



Aerial Survey of Elephants and other Large Herbivores in north-west Matabeleland, Zimbabwe: 2007

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Summary

Elephants and other large herbivores, wild and domestic, were surveyed from the air in north-west Matabeleland in western Zimbabwe during October-November 2007. A fixed-wing aircraft was used to conduct a sample survey, flying transects over the area. The survey area totalled 24 570 km² and included Hwange National Park, Zambezi National Park, Kazuma Pan National Park, Matetsi Safari Area, Deka Safari Area, Ngamo and Sikumi Forest Areas and the Tsholotsho and Maitengwe communal lands along the south-east border of Hwange NP.

The principal objective of this survey was to provide a relatively precise and accurate estimate of the number of elephants in the survey area as a whole, using a technique that could be executed within a reasonable time and at a reasonable cost. Secondary objectives included determining the spatial distribution of elephants, estimating the number and distribution of elephant carcasses, and estimating the numbers and distribution of other large herbivores. The methods, both repeatable and technically robust; were those most suitable for meeting the principal objective of the survey; and were similar to those used during the 2001 survey of elephants in this same region.

The sampling intensity in the 23 strata ranged from 3.2 to 15.4 %, with greater intensity in strata expected (on the basis of previous survey results) to contain greater densities of elephants. The overall sampling intensity was 8.1 %.

Some large herbivores are not easily seen from the air and their numbers were undoubtedly underestimated. Nonetheless, population estimates are given for these species, because the estimates provide useful indices of abundance (with measures of precision) that can be used to determine spatial distribution, as well as temporal trends in population number. No corrections have been applied to any of the estimates to compensate for any undercounting or missed animals.

The estimated population numbers of the principal large herbivores in the survey area were: elephant 39765 (upper and lower 95% confidence limits \pm 16.4 %); buffalo 24506 (\pm 121 %); zebra 4561 (\pm 31.6 %); sable 3368 (\pm 37.9 %); impala 4783 (\pm 54.0 %); giraffe 1471 (\pm 26.9 %); kudu 1283 (\pm 39.4 %); wildebeest 2318 (\pm 143 %); waterbuck 1390 (\pm 108 %); cattle 6523 (\pm 56.6 %); sheep and goats 890 (\pm 122 %); and donkeys 331 (\pm 115 %). During previous surveys, the domestic livestock were confined to the communal lands and forest areas, but during 2007 cattle were seen in Hwange NP and Matetsi SA.

The estimated total number of elephant carcasses (2563) represented 6.1 % of the estimated total number of live and dead elephants. This all-carcass 'ratio' compared with a ratio of 3.2 % recorded in the same area during 2001. The 1+2 carcass ratio (which reflects the mortality rate of elephants during the survey year) was 0.38 % during 2007, compared with 0.21 % during 2001. These increases suggest that there has been an increase in the mortality rate of elephants in the survey area during the last six years. The 1+2 carcass ratio was particularly high in the southern half of the Kazungula stratum and within a 40 km arc stretching from the north-west to the south-west of the PWMA's Main Camp offices. Many of the category 1 or 2 carcasses observed were near roads.

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Introduction

Large wild and domestic herbivores were censused in north-west Matabeleland, western Zimbabwe (Map 1), as part of a continuing study to monitor elephant numbers in the Parks & Wild Life Estate and communal lands of Zimbabwe. This region includes the largest block of Parks & Wild Life Estate in Zimbabwe, which has Hwange National Park as its centrepiece. The elephant population in this region is contiguous with the elephant population in northern Botswana.

The principal objective of this survey was:

- to provide a relatively precise and accurate estimate of the number of elephants *in the survey area as a whole* (i.e. in north-west Matabeleland), using a technique that could be executed within a reasonable time and at a reasonable cost.

Secondary objectives included:

- to determine the spatial distribution of elephants;
- to estimate the number and spatial distribution of elephant carcasses; and
- to estimate the numbers and spatial distributions of other large herbivores.

The methods used were:

- those most suitable for meeting the principal objective of the survey;
- repeatable;
- technically robust; and
- identical to those used during the surveys of elephants in this same region during 2001 and 2006 (Dunham 2002, Dunham *et al.* 2006).

The methods used were not necessarily those that would have been utilised if the principal objective of the survey had been, say, determining the spatial distribution of elephants (which was one of the secondary objectives).

