

**Ruaha Ecosystem Wildlife Management Project**

**Aerial Wildlife Survey in Rift Valley sectors of Ruaha National Park (RNP) and Lunda  
Mkwambi Game Controlled Area (LMGCA)**

**Survey No. 3 1st-6th June 1995**

**Summary Report June 1995**

## **Introduction**

This report summarises the results of the third REWMP aerial wildlife survey. This was conducted at the beginning of June 1995. Ideally the survey would have been conducted a few weeks earlier as a late wet season count for comparison with the mid- and late dry season counts undertaken in 1994. Unfortunately this proved impossible due to logistical problems.

Thus the survey can be regarded as an early dry season count. The survey area was identical with that covered in surveys Nos 1 and 2 i.e. the Rift Valley segment of Ruaha National Park (RNP) and Lunda Mkwambi Game Controlled Area (LMGCA). Transects flown were identical with those flown in surveys Nos. 1 and 2.

At the time of the survey little green grass remained in the survey area, but there was plenty of green foliage on miombo, Commiphora, Acacia and Combretum species. There was widespread occurrence of surface water in pans and as pools in watercourses, though these showed signs of depletion. The level of water in the Great Ruaha River was well below its high-point in March/April, with many sand-banks exposed along its course. The water level in Mtera Dam at the eastern end of the survey zone was higher than in surveys Nos. 1 and 2. It appeared that livestock had removed most of the ground cover over extensive areas in the east of the survey zone.

## **Methods**

### Survey area and transect location

This survey sampled the same transects flown in the first survey (see Appendix Three for UTM co-ordinates of transect endpoints).

### Sampling methodology

The survey was conducted using systematic reconnaissance flight (SRF) methodology as described in Norton-Griffiths (1978). The survey parameters are given in Appendix One.

Strips were delineated by streamers fixed to the wing struts. Strip widths were calibrated by flying at various heights over markers spaced 20 meters apart. Regression analysis was performed to estimate for each rear seat observer the relationship between aircraft height and number of markers seen, an estimator of observed strip width.

Sampling was carried out between 0700 and 1000 and 1600 and 1800 each day. The pilot located each transect and used the aircraft's Global Positioning System (GPS) to identify the beginning of each 2.5 km sub-unit along the transect. For each sub-unit the rear seat observers (RSOs) recorded on cassette the large mammals sighted. In each sub-unit the front seat observer (FSO) took a reading from the radar altimeter.

### Data analysis

Large mammal population estimates were generated using Jolly's method for unequal-sized sampling units as described in Norton Griffiths (1978). SRF software (Campbell), with supplementary programs supplied by TWCM, was used to perform the data analysis and generate density distribution maps for large mammals.

A post-sampling stratification was performed to compare large mammal population estimates in the Ruaha National Park section of the survey zone with those in Lunda Mkwambi Game Controlled Area.

### Results - population estimates for this survey compared with previous ones

Twenty-two species of wild mammals were recorded during the survey. Population estimates for the more important species are shown below, with figures from the previous surveys for comparison. The population estimates are for the entire survey zone. 95% confidence intervals for the estimates are shown as (+/- ...%). Appendix Two contains Density distribution maps for elephant, buffalo, impala, zebra, giraffe and domestic livestock.

Animal	Population estimate June 95	Population estimate Nov 94	Population estimate Jul 94
buffalo	4573 (+/-82%)	4283 (+/- 63%)	3306 (+/-89%)
eland	199 (+/-75%)	724 (+/- 71%)	536 (+/-83%)
elephant	3014 (+/-39%)	1248 (+/-55%)	1307 (+/-43%)
giraffe	1735 (+/-11%)	2338 (+/-12%)	2636 (+/-11%)
impala	2909 (+/-35%)	3592 (+/-34%)	4340 (+/-21%)
kudu	362 (+/-42%)	342 (+/-45%)	596 (+/-34%)
zebra	2391 (+/-28%)	3191 (+/-26%)	3424 (+/-28%)
livestock*	45394 (+19.1%)	66411 (+/-21%)	44581 (+/-26%)

\* livestock - cows, sheep and goats.

The results indicate a significant reduction in the number of livestock in the survey area since November 1994 ( $d = 2.56$  at  $P = 5\%$ ). A significant decrease in giraffe density and an increase in elephant density were also indicated (for giraffe,  $d = 3.5$  at  $P = 5\%$ ; for elephant  $d = 2.6$  at  $P = 5\%$ ).

A significant decrease was indicated in impala density between the survey conducted in July 1994 and this survey ( $d = 2.06$  at  $P = 5\%$ ).

### Combined population estimates for the last three surveys

Population estimates from REWMP surveys nos. 1,2 and 3 were merged to produce a three survey estimate for buffalo and zebra in the survey zone. Cochran's method was used as described in Norton Griffiths (1978).

