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# POPULATIONS OF *EIDOLON HELVUM* IN KAMPALA OVER 40 YEARS

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## ABSTRACT

A decline in population of the straw-colored fruit bat, *Eidolon helvum* in Kampala has been observed on and off for the last 40 year, but with seasonal variability, noticeable with the numbers of the bats surviving in Kampala at present. The first known count of the bats by Mutere (October, 1962) estimated their population at over 200,000 bats while estimates for the same month in 2002 stand at just over 23,000. A lot of impressions have been drawn from studies carried out from 2002-08.

Counts of bats were carried out using the single Stage Systematic system. The decline in population could be due to habitat destruction/ fragmentation; more noticeably tree cutting and other human effects such as negative attitude towards the bats. The present day pattern is of the Kampala colony broken up into several small sub-colonies roosting in a variety of tree species. This pattern is greatly varied from that of the 1960s when the first counts were done at the then Bat valley where *Eucalyptus saligna* was then the prime roosting tree. The surviving populations of *E. helvum* are now distributed in smaller colonies in several areas of the city. During 2002, counts were also conducted in selected other areas within a radius of 80km from Kampala in an attempt to evaluate the bearing of these populations on that in Kampala. Populations of the bats were higher at locations further away from the city as compared to those in Kampala.

**Key words:** *Eidolon helvum*, roost trees, population changes, roost sites.

## INTRODUCTION

Bats comprise more than 20% of all mammal species of the world. In Uganda 90 species of bats have been recorded (Hayman and Hill, 1971; Davies and Vanden Berghe, 1994; Kityo and Kerbis, 1996) making up to about 24% of the country's mammalian diversity.

The straw-colored fruit bat, *Eidolon helvum* is a large frugivorous bat found in tropical Africa. The population of this species is in decline perhaps due to diminishing availability of the floral resources with which they have undergone diffuse co-evolution due to clearance for expansion of human settlement. Studies on the population changes of *Eidolon helvum* in Kampala have been ongoing for the last 40 years following the initial count done in 1960 (Mutere, 1962). Mickleburgh et al (2002) and Huston *et al.* (2001) respectively reviewed the conservation issues relating to *Megachiroptera* and *Microchiroptera* worldwide. Mickleburgh *et a.l* (2002) assessed bat species of the world and confirmed 12 species extinct, 238 species threatened, 212 species near threatened and

479 species being of least concern while 60 are still data deficient. These data suggest that over 20% of the bat species of the world are under considerable risk.

Bat populations are in alarming decline worldwide e.g. in North America bats are the most endangered land mammals with more than half of all the species listed as endangered or official candidates (BCI, 2002). Like most animals, bats suffer habitat loss and environmental pollution but the primary cause of their decline is wanton destruction by humans. *Eidolon helvum* though not endangered (according to IUCN Red List, 2000) has been noted to be very vulnerable to habitat destruction most, especially widespread loss of original habitats.

For Uganda only one species has been categorized as vulnerable while 13 species are considered lower risk not threatened (Mickleburgh et al, 2002). It is nonetheless possible that a species may not be at risk globally while it is under pressure on a country scale. *Eidolon helvum* provides a good example in which numbers of this species of bats in Kampala have reduced from over 200,000 in the early 1960s (Mutere, 1962) to as low as just over 2,000 in 2008.

## METHODOLOGY

### Study Areas

The counts were conducted in Kampala and its outskirts. Surveys were conducted in all the known and new roost sites of *Eidolon helvum* in Kampala. Visits outside Kampala were made to sites in Jinja and Entebbe, which have or had been reported to have roosts of *Eidolon helvum.*

### Methods

The method used for estimating populations of the bats principally involved the 'Single Stage Systematic sampling' first described and used by Baranga and Kiryegera (1979) and which has been used by several other people for estimating the populations of bats. In this method a tree that had *Eidolon helvum* roosting, constituted a primary unit.

The counting method involved total counts of representative clusters on the roosting tree where roosting was done in definite clusters and total counts where the roosts were evenly distributed on the trees or branches. The counts were done three times each month of the study

## RESULTS

Table 1 summarizes the mean monthly population of the bats for the three districts that were surveyed. The highest mean population was in the months of June in Kampala and February for both Jinja and Entebbe.

For all the sites, the standard deviation is small compared to the mean population implying that the mean is a good representation of the sample. Also from the standard error value, it can be deduced that the sample mean is close to the population mean.

It is evident there has been a sharp decline in the population of *E. helvum* in Kampala in the past 40 years (Fig 1). This decline can be attributed to habitat loss/roost sites destruction in Kampala. During the surveys, it was observed that a number of people have very negative attitudes toward the bats and considered them a nuisance in the neighborhood.