Survey Area

The study area was similar to that covered in previous surveys of north-west Matabeleland (Dunham 2002) and included Parks & Wild Life Land (Hwange National Park, Zambezi National Park, Kazuma Pan National Park, Matetsi Safari Area and Deka Safari Area), Forest Areas (Sikumi Forest Area, Ngamo Forest Area and Kazuma Forest Area), communal land (parts of Tsholotsho and Maitengwe communal lands) adjacent to the eastern boundary of Hwange National Park, and small, private estates adjacent to Sikumi Forest Area (Map 2). To the west of the survey area is Botswana, and elephants are free to cross the international border at will. The northern border of the survey area is the Zambezi River, which forms the international border with Zambia, and elephants are also free to cross this boundary.

The study area covered 24 570 km² and was divided into 23 strata (Table 1 and Map 3). The strata boundaries were the same as those used during the 2001 and 2006 surveys, except for the single stratum North Tsholotsho. Although the survey design required the entire North Tsholotsho stratum to be sampled as during 2006, in practice only the northern part of this stratum was sampled during 2007 (see below for more details). In order to minimise confusion, the stratum sampled during 2007 is called here Far North Tsholotsho. Its area was 474 km² (Table 1), which is approximately half the area of the North Tsholotsho stratum. Far North Tsholotsho covers the northern half of North Tsholotsho. This small change in the survey area makes little practical difference to the estimate of the number of elephants in north-west Matabeleland, because just two elephants were seen in the search strips of North Tsholotsho during the 2001 survey (Dunham 2002) and none were seen during the 2006 survey (Dunham *et al.* 2006).

Methods

Survey Design

The procedures used followed those well established for aerial surveys of African large herbivores (Norton-Griffiths 1978) and utilised during earlier surveys of large herbivores in Zimbabwe. Systematic, parallel transects were positioned across each stratum, with the position of the first transect in a stratum determined randomly. Transects were arranged at right angles to the principal environmental feature within a stratum (see Map 3 and Table 1 for transect orientations). In order to maximise the precision of the estimate of the total number of elephants, the sampling intensity varied between strata. Hence, the distance between adjacent transects varied between strata, according to the planned sampling intensity in each stratum. Overall sampling intensity was planned to be 7.2 %, with a transect width (i.e. combined width of the two search strips) of 300 m. The planned sampling intensity in each stratum was determined by using the mean of the elephant densities in each stratum during 1998, 1999 and 2001 (Dunham 2000, 2002, Gibson 1999) as the predicted elephant densities in equation 1 of Gibson (1989). As a consequence, those strata expected to contain high densities of elephants were sampled more intensively than strata expected to contain few elephants. In practice, the transect spacing varied from 2.2 km in strata expected to contain numerous elephants, to 10.0 km in strata expected to contain few or no elephants (Table 1).

The survey was designed using WWF-SARPO's custom software (AIRDESW, version dated 29/05/97). Given a stratum boundary in the form of an ATLAS GIS bna format file, and the transect orientation and spacing, this software generates flight lines (the transects), with the first flight line offset from the end of the stratum by an entered random number. The start and end points for each transect (Appendix 3) were transferred as waypoints to a Global Positioning System (GPS) receiver prior to flying each stratum.

The design used during 2007 was originally prepared for the 2006 survey, but technical problems with the survey plane prevented completion of the 2006 survey. Hence, the same survey plan was used during 2007 as during 2006. Consequently, for strata surveyed during both 2006 and 2007, the transects flown were identical in the two years.

Flight Procedures

All strata were surveyed during the period 27 October to 10 November 2007 (Table 1).

The aircraft used was a Cessna 206, which was fitted with a radar altimeter. During surveys, the aircraft was flown at approximately 160 km per hour at about 300 feet above ground level. Waypoints denoting the start and end points of transects were entered into a Garmin GPSMap276C GPS receiver and navigation along the transects was undertaken by the pilot, with reference to this GPS receiver.

The aircraft crew included a pilot (Charles Mackie), a recorder (Ongai Musemburi) who sat next to the pilot, and two observers who sat behind the pilot and recorder. All four crew members could talk to one another through an intercom system. The two observers were Colum Zhuwau and Godfrey Mtare. Prior to this survey, Mr Zhuwau had experience of observing during aerial surveys, having served as an observer for the Sebungwe and north-west Matabeleland surveys during 2006 and for the Gonarezhou survey during 2007 (Dunham *et al.* 2006a,b, 2007), while Mr Mtare had no previous experience as an observer.