Animal	Merged three survey population estimate	95% C.I.
buffalo	4007	43%
zebra	2864	16%

It was not possible to produce a combined estimate for giraffe, impala or elephant because of the density differences indicated between this and previous surveys.

### Comparison of large mammal populations in RNP and LMGCA

Post-sampling stratification produced the following estimates for RNP and LMGCA sectors of the survey zone:

Animal	RNP popn estimate	LMGCA popn estimate
Buffalo	4582	63
Impala	1957	916
Zebra	2166	249
Giraffe	1380	358
Elephant	2113	888
Kudu	142	220
Cattle	-	28359
Goats	-	11828

The area of LMGCA surveyed was 3300 km<sup>2</sup>, and the area of RNP surveyed was 2260 km<sup>2</sup>.

The density distribution maps in Appendix Two indicate the areas where elephant, buffalo, impala, zebra, giraffe and livestock were recorded.

### Discussion

There is no obvious explanation for the significant decrease in giraffe numbers indicated over the last seven months or for the decrease in impala indicated over the last twelve months. If accepted, the results imply a movement of animals out of the survey zone or a reduction in total numbers. Alternatively the results may be an artefact of bias e.g. reduced visibility, due to more shade cast by tree foliage. It will be interesting to see whether future surveys show similar results.

There was a significant increase in elephant numbers in the survey zone. They were recorded in increased numbers inside and outside the park. Outside the park they occurred especially in the miombo regions in the south-west end of the survey zone. Elephants also were recorded in the east of the survey zone near Mtera Dam, from where there have been reports of crop raiding.

Domestic livestock numbers were reduced in comparison to November 1994. However the population estimate was not dissimilar from that of July 1994. As the dry season progresses herders and their stock may concentrate around Mtera Dam, eventually restoring livestock densities to those observed in November 1994.

For the more important species occurrence maps are shown in Appendix Two. These show the distribution of locations at which animals were recorded over the course of the three REWMP surveys. No indication is given of relative density.

#### Implications for large mammal utilisation

The stratification supports the suggestion from earlier surveys that in LMGCA large mammals currently occur at densities which are not high enough to support a significant level of offtake for meat provision to villages.

Impala and buffalo are the most important species on the current quota for cropping in Mlowa village area. As noted, overall estimates have not changed significantly of the populations of these species in the survey area over the last year or so. Whilst remembering that buffalo are not amenable to population estimation by SRF, it seems fair to say that their distribution has changed little over the three surveys. The animals remain concentrated in RNP and close to the RNP boundary in village lands..

The distribution of impala is more widespread, and this survey indicated that proportionally more impala occurred in LMGCA than in previous surveys. Impala were recorded well inside village lands.

As the dry season progresses and the river falls further, more animals may cross into LMGCA from the park. Local people have claimed that this process occurs. However this survey, compared with the 1994 mid and late dry season surveys, suggests that the process occurs only on a small scale for buffalo. For impala the distribution maps suggest there may be a movement into LMGCA at the start of the dry season (i.e. current survey), but that by the end of the dry season animals are again concentrated close to the river. This needs confirmation by further investigation; village game scouts could play a useful role in establishing whether and to what extent such movements occur.

This has obvious implications for any attempt to improve the wildlife status of the area with the aim of making it suitable for tourist hunting or game viewing. In particular it will be important to clarify the significance of dispersal from RNP and investigate the effect that factors such as managed/unmanaged/mismanaged burning (in RNP and LMGCA) and human disturbance (in LMGCA) have on the immigration of game from RNP.

## **References**

- Campbell, K.L.I., 1993, SRF: Systematic Reconnaissance Flight.  
Norton-Griffiths, M.,1978, Counting Animals. African Wildlife Foundation. Publication no. 1.

## Appendix One

### Detailed survey parameters

#### Aircraft

Cessna 182 5H-FOR

#### Crew

Pilot: L. Patterson, ODA

FSO: A. Bielinski, ODA\VSO

RSOs: S. Jennings, ODA

D. Bayona, RNP

#### Sampling

Transect spacing: 2.5 km.

Total area surveyed: 5566 km<sup>2</sup>.

Sub-unit length: 2.5km

Number of transects: 58.

Nominal flying height: 250 feet.

Nominal flying speed (ground speed): 150 kph.

Nominal strip width (total) 250m, giving a nominal sample fraction of 10%.

Actual average flying height: 257 feet, standard deviation 24 feet

Actual average flying speed (ground speed): 158 kph, standard deviation 10 kph

Actual total strip area: 57142 ha

Actual sample fraction: 10.3 %

**Appendix Two**

- (i) Density distribution maps for important large mammals**
- (ii) Occurrence maps for major herbivores Surveys 1,2,3 combined**

**Appendix Three**

**Transect Co-ordinates (UTM)**