Highest population estimate in Kampala was recorded at 76,000 bats in late June 2002 and the lowest at 23,081 bats in mid October 2002 (Table 1). No bats were recorded in Kampala in August and September (2002). This has been the observed trend through all the years that counts were done except for August (1963 and 1964) when populations

were estimated at 9,000 and 6,000 respectively. These totals are low compared to those of other months.

Table 1: Mean monthly population of *Eidolon helvum* in Kampala, Jinja and Entebbe roost sites from May 2002 to March 2003

| Month | Mean number | | | Standard deviation (SD) | | | Standard error (SE) | | |
|---|---|---|---|---|---|---|---|---|---|
| | KLA | EBB | JJA | KLA | EBB | JJA | KLA | EBB | JJA |
| May 02 | 65,393.42 | Nc | 46,284.88 | 2,022.69 | Nc | 593.40 | 350.36 | Nc | 66.76 |
| June 02 | 76,000.56 | 6,798.22 | Nc | 2,280.24 | 566.52 | Nc | 389.17 | 157.12 | Nc |
| July 02 | Nc | 8,439.67 | 67,112.79 | Nc | 625.16 | 767.00 | Nc | 164.18 | 81.29 |
| Aug 02 | 0 | Nc | Nc | 0 | Nc | Nc | 0 | Nc | Nc |
| Sept 02 | 0 | Nc | Nc | 0 | Nc | Nc | 0 | Nc | Nc |
| Oct 02 | 23,081.24 | 12,166.10 | Nc | 344.50 | 553.00 | Nc | 41.78 | 115.31 | Nc |
| Nov 02 | 39,395.75 | Nc | Nc | 1,265.74 | Nc | Nc | 215.49 | Nc | Nc |
| Jan 03 | 23,857.79 | Nc | Nc | 954.31 | Nc | Nc | 187.16 | Nc | |
| Feb 03 | 23,298.12 | 24,099.63 | 122,618.88 | 931.92 | 803.32 | 559.90 | 182.76 | 144.28 | 37.75 |
| Mar 03 | 43,364.38 | Nc | Nc | 1,421.78 | Nc | Nc | 253.32 | Nc | Nc |

0=No bats, Nc= No count, KLA=Kampala, EBB=Entebbe, JJA=Jinja

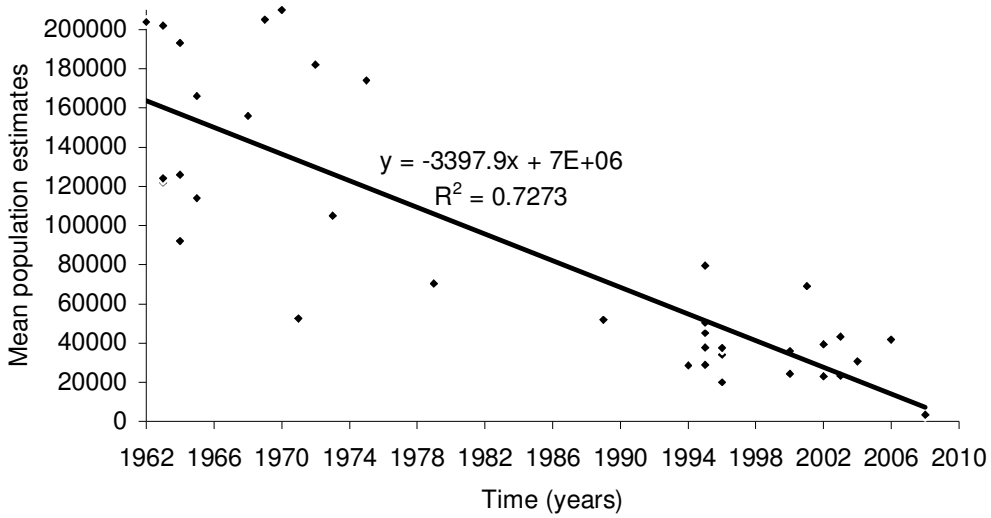


Figure 1 Trend in population of Eidolon helvum in Kampala over the years

This is presumably the time when the bats move to other areas outside Kampala (perhaps to the Islands in Lake Victoria as suggested by Mutere, 1962). It has also been noted that *Eidolon helvum* are capable of long distance migrations following food availability (Kingdon, 1978). He also suggested that this was a tactic for exploiting the seasonal and widely dispersed fruits of the woodlands and the savannahs.

Variations in populations were also noted within same month, for example early November 2004 registered just over 28,000 bats compared to late November 1972 with as high as 105,000 bats. This trend was also noted by Engola (2001-unpublished). This could suggest that the concept of "single home roost" may not apply to these bats. There might be a considerable turnover among individuals present in a roost from day to day. Therefore a colony would not constitute an autonomous group of the same individuals but rather temporarily associated members of a large mobile population.