All animals seen by the observers within the search strips (see section *Strip Width and Calibration* below) were called to the recorder, who wrote down the species, the number of individuals of the group that were within the strip, and the GPS location against the time (to the nearest 30 seconds) after the start of the transect. Locations were recorded as waypoints using the Garmin GPSMap276C GPS receiver. During the surveys, the actual height of the plane above ground level (agl) was recorded by the recorder, from the radar altimeter, every

30 seconds (of time) while flying along the transects. Later the mean height above ground level for each transect was calculated. The recorder used a stopwatch to record the time (to the nearest second) taken to fly each transect.

Observations

Although this survey was designed especially to count elephants, the observers were instructed to count also other wild large herbivores and domestic livestock (cattle, goats, sheep and donkeys). Sheep and goats are not readily distinguished during aerial surveys and so both were recorded as 'shoats'.

If any animal group was too large for all the individuals within it to be counted, group size was estimated by the observer. Groups of elephant bulls were differentiated from elephant cow herds (i.e. herds containing calves), although the latter may have included some bulls. Ground hornbills are large and conspicuous birds and any seen were counted. Any ostriches or poachers' camps seen were also counted.

The observers were instructed to note any carcasses seen. Any carcass that could not be identified to species was recorded as an 'unidentified carcass'. All elephant carcasses noted were classified using four age categories as follows:

| Carcass category | Definition |
|-------------------------|--|
| 1 | Fresh Carcass still had flesh, giving the body a rounded appearance. Vultures were probably present and the ground was still moist from body fluids. (Likely to have died within the past month). |
| 2 | Recent Rot patch and skin still present. Skeleton not scattered. (Likely to have died within the past year). |
| 3 | Old Clean bones; skin usually absent; vegetation regrown in rot patch. (Likely to have died more than 1 year ago). |
| 4 | Very Old Bones scattered and turning grey. (Likely to have died within the last 10 years). |

These carcass categories differ from those used during previous surveys of this region, when only three categories were used (Dunham 2002). The new categories are those used by Douglas-Hamilton & Hillman (1981) and now recommended by MIKE for elephant surveys (Craig undated). MIKE (Monitoring the Illegal Killing of Elephants) is a CITES programme that uses aerial and ground surveys of elephant populations, and data collected by law-enforcement patrols, to monitor the illegal killing of elephants at representative sites across Africa and Asia. For most practical purposes, the new categories 1 and 2 are the same as the former categories 1 and 2 respectively. The new categories 3 and 4 include all carcasses that previously were placed in the former category 3.

Strip Width and Calibration

Two fishing rods were attached with custom brackets to each wing strut of the aircraft, so that the rods pointed backwards and parallel to the ground during level flight. The distance between the rods on each strut was arranged so that, when the aircraft was flying at 300 feet agl, this distance represented a strip about 150 m wide on the ground. Each outer rod was marked with a small piece of tape to provide the observers with a "decision point" (it was at this point that the observer decided whether an animal was inside his search strip). When deciding whether animals were inside or outside the strip, the observer moved his eye so as

to align the tape on the outer rod with a small piece of tape on his window, thereby ensuring that all his decisions were made at the same viewing angle.

Prior to the survey, the strip widths were calibrated by flying the aircraft at right angles across an airstrip that had two sets of large-sized numbers (from 0 to 35) arranged at 10-meter intervals along the side of the airstrip. The numbers were arranged as 35 34 33....2 1 0 1 2.....33 34 35, with 0 near the centre of the airstrip. Each observer noted the largest and smallest number within his strip and the recorder noted the aircraft's height above ground level, as recorded by the radar altimeter. For each flight passing over the calibration numbers, the combined strip width (in meters) was adjusted to 300 feet above ground level as follows:

$$\text{Combined strip width at 300 feet} = \frac{\text{Actual combined strip width} \times 300}{\text{Actual flying height}}$$

The combined strip widths, after adjustment to 300 feet above ground level, were then averaged to give the nominal (calibrated) combined strip width at 300 feet. This was 328 m (Appendix 1).

