

CATTLE WATER TROUGHS AS SOURCES OF CULICINE MOSQUITOES IN NORTHEAST TANZANIA

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SUMMARY

An active search of preimaginal stages of mosquitoes was conducted in cattle water troughs in Muheza township with the aim of assessing their potential in supporting mosquito breeding. On average, 57.2% of the troughs were found to contain immature stage of culicine mosquitoes. *Culex cinereus* was the predominant mosquito species accounting for 55.7% of the emerged adults. Other species included *Cx quinquefasciatus*, *Cx decens* and *Aedes aegypti*. This survey indicates that poor dairy cattle husbandry in urban areas may contribute highly to culicine mosquito productivity. The public health importance of these mosquito to the urban population is discussed.

INTRODUCTION

Raising of animals such as cattle, sheep, goats, pigs, rabbits, poultry and fish both within and on the edge of built-up areas in cities and towns has been carried out since time immemorial. Since the late 1970s, urban farming has been growing in many developed and developing countries, in terms of number of people involved, space used, benefits to households and urban economies, and new challenges. To date, the largest-scale advances in urban farming and marketing are found in and around major Asian cities (Mougeot, 1994). During the pre-independence period in Africa, urban farming was discouraged and often prohibited in low-income housing areas, and public spaces. However, a growing number of independent countries are departing from strict urban regulations. This can be seen in the design of the new national capitals of Cote d'Ivoire, Malawi and Tanzania, and is also expressed in masterplans of Kinshasa (1975), Maseru (1986), Kampala (1994) and

in the on going urban management of Dar es Salaam (Mougeot, 1994).

Dairy cattle farming is increasingly becoming an important activity in most urban areas of Tanzania. People in urban areas are encouraged to embark on urban cattle farming so as to boost their daily incomes. Cattle raising activity has increased markedly over the last two decades. Initially, people started with a small number of cattle, but latter the number of animals per family and the number of families keeping cattle increased. Of late, there has been a marked increase in the number of people living in urban areas due to high population growth rate and rural-urban migration. These factors provided a ready market for the animal products hence stimulating more people to engage on these ventures. Thus, urban cattle farming is commonly a response to economic stress.

Despite enormous benefit of urban livestock keeping, animals may be a potential source of environmental, social and

health hazards. For instance, a number of zoonoses associated with urban livestock farming have been reported in Tanzania by Kambarage *et al.* (1993). Unfortunately, the potential health implications of urban farming have received little attention from the authorities concerned. In most of the urban areas in Tanzania, cattle, sheep and goats are often kept at the dwelling and feeds carried to them (zero grazing). In zero-grazing, animals are usually provided with water in concrete-built water troughs. These troughs are infrequently cleaned and most of times are covered with grass debris. Infrequently cleaned water troughs may provide temporary breeding sites for a number of container breeding mosquitoes. It was the aim of this study therefore, to determine the potential of cattle water troughs in supporting breeding of mosquitoes in an urban area of Muheza, northeast Tanzania.

MATERIALS AND METHODS

Study site

The study was conducted in Muheza, a small town 40 km to the west of a coastal town of Tanga, north-east Tanzania. The town has an estimated human population of 15,000 inhabitants. There are about 500 dairy cattle kept in the area. All the animals are zero-grazed and cattle sheds are built near the owner's house for easy management and security purpose.

Survey of cattle water troughs

The study was conducted in February and March 1995. At first, cattle farmers in Muheza township were identified and registered. Immature stages of mosquito were searched in all cattle water troughs in the area. A dipping method as the main sampling technique was used, but pipetting

was employed where the water level in troughs was extremely low. Five standard dips were done in each trough found to contain enough water. Records were made of the presence or absence of mosquito eggs and other pre-imaginal stages in the water troughs. Collected larvae and pupae were transferred into collecting bottles half full of water from the trough and sent to Ubwari Field Station laboratory for identification. In the laboratory, larvae were identified into species where possible, while the unidentified larvae and pupae were reared to adult stage for further identification.

Table 1: The proportion of cattle water troughs infected with mosquito immature instars and their larval density in Muheza in 1995.

	Feb 17	Mar 8	Mar 27
No troughs	32	30	29
% infested	60.4	56.6	54.7
Larvae sampled	1805	1146	1149
Larvae /trough	56.4	38.2	39.6

The mean number of troughs, percentage infested, larvae sampled and larvae per trough on February 17th, March 8 and March 27 1995 were 30.3, 57.2, 1367 and 44.7 respectively (Table 1).

