile species, been encountered in all five habitat types in fairly high proportions (Table II). *An. gambiae* showed significant ($P < 0.05$) preference for Temporary Ground Pools (52.05%), and was least encountered in Septic Tanks (2.26%). As in *An. gambiae*, *Cx. P. fatigans* was also significantly ($P < 0.05$) most abundant in Temporary Ground Pools (50.80%) but least abundant in Domestic Containers (5.57%) and Drains (4.87%). *Ae. aegypti* bred in four of the five habitat types surveyed, been absent only in the Septic Tank. This species was found breeding mainly in Domestic Containers (66.14%) with some present in Drains (18.47%) and Temporary Ground Pools (12.27%), but very scanty in large Water Bodies. The proportions of *Ae. palpalis* (50.17%) and *An. nili* (65.17) breeding in Temporary Ground pools were significantly ($P < 0.05$) higher than in other habitat types. However, while *Cx. p. quinquefasciatus* bred almost equally high in Temporary Ground Pools and Drains (40.35% and 37.69%, respectively), *Cx. decens* did so in Domestic containers and Temporary Ground Pools (53.70% and 42.02%, respectively). *An. pharaoensis* was the most restricted species. This mosquito was encountered only in Domestic Containers (84.19%) and Large Water Bodies (15.09%).

Table 1: Species composition and relative abundance of mosquitoes in Ilorin metropolis, between January 2004 and December 2005

Genus	Species	No. of larvae caught/dip	Percentage (%)
Aedes	*Aedes aegypti*	4.34	23.61
	Aedes palpalis	0.6	3.26
	Subtotal	4.94	26.88
Anopheles	*Anopheles funestus*	1.74	9.47
	Anopheles gambiae	5.8	31.56
	Anopheles nili	0.18	1.06
	Anopheles pharaoensis	0.12	0.61
	Subtotal	7.84	42.66
Culex	*Culex decens*	0.54	2.94
	Culex pipiens fatigans	3.26	17.74
	Culex pipiens quinquefasciatus	1.8	9.79
	Subtotal	5.6	30.47
	Grandtotal	18.38	100

Table 2: Mosquito species and their relative abundance in five habitat types in Ilorin metropolis between January 2004 and December 2005

Species	DC	TGP	D	LWB	ST	Mean
Ae. aegypti	2.86* (66.14)**	0.54 (12.27)	0.80 (18.47)	0.14 (3.13)	0.00 (0.00)	0.86
	54.01***	7.65	26.59	6.02	0.00	23.59
Ae. palpalis	0.24 (38.75)	0.30 (50.17)	0.06 (11.07)	0.00 (0.00)	0.00 (0.00)	0.16
	4.40	4.35	2.22	0.00	0.00	3.28
An. funestus	0.12 (6.72)	0.36 (21.13)	0.00 (0.00)	1.26 (72.15)	0.00 (0.00)	0.34
	2.20	5.28	0.00	55.60	0.00	9.45
An. gambiae	1.10 (19.06)	3.02 (52.05)	1.24 (21.39)	3.00 (5.24)	0.14 (2.26)	1.16
	20.86	43.49	41.27	13.51	15.48	31.62
An. nili	0.02 (13.48)	0.12 (65.17)	0.04 (21.35)	0.00 (0.00)	0.00 (0.00)	0.04
	0.47	1.74	1.32	0.00	0.00	1.01
An. pharaoensis	0.10 (84.91)	0.00 (0.00)	0.00 (0.00)	0.02 (15.09)	0.00 (0.00)	0.02
	1.77	0.00	0.00	0.74	0.00	0.60
Cx. decens	0.28 (53.70)	0.22 (42.02)	0.02 (4.28)	0.00 (0.00)	0.00 (0.00)	0.10
	5.00	3.24	0.76	0.00	0.00	2.92
Cx. p. fatigans	0.18 (5.57)	1.66 (50.80)	0.16 (4.87)	0.54 (16.72)	0.72 (22.04)	0.66
	3.42	23.79	5.26	24.14	84.52	17.71
Cx. p. quinquefasciatus	0.40 (21.97)	0.72 (40.35)	0.68 (37.69)	0.00 (0.00)	0.00 (0.00)	0.36
	7.46	10.47	22.58	0.00	0.00	9.83
Total	5.30 (28.89)	9.94 (37.83)	3.00 (16.39)	2.26 (12.27)	0.84 (4.62)	3.66 (100.00%)

Discussion

The serious public health implications of the occurrence of the various species of mosquitoes encountered in Ilorin, is the possibility of outbreaks and endemicity of diseases like yellow fever, dengue and malaria in the area (Gillet, 1971; Shililu *et al*., 1998). The species composition of mosquitoes encountered in Ilorin was similar to those reported elsewhere in Nigeria (Okogun *et al*., 2005; Mafiana *e. al*., 1998). By virtue of their relatively high densities and constant distribution, *Ae. aegypti*, *An. gambiae* and *Cx. p. fatigans* may be regarded as the dominant mosquito species in Ilorin.

