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Identification of breeding sites and prevalence of endemic mosquito vectors of parasitic infection in Uyo urban, Akwa Ibom State, Nigeria

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尼日利亚 Akwa Ibom 洲 Uyo 市郊传媒蚊虫的繁殖和流行区的确定

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摘 要 蚊虫是寄生虫病的主要传播者。为确定传病媒介蚊虫在 Uyo 郊区的繁殖和流行地,从 1999 年 5 月到 2000 年 1 月在 208 个繁殖地进行了取样,从 144 个地点用滤网取到了 5 844 只蚊虫幼体。采集到的 4 种蚊虫是致倦库蚊(*Culex quinquefasciatus*)成虫 604 只(43.5%),冈比亚按蚊(*Anopheles gambiae*)357 只(26.1%),一种按蚊(*Aedes uegypti*)208 只(25.5%)和非洲曼蚊(*Mansonia africana*)101 只(7.4%)。监测了蚊虫种群的时间变化,发现 5 月份 ~ 10 月份的丰度高于 11 月份 ~ 1 月份,幼体表明了同样的趋势,但比成体提前 1 ~ 2 个月。卡方检验表明,除了非洲曼蚊以外,其它 3 种蚊虫数量与混凝土水槽、土坑和居民区/公共环境之间的相关显著[动物学报 49(3):522 ~ 524,2003]。

关键词 蚊子 疟疾 寄生性感染
Key words Mosquito, Malaria, Parasitic infection

The rural areas of Nigeria are thought to provide the optimal environment for transmission of parasitic infection. But many urban areas also serve as endemic foci of parasitic infection (WHO, 1991). The negative impact of road construction and poor methods of economic development provides ample breeding grounds for mosquitoes (Liexse, 1991). Robber *et al*. (1996) reported that the breeding sites of dipteran—borne disease vectors could be predicted based on a clear understanding of prevailing environmental factors. The incidence of malaria, filariasis and yellow fever are associated with the presence of mosquito vectors. The correct identification and knowledge of the habitat preferences of local vectors is necessary for effective control measures (Habluelselm *et al*., 1989).

In April 2000, the government of Nigeria hosted a conference in Abuja attended by 44 of the 50 malaria- affected countries, tagged, "Roll Back Malaria". Conference participants resolved to reduce malaria mortality in Africa by 2010. The adoption of the latest World Health Organisation guidelines by African leaders will have a more permanent effect. Since malaria is a mosquito borne disease, this work on identification of mosquito breeding sites and the prevalence of mosquito vectors does not only identify enzootic foci for malaria but also help to create a strategy for the control of other parasitic infections.

1 Materials and methods

Investigations were conducted in several streets, private/public residences and environments within Uyo urban. Sampling for immature stages of the mosquito was done weekly between May 1999 – January 2000 by straining them from the water in ravines and gutters. A basin was used to collect larvae in shallow, muddy and swampy pools. Rinsed larvae were preserved in labeled bottles containing 70% alcohol and taken to the University of Port Harcourt Entomology Research Laboratory for identification

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and counting.

Adult mosquitoes were collected in and around human habitats in the study area. Indoor collection was done by spraying with insecticides (Sheltox, Bp product) with windows and doors shut for about 20 – 30 minutes. The fallen mosquitoes were then collected. All adult mosquitoes were preserved according to the method of WHO (1992). The mosquitoes were kept alive in paper cups containing pieces of cotton wool soaked in 5.8% sugar solution. The cups containing the mosquitoes were placed upright in a deep tray. The cups were covered with a damp towel until the mosquitoes reached the laboratory for identification and counting. The proboscis and siphon of adults and larvae were observed respectively under the dissecting microscope while the wings, head, thorax and abdomen were examined with the aid of a magnifying hand lens. Identification of collected specimens was based on Gordon *et al*. (1978).

Anopheles gambiae

Adult Palps are as long as the proboscis, thorax is nearly black with scale. Scutellum is not lobed; wings are spotted with pale or dark patches on costa. Legs are irregularly speckled. Abdomen is dark and hairy.

Larva Palmate hairs, branched lateral hairs lack siphon.

Culex quinquifasciatus

Adult Proboscis dark and long, dark and short palps. The thorax is pale brown, the wings are narrow and dark scaled. The legs are mainly dark. The abdomen is distinctly blunt at tip; with white bands along the base of each tergite. Scutellum is trilobed.

Larva Readily recognized by the presence of a long narrow siphon and several pairs of ventral tufts.

Mansonia africana

Adult Mainly dark and short palps. Thorax is variable in pattern ranging from brown, grey-green to yellowish scales. Scutellum trilobed. Wings are covered with groups of light and dark coloured, broad scales giving a speckled appearance. Scales are heart shaped, abdomen truncated, legs possess central patch of scales, dark brown with white band.

Larva Has a short pointed tube with pairs of prehensile hairs.

Data obtained from laboratory work were analysed using the chi-square test (Bende *et al*., 1989) to determine if mosquito species were randomly distributed among the sampled habits.