Data Analysis

Far North Tsholotsho stratum

The survey design required the entire North Tsholotsho stratum to be sampled, as during 2006. This stratum, in the north of the Tsholotsho communal land and along the eastern edge of the survey area, was flown without the use of a GPS receiver to aid navigation, because the GPS receiver malfunctioned. During data analysis, it became clear from the transect flying times for this stratum that the transects actually flown were generally much shorter than the intended transects. It appeared that the road used as the southern boundary of the stratum whilst flying was not the correct road. The transect flying times and the mean ground velocity when flying transects in another stratum (Dzivanini) were used to estimate the lengths of the transects flown in North Tsholotsho and thereby determine which road was used as the southern border of the stratum. This road was taken as the southern border of a new stratum, now called Far North Tsholotsho. The area of this new stratum and the lengths of the transects flown were determined using the spatial data software CARTALINX (Hagan *et al.* 1998).

This change in the survey area makes little practical difference to the estimate of the number of elephants in north-west Matabeleland, because few elephants were seen in the North Tsholotsho during the 2001 and 2006 surveys. However, the change will have greater impact on the estimated numbers of domestic livestock, because most of those in the survey area are in the communal lands.

Transect surveys

Population estimates and 95 % confidence limits for individual strata were calculated with WWF-SARPO's custom software (AIRSURVW, version dated 22/05/97). This software uses Jolly's (1969) method 2 for unequal-sized sample units. Given the mean combined strip width when the plane was flying at 300 feet (i.e. the calibrated strip width), and the mean flying height for each transect, the software determines the actual combined strip width for each transect. The actual combined strip width is the product of the nominal strip width at 300 ft and the mean height for the transect, divided by 300. The area of each transect is calculated as the product of the actual combined strip width and the transect length. Transect lengths were provided by the survey design software (Appendix 3).

Transects near the boundary of a stratum were sometimes broken into two or more sections, with land outside the stratum between the sections. For the purposes of analysis, data for all sections of the same transect were combined and entered into the software as one transect. Calculation of the variance of a population estimate required the calculation of N, an integer that is the total number of transects that could have been used in the survey of a stratum. The value of N for a stratum was found by dividing the baseline length by the overall mean actual strip width for that stratum.

Thus, for each stratum, N was calculated as:

$$N = \frac{\text{Baseline length} \times 1000 \times 300}{\text{Nominal strip width} \times \text{Average flying height}}$$

where:

Baseline length = length (in km) of a straight line aligned at right angles to the orientation of the transects, and running from one end of the stratum to the far end;

Nominal strip width = calibrated combined strip width (in m) when flying at 300 feet agl; and

Average flying height = Mean of the mean flying heights (in feet) for all transects in the stratum.

The calculated value of N was rounded to the nearest integer. The value of Student's *t* used to calculate the 95 % confidence limits of a population estimate was t_{n-1} for $P = 0.05$ (Rohlf & Sokal 1981), where *n* = number of surveyed transects in stratum. The WWF-SARPO custom software AIRSURVW calculates the 95 % confidence *interval* as the difference between the mean population estimate and the upper (or lower) 95 % confidence *limit*. The lower 95 % confidence limit is displayed as zero if the calculated value is negative.

Entire survey area

Population estimates for the entire survey area and for various land units within it were calculated as the sum of the estimates for the individual strata within the survey area or the relevant land unit. The upper and lower 95% confidence limits for such a population estimate were calculated as:

$$\text{Population estimate} \pm [t_v \times \text{Square root of (Sum of Variances for individual strata)}]$$

where:

v = the degrees of freedom estimated by Satterthwaite's rule (Snedecor & Cochran 1980, Gasaway *et al.* 1986).

v was an integer, calculated using the formula:

$$v = \frac{(\text{Sum of Variances for individual strata})^2}{\text{Sum of } [(\text{Variance for individual stratum})^2 / (n-1)]}$$

with the outcome of this formula rounded down to the nearest integer. t_v was calculated using the EXCEL function TINV(0.05, v).

Elephant carcasses

The elephant carcass "ratio" *sensu* Douglas-Hamilton & Burrill (1991) - although it is a percentage, not a ratio - was calculated as the estimated number of all elephant carcasses (i.e. age categories 1, 2, 3 and 4 summed) as a percentage of the estimated number of all elephants (i.e. live + dead). Because carcass ratios are based on all elephant carcasses,

regardless of age category, the ratios are unaffected by the age categories used during a survey, and hence are unaffected by the use of new age categories during 2006 and 2007. The elephant carcass ratios and densities given here are directly comparable with the ratios and densities from previous surveys of this region.