Table 2: Species of adult mosquito emerged from immature instars sampled in Muheza.

<i>Culex cinereus</i>	97 (55.7 %)
<i>Culex quinquefasciatus</i>	56 (32.2 %)
<i>Aedes aegypti</i>	17 (9.8 %)
<i>Culex decens</i>	4 (2.3 %)

RESULTS

A total of 53 water troughs from different houses were surveyed on three different occasions in which 4100 mosquito larvae were collected. On average, 57.2% (30/53) of the troughs were found to contain either mosquito eggs, larvae or pupae at the time of the surveys (Table 1). All the collected mosquito instars were culicines. Of the collected larvae and pupae 270 live ones were reared in the laboratory for adult emergence. Of the 174 emerged adult mosquitoes, *Culex cinereus* presented the collected immature stage included *Cx quinquefasciatus*, *Cx decens* and *Aedes aegypti* (Table 2). The four mosquito species appeared to breed in a similar ecological habitat, though to different extent. Most of the water troughs were not clean and contained fodder debris most probably being thrown in by the eating and drinking animals. In some of the troughs fermentation smell could be detected.

DISCUSSION

Results of this study indicate that over half of the water troughs sampled serve as potential breeding sites for culicine mosquitoes. *Cx cinereus* and *Cx quinquefasciatus* were the predominant culicine species breeding in water troughs accounting for an average of 87.9% of the total adult mosquitoes emerging from the immature sampled. The tendency of *Cx cinereus*, *Cx quinquefasciatus*, *Cx decens* and *Ae aegypti* to breed in similar ecological habitats has also been observed in man-made containers in central Nigeria (Irving-Bell *et al.*, 1987; Lyimo and Irving-Bell, 1988) and coastal area of Kenya (Subra and Dransfield, 1984).

Most of the water troughs as seen in

the study contained thrown in fodder or hay debris which showed some signs of fermentation. This indicates that the troughs are either infrequently cleaned or the water is left for some time before it is replaced. Fermented grass infusion, for instance from *Cynodon dactylon*, contains substances which are known semiochemicals that strongly influence oviposition by culicine mosquitoes, in particular *Cx quinquefasciatus* (Millar *et al.*, 1992).

It is likely that the resulting increase of stagnant polluted water in urban areas particularly in dwelling places will multiply the number of breeding sites suitable for culicine mosquitoes. Culicines are known for their considerable annoyance to people exposed to their constant biting. Large numbers of nuisance *Cx quinquefasciatus* for instance, have been a major obstacle to public acceptance of the most recent initiative to control malaria vectors in Dar es Salaam (Chavasse *et al.*, 1995). In addition to the serious nuisance problem caused by these mosquitoes, *Cx quinquefasciatus* and *Ae aegypti* are important vectors of bancroftian filariasis and yellow fever respectively. Therefore, domestic animals, such as cattle which are preferred and or easily accessible by the mosquitoes may not only favour mosquito reproduction but also serve as reservoir and amplifiers of disease pathogens (Sota and Mogi, 1989).

Most cattle barns in urban areas are often placed near homes. This practice may lead to increased contact between mosquitoes and human populations, resulting in greater likelihood of transmission of mosquito-borne diseases to humans. Studies by Hewitt *et al.* (1994) have shown that proximity to cattle and goats increase human subject's chances of been bitten by anopheline mosquitoes. The findings by

these authors provided some evidence as to why malaria prevalence is higher amongst families that keep cattle than those that do not. Although there has been a feeling that spraying cattle with permethrin will be a bonus because it will kill mosquitoes feeding on them and hence on man, there are some indications that this in fact will prevent feeding on the cattle and divert mosquitoes to feeding on people (Service 1991).

In conclusion, cattle water troughs which are often in large numbers in many towns and cities in Tanzania constitute important breeding places for culicine mosquitoes. The keeping of many domestic animals, particularly cattle, in urban areas may thus provide additional habitats suitable for mosquito larvae. These breeding sites though small, cannot be disregarded in campaigns designed to interrupt mosquito-borne disease transmission and mosquito control at large. The public health implications of urban cattle farming therefore, need the attention of relevant authorities. Proper cleaning and frequent changing of water to avoid mosquito breeding must be emphasized. In addition, proper management of livestock, which are often economic importance, should form one aspect of the control of mosquito-borne disease. In view of the above it is important therefore to conduct further studies to determine the potentiality of cattle water troughs in supporting the breeding of man-biting mosquitoes in many other urban areas and to find ways of instituting community based mosquito control programmes.

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