The results of the seasonal dynamics of larval densities and productivity of larval habitats, suggest that mosquitoes breed all-year-round in the area, with peak activities during the months of May to October. This finding is very important for health officials in mosquito control programmes. For effective mosquito control in Ilorin, larviciding measures must be sustained throughout the year, with particular attention paid to the rainy season and certain larval habitats namely, Domestic Containers, Temporary Ground Pools and Drains.

The mosquitoes bred in all types of habitats surveyed, probably suggesting that the city is a high mosquito-producing area. Okogun *et al*., (2005) and Mafiana *et al*., (1998) observed that poor behavioural attitudes and sanitary conditions in Nigerian cities are responsible for the proliferation of mosquito breeding sites. Domestic Containers that raised all 9 species collected in this survey occurred in large numbers and were encountered very close to homes, due to indiscriminate disposal of cans and the use of plastic containers for domestic water storage. An aggressive environmental sanitation programme, as recommended by Mafiana

Table 3: Monthly average population fluctuations of larvae of mosquitoes and larval habitats productivity in Ilorin metropolis, between January 2004 and December 2005

Species	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Ae. aegypti	6.76*	6.20	4.70	5.70	3.66	4.70	4.16	2.10	3.46	3.00	3.10	4.50	4.34
	(12.99)**	(11.91)	(9.03)	(10.95)	(7.03)	(9.40)	(9.03)	(4.04)	(6.65)	(5.76)	(5.96)	(8.65)	(23.61)
Ae. palpalis	0.16	0.36	0.20	0.50	0.50	0.96	1.06	0.96	0.50	1.00	0.86	0.26	0.60
	(2.19)	(4.92)	(2.73)	(6.83)	(6.83)	(13.11)	(14.48)	(13.11)	(6.83)	(13.66)	(11.75)	(3.55)	(3.26)
Subtotal	6.90	6.56	4.90	6.20	4.16	5.66	5.20	3.06	3.96	4.00	3.96	4.76	4.94
	(11.63)	(11.06)	(8.26)	(10.45)	(7.01)	(9.54)	(8.77)	(5.16)	(6.68)	(6.74)	(6.68)	(8.02)	(26.88)
An. funestus	1.90	1.46	2.70	1.66	1.90	1.56	2.50	2.20	1.50	1.16	1.40	0.96	1.74
	(9.46)	(7.27)	(17.22)	(8.26)	(9.46)	(7.77)	(12.44)	(10.95)	(7.47)	(5.77)	(6.97)	(4.78)	(9.47)
An. gambiae	0.95	1.80	3.86	3.46	9.06	10.46	13.26	8.36	10.10	2.90	3.50	2.06	5.80
	(1.36)	(2.58)	(5.53)	(5.00)	(12.99)	(14.99)	(19.01)	(11.98)	(14.48)	(4.16)	(5.02)	(2.95)	(31.56)
An. Nili	0.06	0.00	0.06	0.12	0.12	0.50	0.66	0.26	0.26	0.30	0.00	0.00	0.18
	(2.56)	(0.00)	(2.56)	(5.13)	(5.13)	(21.37)	(28.21)	(11.11)	(11.11)	(12.82)	(0.00)	(0.00)	(1.06)
An. pharaoensis	0.00	0.00	0.00	0.00	0.06	0.30	0.24	0.30	0.42	0.24	0.00	0.00	0.12
	(0.00)	(0.00)	(0.00)	(0.00)	(3.85)	(19.23)	(15.38)	(19.23)	(26.92)	(15.38)	(0.00)	(0.00)	(0.61)
Subtotal	2.86	3.26	6.60	5.20	11.10	12.80	16.60	11.06	12.20	5.76	4.90	3.00	7.84
	(3.00)	(3.24)	(6.92)	(5.45)	(11.64)	(13.43)	(17.41)	(11.60)	(12.80)	(6.04)	(5.14)	(3.15)	(42.66)
Cx. decens	0.00	0.00	0.00	0.00	0.00	0.90	0.50	1.10	2.00	1.30	0.40	0.26	0.54
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(13.93)	(7.74)	(17.03)	(30.96)	(20.12)	(6.19)	(4.02)	(2.94)
Cx. P. fatigans	1.96	1.56	3.90	1.16	3.20	3.80	3.50	5.06	6.66	4.30	2.83	1.16	3.26
	(5.01)	(3.99)	(9.98)	(2.97)	(8.19)	(9.72)	(8.95)	(12.94)	(17.04)	(11.00)	(7.24)	(2.97)	(17.74)
Cx. P.	0.00	0.86	0.46	1.46	3.06	3.46	3.86	2.36	3.20	2.10	0.90	0.00	1.80
quinquefasciatus	(0.00)	(3.96)	(2.12)	(6.72)	(14.09)	(15.93)	(17.77)	(10.87)	(14.73)	(9.67)	(4.14)	(0.00)	(9.79)
Subtotal	1.96	2.40	4.36	2.60	6.26	8.16	7.86	8.50	11.86	7.70	4.16	1.40	5.60
	(2.92)	(3.57)	(6.49)	(3.87)	(9.31)	(12.14)	(11.69)	(12.65)	(17.64)	(11.45)	(6.19)	(2.08)	(30.47)
Total	11.07	12.02	15.86	14.00	21.50	26.60	29.66	22.60	28.00	16.26	13.00	9.02	18.38
	(5.31)	(5.44)	(7.20)	(6.36)	(9.76)	(12.08)	(13.47)	(10.26)	(12.71)	(7.38)	(5.90)	(4.10)	(100.00)

DC = Domestic Containers; TGP = Temporary Ground Pools; D = Drains; LWB = Large Water Bodies and ST = Septic Tanks.
* Mean number of mosquito larvae per dip in a habitat type; ** Percentage distribution of a species in the five habitat types; *** Percentage composition of a species within a habitat type.