When interpreting the results of this survey, it is reasonable to assume that all category 1 or 2 carcasses represent elephants that died during 2007. Hence, the 1+2 carcass ratio provides an index of elephant mortality (both natural and anthropogenic) during 2007 and it was calculated as the estimated number of elephant carcasses in age categories 1 or 2 as a percentage of the sum of the estimated number of live elephants and the estimated number of carcasses in age categories 1 or 2.

Search Effort

The greater the time spent searching each square kilometre of a transect, the greater the probability that the observer saw all the animals that were there. Search effort (in minutes per square kilometre) for a stratum was defined as the total time spent flying all transects within that stratum, divided by the total area of those same transects.

Even the largest herbivores are not easily seen from the air and the numbers of all species were probably underestimated, with the degree of underestimation greater for small or cryptic species than for large species. However, population estimates are given for all species, because the estimates provide useful indices of abundance (with measures of precision) that can be used to determine spatial distribution, as well as temporal trends in population number. No corrections have been applied to any of the estimates to compensate for any undercounting or missed animals.

Results

Search Effort

Overall, search effort averaged 1.02 minutes km⁻² (Table 1).

Animal Numbers

The estimated numbers of elephants, elephant bulls in bull groups, elephants in cow herds, elephant carcasses (age categories 1, 2, 3 and 4), unidentified carcasses, buffalo, impala, sable, zebra, giraffe, kudu, warthog, wildebeest, waterbuck, eland, roan, cattle, sheep and goats, donkey, ostrich and ground hornbill are given in Tables 2 to 25 respectively. Estimates are given for each stratum and for the entire survey area. Separate estimates are provided for the Matetsi Complex, Hwange National Park, the Ngamo and Sikumi Forest Areas, and the surveyed portions of the communal lands of Tsholotsho and Maitengwe.

The columns in the tables give (from left to right):

- the name of the **stratum** (or of a **land unit** comprised of several strata);
- the **estimate** of the number of animals of that species (or of carcasses, camps, etc.) in that stratum or land unit, in other words the population estimate;
- the number of individuals of that species seen (**No. seen**) *inside the search strips* during the survey of that stratum or land unit;
- the **variance** of the estimated number of animals in that stratum or land unit;
- the 95 % confidence interval of the population estimate for that species in the stratum or land unit, as a percentage of the population estimate for that stratum or land unit (**% CI**);

- the lower 95 % confidence limit of the population estimate (**Lower CL**); and
- the upper 95 % confidence limit of the population estimate (**Upper CL**).

There may appear to be small arithmetic errors in some tables, but these are simply rounding errors: all numbers in the tables were calculated to three decimal places before they were rounded to the required number of decimal places.

For practical purposes, it can be assumed that the number of a given species in a given land unit lies between the lower and upper confidence limits, with the 'estimate' providing the best estimate of the number there. For example, from the bottom of Table 2, one can say that there were between 33229 and 46300 elephants in north-west Matabeleland, with 39765 being the best estimate of the number of elephants in the area. For practical purposes, one might say that there were between 33000 and 46000 elephants in the survey area during the late dry season of 2007, with 40000 being the best estimate of the number of elephants there.

Small numbers of duiker, hippo, black rhino, white rhino, steinbuck, jackal, crocodile, lion and bushbuck were seen during the survey, but no attempt has been made to estimate the numbers of these species. No gemsbok or tsessebe were recorded during the survey.

Animal Distributions

The spatial distribution of the principal wild herbivores is shown in Maps 4-6 and 9-19, with each stratum shaded to represent the average density of the given species in that stratum. The spatial distribution of elephant carcasses is shown in Map 7 (category 1 and 2 carcasses) and Map 8 (all-carcass ratios and category 3 and 4 carcasses).

Encroachment on the Parks & Wildlife Estate

The spatial distribution of cattle in the Parks and Wildlife Estate is shown in Map 20. The estimated number of poachers' camps is given in Table 26 and the spatial distribution of these camps is shown in Map 21.

Comparison of Observers

A comparison of the numbers of elephants seen in the search strips by the observers (Appendix 5) did not suggest that there were any major differences in the efficiency of the two observers at counting elephants.