2 Results

A total of 208 possible breeding sites of mosquito were sampled and 5 844 mosquito larvae were collected from 144 sites. The abundances of mosquito species were as follows: *Culex quinquefasciatus* 2 344 (40.1%) *Anopheles gambiae* 1 417 (24.2%), *Aedes aegypti* 1 362 (23.3%) and *Mansonia africana* 721 (12.3%). Eight groups of breeding sites (habitats) were categorized with the distribution of larvae as follows: public and residential environment 1 907 (32.6%), concrete gutters 990 (16.9%), ravines 760 (13.0%), primary forest 683 (11.7%), earthen gutters 578 (9.9%), muddy and swampy pools 394 (6.7%), grassland 358 (6.1%) and ventilated/broken septic tanks 173 (3.0%). *Aedes aegypti* dominated the septic tank habitat, *Anopheles gambiae* was closer to human habitation, *Mansonia africana* preferred ravines, primary forest and plantain/cocoyam axils while *Culex quinquefasciatus* preferred all habitats except septic tanks. The Chi square test indicates significant association ($P < 0.01$) between all species except *Mansonia africana*

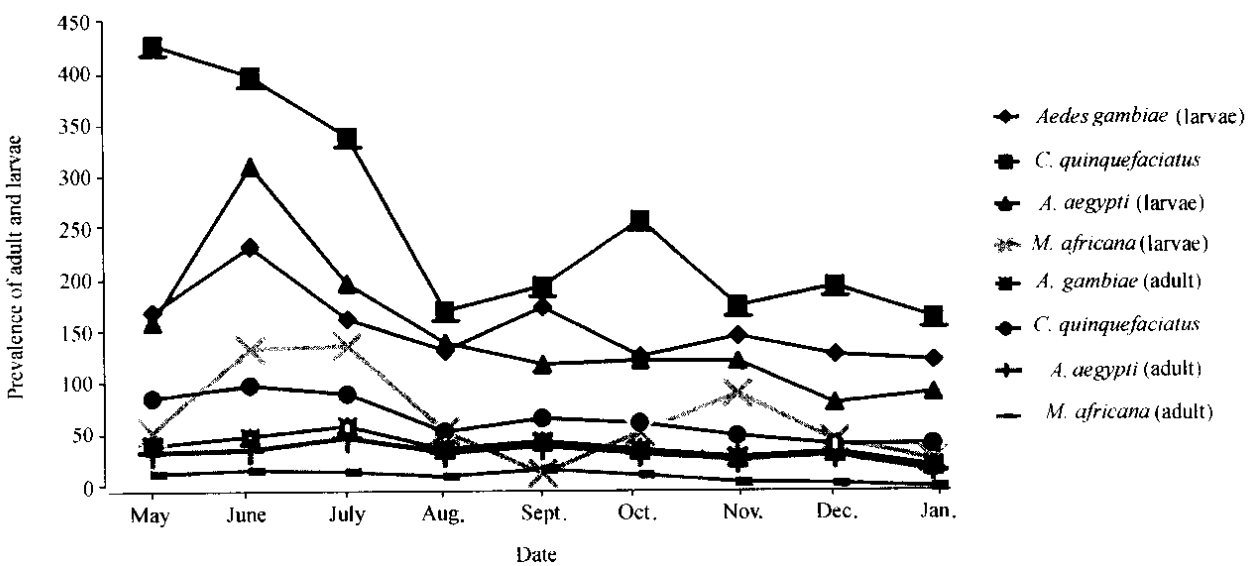

Fig.1 Monthly prevalence of mosquito-larvae and adults in 1999 – 2000

and the three habitats of concrete gutters, earthen gutters and residential/public environment.

Temporal variation in mosquito captures revealed that mosquito larvae were more abundant between May and October than November to January (Fig. 1). Adult mosquitoes also were more abundant between May and October than November and January (Fig. 1) but peak adult abundances usually followed the larvae population peaks by 1 – 2 months. A total of 1 370 adult mosquito vectors were collected mostly inside and around residential areas at random. The four species of mosquitoes encountered were as follows: *Culex quinquefasciatus* 604 (43.5%), *Anopheles gambiae* 357 (26.1%), *Aedes aegypti* 308 (22.5%) and *Mansonia africana* 101 (7.4%).

3 Discussion

The observed higher abundance of *Culex quinquefasciatus* in our samples is similar to Ogunba's 1976 observation that *Culex quinquefasciatus* accounts for over 70% of the mosquitoes in Nigerian cities. Poor drainage and sanitation, the discharge and scattering of empty cans, fermentation of cassava in earthenware vessels in homes and the increased building of houses creates wells in almost every home. Ventilated septic tanks associated with these houses are also responsible for increasing the number of breeding sites and consequently the numbers of mosquito larvae in public/residential habitats.

Poor road design and construction that has created flat stable concrete/earthen gutters accounts for the abundance of mosquito larvae in these habitats. The few drainable gutters that exist flow into ravines which likely contributes to their status as a permanent resevoir of mosquito larvae. This investigation reveals that breeding sites of *Mansonia africana* are distributed closer to residential buildings than the breeding sites of the other recorded species. The number of adult *Mansonia africana* caught inside residential buildings was more than that of any other species of mosquito and this indicates that the number of mosquitoes entering a house is related to the distance between houses and mosquito breeding sites. Larvae of mosquitoes were more abundant in June while adult numbers peaked in July. This temporal distribution may be due to the high breeding rate at the onset of the rainy season which provides abundant breeding sites in May and June, and the subsequent metamorphosis of larvae into adult forms in July. The gradual decrease in both adult and larval populations between July and August is caused by the subsequent dislodging of mosquito larvae from their habitats.

The spread of parasitic infections depends on the availability of their respective vectors. Thus the prevalence of *Anopheles gambiae*, *Culex quinquefasciatus*, *Mansonia africana* in Uyo urban allows for the persistence of malaria, yellow fever and filariasis respectively. For effective control of malaria and other parasitic infections in Uyo urban, the malaria control unit should be well equipped and sufficiently funded. The government needs to discourage poor engineering activities and improve drainage. The attention of the Federal Government and international organisations should be drawn to Uyo ravine, which is not only a permanent reservoir for breeding of vectors but a barrier to urbanization.

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