THE BREEDING PATTERN OF THE EASTERN EPAULETTED BAT, *EPOMOPHORUS ANURUS* HEUGLIN, IN UGANDA

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**Summary.** Continuous monthly observations of the reproductive organs of the Eastern epauletted bat, *Epomophorus anurus*, has revealed its breeding to be cyclic with two distinct breeding seasons separated by about a month. Gestation appeared to last between 5 to 6 months, and occurred from April to September and October to March. Testes were heaviest from February to April and from September to December, and a majority of young bats were caught in late March and early October during the short intervals between breeding. This study supports the findings of earlier workers showing that breeding in tropical fruit bats is seasonal and closely related to rainfall. It further supports an earlier suggestion that this fruit bat is polyoestrous and breeds continuously.

**INTRODUCTION**

In his work on the reproductive activity of bats, Herlant (1953) implied that reproduction in *Epomophorus anurus* Heuglin may be continuous and acyclic, but a precise analysis of the data was made difficult because of the small number of animals caught. More recently, Mutere (1967, 1968) carried out some studies which showed that in two other fruit bats, *Eidolon helvum* Kerr and *Rousettus aegyptiacus* E. Geoffroy, breeding is seasonal and not continuous. In the light of these findings, it was thought necessary to re-examine the breeding habits of *E. anurus*. An opportunity to do this arose during a field survey of fruit bats conducted between 1971 and 1972 to establish their rôle in the epidemiology of human arboviruses.

**MATERIALS AND METHODS**

Mist netting was carried out monthly between August 1971 and July 1972 in the Entebbe area 0° 5' N, 32° E and in Sebei, 1° 30' N, 34° E in Uganda. These areas are both characterized by two rainfall seasons, one occurring between March and May with a peak in April and the second between October and December with a smaller peak in November, separated by brief dry spells.

A total of eighty bats were caught with mist nets placed in bushes and forests or by hand from house roofs. They were anaesthetized with ether, weighed and bled by heart puncture. The forearm was then measured and the reproductive organs were examined for the presence of testes and accessory sexual glands.

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organs were dissected out. After removal of whole uteri with the ovaries attached by cutting across the cervix, they were cleaned of fat and weighed on a Mettler balance. If the uterus contained a sizeable embryo, this was removed and weighed separately. Testes together with the epididymides were also cleaned before weighing.

RESULTS

Of the total number of bats collected, forty-two were adult females, thirteen
were adult males, and the remaining twenty-five were young bats. Young male bats weighed less than and adult males more than 60 g, young female bats weighed less than and adult females more than 55 g and all young animals had a forearm length of 70 mm or less. Adult bats of both sexes often had a forearm length between 70 mm and 80 mm, the length being greater in males than in females.

The monthly increase in weight of the uteri and fetuses throughout the year is shown in Text-fig. 1. It is evident from the histogram that breeding was bimodal. The first breeding period extended from late April to early September, and the second from late October to late February. In late March and late September, uteri were found to be in the post-parturient stage as shown by slight and more uniformly distributed enlargement of one of the uterine horns and the presence of ischaemic placental scars. This condition of the uterus was maintained up to early April and early October but by late April and late October one of the uterine horns of many adult females showed a swelling that indicated early pregnancy. The time when early pregnancies were evident was also the lactating period as shown by the enlarged and protruding mammea and the presence of milk when squeezed. By late August and early February, the fetuses weighed an average of 8 g but, by early September, they had attained a weight of 11 g. No female bats were caught in late February. Fetuses were distributed between left and right uterine horns with about equal frequency (nine right to eleven left in twenty pregnancies). Testes weighing over 900 mg were found in September and October and testes weighing between 100 and 200 mg were also found in February, April and May. No data were available for March.

The graph in Text-fig. 1 shows the cyclical variation in the percentage of young animals caught during the survey. The percentages were expressed as the number of young bats caught divided by the average monthly catch total of six bats. The results showed that peak recruitment of young bats into the flying population occurred in the months following the end of the breeding period in late March and early October.

**DISCUSSION**

The results presented above clearly show that *Epomophorus anurus* Heuglin, like other fruit bats that have been studied in Uganda, are cyclic in their breeding. The months when heavy testes were found (September, October and February to April) correspond to the periods of the year when early pregnancies were detected, indicating that mating occurred during these months. In view of the very brief period between birth and the appearance of early pregnancies, it would appear that this bat experiences post-partum oestrus with ovulation. Matting would then occur between late March and early April and between late September and early October resulting in pregnancies in late April and October. This suggests that in *E. anurus* oestrus occurs twice during the year, a conclusion agreeing with that of Herlant (1953) who suggested that this bat was polyoestrous. Herlant’s claim that the bat breeds continuously would also be
results substantiated, but his finding of late pregnancies in October and his suggestion that fertilization occurs at different times of the year need more qualification. These data indicate that two fertilizations at 6-monthly intervals occur at particular times of the year. Perhaps part of the discrepancy between the results could be explained by differences in local environmental conditions and also by the criterion Herlant used for classifying pregnancies. For example, he also observed pregnancies in December, February and March although he considered that these pregnancies were early, whereas in Uganda they would have been considered late since by March most of the adult females had given birth to their young.

The occurrence of heavy testes in September and October is similar to Herlant’s findings that the epididymis of male bats contained spermatozoa and the seminal vesicles were full of secretions in August, October, November and December. As in his study, few data were available in the remaining part of the year, but the occurrence of heavy testes in February and April and also in September and October indicates a bimodality in testicular weight and tends to correlate well with the existence of post-partum oestrus.

In the tropics, and in Uganda particularly, the larger fruit bats such as *Eidolon helvum* would seem to have only one breeding period in the year whereas the smaller fruit bats, such as *R. aegyptiacus* and *E. anurus*, have two breeding seasons occurring one after the other separated by about a month’s interval, the seasons occurring simultaneously in the two species. It is suggested that the 2-month break observed by Mutere (1968) represented the period of early pregnancies that were probably overlooked. From personal observation (N. O. Okia, unpublished work), uterine swellings (indicating early pregnancies) were found in female *R. aegyptiacus* in May and November. This bimodal breeding behaviour appears to be related to rainfall in that the young are born at a time when it is neither too wet nor too dry.

Since the birth weight was about 11 g, the young bats caught during the birth season, i.e. February to March and September to October, whose average weight was 53.7 g, must have been born in the previous breeding period and not in the one immediately preceding their capture. This would also explain the few catches of young bats during the gestation period and would indicate that the young bat does not leave its mother until just before the next generation is born.

The period of peak recruitment of young bats into the flying population probably coincides with the abundance of some types of bat food. It is known, for example, that a number of trees in this area that are visited by bats for their fruit or flowers, such as *Parkia filiceoida* Welw. and *Kigelia* sp., flower in the drier parts of the year, the former in January and February and the latter between November and March (communication from the Forestry Department, Makerere University). The author has, however, observed bats feeding on the mango tree, *Mangifera indica* L., in June and July during its ripening period, and on the fig tree, *Ficus natalensis* Hutch, in May and June. These months, though not corresponding to the peak recruitment of young bats, fall within the first gestation period. Further study might reveal that breeding in this bat is not only related to rainfall, but also to the availability of food.
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REFERENCES