During February 2003, about 400 bats were hunted for food in one day at the source of the Nile in Jinja. This figure comprised about 0.33% of the population that was roosting at this site in February (122,619 bats). Assuming that such pressure was to be sustained, it would only take 307 days for all the bats roosting here to be hunted. This means in less than one year, *Eidolon helvum* the Jinja colony could be completely hunted out. Osmaston (1965) showed that the germination success of *Melicia excelca* and Mosanga cercropoides was as high as 90% for seeds ingested and defecated by *Eidolon helvum* compared to less than 10% for those collected directly from the trees. This therefore gives an insight into the ecological role of *Eidolon helvum* in the balance of nature.

The movement of the bats in and out of Kampala was mainly oriented toward those places that had the food resources. Mutere (1965) noted that these bats fed on ripe fruits such as *Papaya carica*, *Melicia excelsa*, Figs, *Mangifera indica* and others. The sites to which the bats moved had tree species that are food sources for the bats. Trees like *Sapium ellypticum, Ficus natalensis, Maesopsis emini* and *Eucalyptus citriodora, Canarium schweinfurthii*, and *Papaya carica* were present.

**Summary of general impressions on *E.helvum***

During the surveys, it was noted that many sites that had bat roosts in previous studies had no bats. Several tree species were being used by the bats for roosting but the roosting pattern varied both within and between the tree species at the different sites. Cluster sizes (number of bats per cluster) and cluster numbers (number of clusters of bats per tree) were also varied within individual primary units.

Although roosts were established mainly on tall trees, some of which are common food sources for the bats, *Eidolon helvum* did not necessarily roost on the tree species on which it feeds. This was especially true for most of the sites in that those trees commonly used as foods like *Maesopsis emini*, *Eucalyptus sp*, *Ficus* sp and others had lower bat loads or none compared to other trees.

## DISCUSSION

Studies on the population changes of the straw-colored fruit bat, *Eidolon helvum* in Kampala have continued on and off over the last forty years. Mutere (1962) estimated the population of the bats at the then Bat Valley at over 200,000. It is apparent that there has been a general decline in the population of *Eidolon helvum* in Kampala (Fig 1). The existing populations are found in small pockets scattered in the Kampala area. It is also clear that major changes in the bats' roosting behavior are taking place.

The break up of the large colony may be attributed to the degradation of the habitat that supported large roosts of bats. The decline in populations of bats in Kampala has kept trend with that of potential habitats from which these bats were recorded. Of 13 different sites that previously hosted large roosts of bats, only a few now host roosts. There is however no guarantee for this, but it is one aspect that points to the pressure these bats face and a question to the long-term survival of this species.

With over 300 plants in the old world tropics dependent on bats for pollination and dispersal (Bat conservation International, 2002), the role of bats such as *Eidolon helvum* as major allies in ecosystem regeneration will be greatly compromised if no steps are taken to save their populations. When we hurt the populations and ecology of the other species with which we share the world, then we are putting our survival at great risk.

Of the major threats to bats identified by Mickleburgh *et al* (2002), roost site loss or disturbance may be the main threat to *Eidolon helvum* in Kampala. This is not to rule out other threats such as habitat loss or modifications including impacts of deforestation and natural events like tree falls, health issues arising from associating bats with disease to humans, persecution of bats arising from a combination of ignorance and perceived risk of damage or disease and lack of information that makes accurate assessment of their status difficult and over exploitation of bats for food (noted in Jinja).

From the recent surveys, it has been noted that the ideal habitats for *Eidolon helvum* are also the best potential residential areas in Kampala. This has put a lot of pressure on the roost sites for conversion into residential premises. This is already evident for the Bat Valley area whose stand of *Eucalyptus* trees have all been cut down and the area turned into commercial plots.

The population home range presumably encompasses multiple roosts among which individual bats shift on daily or perhaps wholly opportunistic basis. Hayman and Hill (1971) noted that degradation and reduction in habitat size for residential and other social uses is one destructive force that requires checking and monitoring.

Conservation policy in Uganda puts more emphasis on the natural areas that support high population of wild animals in National parks or Nature reserves, down playing the biodiversity levels outside these protected areas. Many species that today survive outside gazetted protected areas therefore continue to suffer loss of habitat and

population decline, a fact that could rapidly change their status in the IUCN threat categories.

When we hurt the populations and ecology of the other species with which we share the world then we are putting our survival at great risk, therefore there is a need to inform the local populations of the role that the bats play in maintaining a balance in the environment.

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