Discussion

Caveat

This survey took place later during the year than was originally planned because delays in executing an earlier survey in south-east Zimbabwe had a knock-on effect and delayed the north-west Matabeleland survey. Consequently, this survey was not completed before the end of the dry season. Some rain had fallen in the study area before the survey was completed and some rain showers occurred during the survey period. Hence, one cannot be certain that significant movements of elephants between strata did not occur during the survey.

The problem of rain during the survey period has occurred before, for example during the 1993 survey of north-west Matabeleland (Bowler 1995), and cannot always be avoided

simply by conducting the survey earlier during the dry season (the 1993 survey was flown during late September and early October, a month earlier than the 2007 survey).

Elephants

There were estimated to be 39765 elephants (lower and upper 95 % confidence limits 33229 and 46300) in north-west Matabeleland study area during 2007. This is less than the estimated number of elephants in the same area during 2001 (49310, with confidence limits 43222 and 55398 (Dunham 2002)). The overlap between the confidence intervals of the two estimates is relatively small. However, given the fact that one cannot be certain that significant movements did not occur during the survey as a consequence of rain, also one cannot be certain that there has been a genuine decline in elephant number. It is probably relevant to note that the 2006 survey – which covered the southern two-thirds of the survey area – found no evidence of any decline in the number of elephants here (Dunham *et al.* 2006).

Given the uncertainty as to whether the number of elephants in north-west Matabeleland has declined, or whether there only appears to have been a decline because the survey was compromised by rain during the survey period, the best course of action would be a repeat survey in the near future. The problem of interpreting the results of this year's survey does emphasise the value of conducting regular surveys at relatively short intervals, for example 1-2 years, rather than at lengthy intervals (e.g. 5+ years).

Elephant Carcasses

The estimated total number of elephant carcasses of all age categories (2563) represented 6.1 % of the estimated total number of live and dead elephants. This all-carcass 'ratio' (which reflects the mortality rate of elephants during the several years preceding the survey) is nearly double the ratio of 3.2 % recorded in the same area during 2001 (Dunham 2002). The 2006 survey that covered the southern two-thirds of the survey area showed a similar increase in the all-carcass ratio (Dunham *et al.* 2006). The 1+2 carcass ratio (which reflects the mortality rate of elephants during the survey year) was 0.38 % during 2007, compared with 0.21 % during 2001. The number of unidentified carcasses in the survey area during 2007 (1543) was similar to that recorded during 2001 (1492). These observations suggest that there has been an increase in the mortality rate of elephants in the survey area during the last six years. However, the observed increase in the carcass ratios would not be sufficient to account for the apparent decline in the number of live elephants.

The all-carcass ratio was high in the strata of the Matetsi Complex, compared with the strata within Hwange NP (Table 8). Within Hwange NP, the all-carcass ratio was relatively high (> 9 %) in the Robins, Mtoa, Main Camp and Ngamo strata.

The carcasses of elephants that died during 2007 (i.e. category 1 or 2 carcasses) were not distributed evenly across the survey area, but occurred in four groups, two major and two minor (Map 7). One major group was in the southern half of the Kazungula stratum, where the 1+2 carcass ratio was particularly high at 24 % for the stratum as a whole (Table 6). The 1+2 carcass ratio was also relatively high (> 1.3 %) in the Main Camp and Mtoa strata, reflecting the presence of the second major group of carcasses within a 40 km arc stretching from the north-west to the south-west of the PWMA's Main Camp offices. Many of the category 1 or 2 carcasses observed were near roads: nine of 19 carcasses observed are close to strata boundaries, which are usually roads (the survey area having been stratified during the days before GPS receivers were available to assist navigation). The obvious conclusion to be drawn from an association between elephant carcasses and roads is that few of these carcasses are of elephants that died from natural causes.

Encroachment on the Parks & Wildlife Estate

Cattle were recorded in both Hwange NP and Matetsi Safari Area (Map 20 and Table 21). Although the numbers of cattle were small, it appears that this is the first survey to record the encroachment of domestic livestock on the Parks and Wildlife Estate in north-west Matabeleland.