* Mean mosquito density per month
** Percentage composition of a species per month

Table 4: Monthly average population fluctuations of mosquito larvae in five habitat categories in Ilorin metropolis, between January 2004 and December 2005

Larval Habitat	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Domestic Containers	3.82* (6.00)**	2.54 (3.99)	2.54 (3.99)	5.82 (9.15)	6.40 (10.06)	8.80 (13.84)	6.96 (10.94)	8.26 (12.99)	6.40 (10.06)	5.06 (7.96)	4.46 (7.01)	2.60 (4.09)	5.30 (28.89)
Temporary Ground Pools	0.00 (0.00)	1.24 (1.49)	0.82 (0.99)	2.38 (2.85)	7.36 (8.82)	14.10 (16.91)	15.14 (18.15)	17.44 (20.91)	11.68 (14.00)	9.16 (10.98)	2.32 (2.78)	1.72 (2.06)	6.94 (37.83)
Drains	0.62 (1.76)	0.44 (1.25)	0.14 (0.40)	1.76 (5.00)	2.76 (7.84)	3.60 (10.23)	4.32 (12.27)	9.04 (25.68)	6.84 (19.43)	4.68 (13.30)	1.08 (3.07)	0.82 (2.33)	3.00 (16.38)
Large Water Bodies	1.90 (7.04)	1.26 (4.67)	2.98 (11.04)	2.16 (8.00)	1.70 (6.30)	1.82 (6.74)	2.44 (9.04)	3.24 (12.00)	2.28 (8.44)	1.62 (6.00)	1.70 (6.30)	2.96 (10.96)	2.26 (12.28)
Septic Tanks	1.22 (11.96)	1.00 (9.80)	0.84 (8.24)	0.72 (7.06)	0.82 (8.04)	0.86 (8.43)	0.62 (6.08)	0.40 (3.92)	0.94 (9.22)	0.76 (7.45)	1.12 (10.98)	0.90 (8.82)	0.86 (4.63)
Total	1.52 (3.45)	1.30 (2.95)	1.46 (3.31)	2.56 (5.81)	4.00 (9.07)	5.84 (13.25)	5.90 (13.38)	7.68 (17.42)	5.62 (12.75)	4.26 (9.66)	2.14 (4.85)	1.80 (4.08)	3.68 (100.00)

* Mosquito density per month

et al., (1998), coupled with public enlightenment campaign to reverse these attitudes in the residents will reduce the breeding of mosquitoes in such habitats. The Temporary ground pools were common sights in the rainy season, and they bred the largest number of larvae. The water table in Ilorin is relatively high, flooding the surface at some points during the rainy season (The Nigerian Congress, 2004). Drainage is poor due to inadequate drainage system in the city (Olorunfemi and Odita, 1998). The risk of flood is, therefore, high because of the concentration of precipitation in the wet season months. This created many temporary ground pools, favourable to the breeding of mosquitoes. These natural breeding sites are more difficult to control than artificial containers (Adefolalu, 2004). To reduce these sources of mosquitoes, environmental management tactics (such as sand-filling) and the use of Ultra Low Volume (ULV) spraying of pyrethroid insecticides are hereby recommended. The productivity of Drains and Septic tanks with respect to number and types of mosquitoes that bred in them was worrisome, as these two sites were always situated close to human dwellings thus encouraging intense man-vector contact. The control of mosquito breeding in these habitats entails developing an efficient water drainage system around homes and prompt mending of broken Septic Tanks. Very little can, however, be done to discourage mosquitoes from breeding in Large Water Bodies such as lakes meant for public water supply and fortunately, the results of this study showed that these sources pose little threat to human health as the mosquito contribution from them were relatively low.

Conclusion

Nine mosquito species were encountered breeding in probable habitats in Ilorin. In terms of distribution and relative densities, *Ae. aegypti*, *An. gambiae* and *Cx. p. fatigans* were the dominant species. Most of the species increased significantly in abundance during the rainy season, reaching a peak between June and September. The mosquito species exhibited significant preference for habitats in agreement with their known biology, but *An. gambiae* and *Cx. p. fatigans* bred actively in uncharacteristic habitats. Although all types of habitats surveyed bred mosquitoes, the most active were Temporary ground pools and Domestic containers. Proper environmental management and reversal of poor behavioural attitudes in the residents will reduce mosquito breeding in the area.

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