Responsibilities

In line with recent recommendations on authorship in ecology (Weltzin *et al.* 2006), the survey responsibilities of the authors are summarised below:

- KMD was solely responsible for designing the survey, data analysis, mapping and writing this report;
- CSM piloted the aircraft, coordinated aviation aspects of the survey and was co-responsible for survey logistics;
- OM was the recorder (with responsibility for recording all sightings, transect, stratum and flight times, using the GPS receiver to enter transect start and end points, recording sighting locations and downloading waypoint and track log files, and assisting the pilot with navigation);
- CZ and GM were the observers (who brought sharp eyes, good humour and team spirit to one of the most-important but least-appreciated roles in any aerial survey);
- RDT drafted the project proposal to United States Fish & Wildlife Service and was responsible for overall co-ordination of the survey programme; and
- TC co-ordinated the role of the PWMA in the survey.

Acknowledgements

This survey was funded by the United States Fish & Wildlife Service, with additional support from the Parks & Wild Life Management Authority and the World Wide Fund for Nature – Southern Africa Regional Programme Office.

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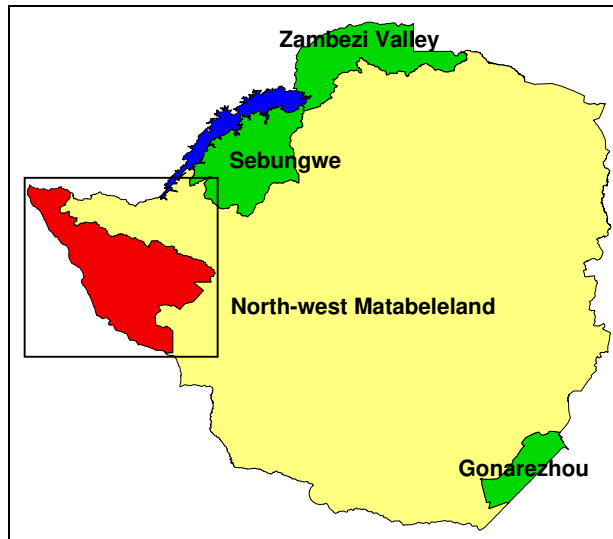
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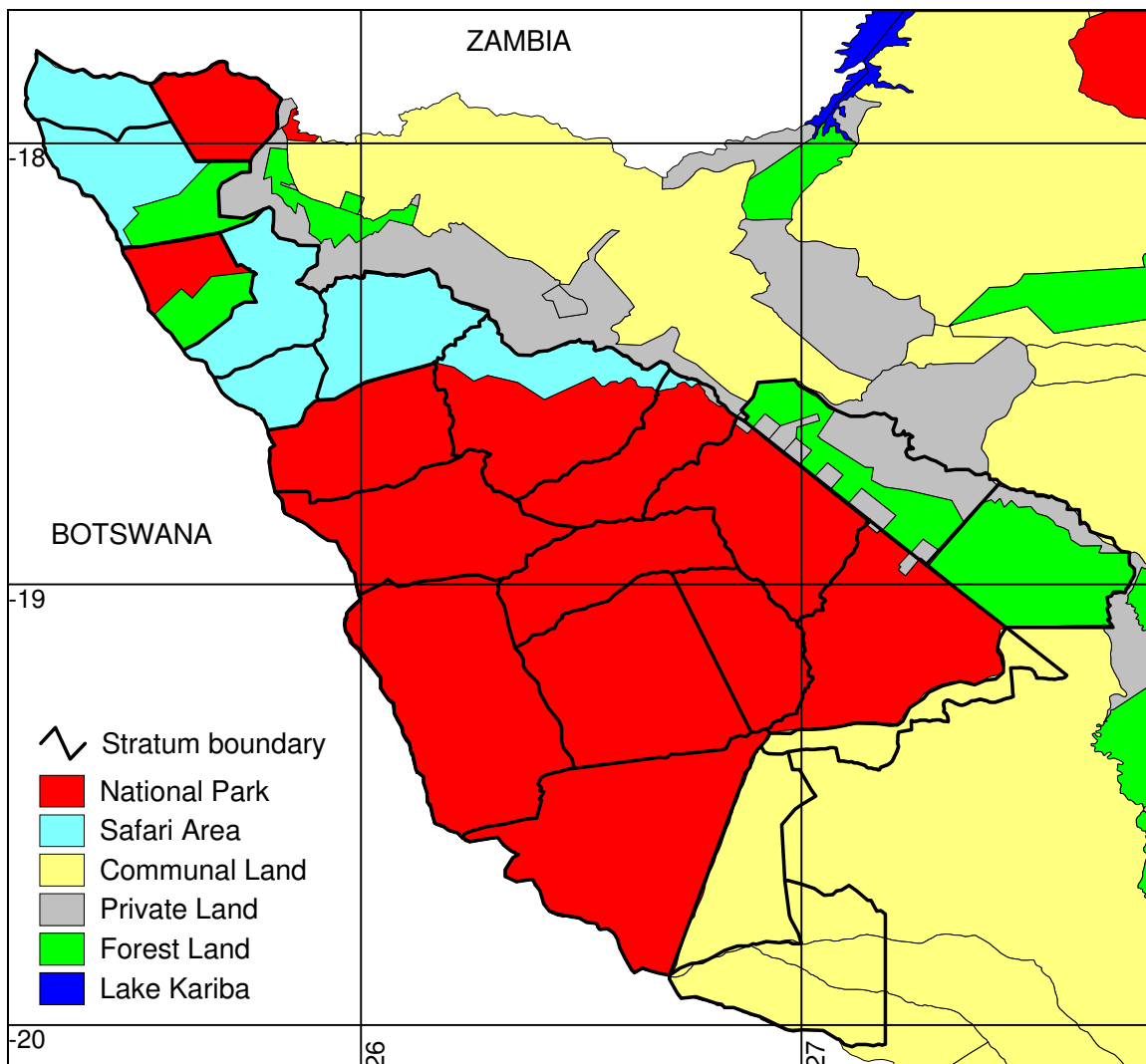
Table 1. Sampling statistics for 2007 aerial survey of large herbivores in north-west Matabeleland

| Stratum name | Stratum area (km ²) | Transect spacing (km) | Transect orientation (°) | Number of transects [= n] | Percent of stratum sampled | Time and date sampled | Flying time (hours) ^a | | | Search effort (minutes km ⁻²) |
|----------------------|---------------------------------|-----------------------|--------------------------|---------------------------|----------------------------|-----------------------|----------------------------------|--------------|--------------|---|
| | | | | | | | Transect | Stratum | Total | |
| Zambezi NP | 543 | 4.2 | 0 | 7 | 7.70 | pm 27 Oct | 0.73 | 0.95 | 2.22 | 1.03 |
| Kazungula | 446 | 2.3 | 0 | 15 | 14.49 | am 27 Oct | 1.11 | 1.70 | 2.92 | 1.03 |
| Panda Masuie | 963 | 4.7 | 0 | 11 | 7.02 | am 28 Oct | 1.20 | 1.72 | 2.78 | 1.07 |
| Kazuma | 561 | 4.7 | 0 | 7 | 7.33 | am 28 Oct | 0.62 | 0.90 | 2.42 | 0.91 |
| Matetsi | 703 | 6.9 | -50 (130) | 6 | 5.19 | am 29 Oct | 0.63 | 0.92 | 1.97 | 1.03 |
| Rossllyn | 344 | 4.6 | 90 | 5 | 7.09 | am 29 Oct | 0.42 | 0.65 | 1.63 | 1.04 |
| Zanguja | 839 | 5.1 | 29 | 9 | 6.51 | pm 29 Oct | 0.91 | 1.28 | 2.43 | 1.00 |
| Robins | 1029 | 2.6 | 90 | 14 | 12.84 | am 30 Oct | 2.30 | 2.82 | 4.02 | 1.05 |
| Dandari | 1290 | 2.9 | 0 | 25 | 11.45 | am 5 Nov | 2.47 | 3.18 | 4.33 | 1.00 |
| Shakwanki | 2143 | 6.3 | 90 | 11 | 5.27 | am 6 Nov | 1.89 | 2.50 | 3.68 | 1.01 |
| Dzivanini | 2098 | 4.3 | 90 | 14 | 7.66 | am 8 Nov | 2.63 | 3.28 | 4.50 | 0.98 |
| Sinamatella | 1522 | 2.9 | 0 | 20 | 11.73 | am pm 31 Oct | 3.05 | 3.72 | 5.12 | 1.02 |
| Mtoa | 826 | 3.0 | 0 | 18 | 10.86 | pm 30 Oct | 1.58 | 2.12 | 2.62 | 1.06 |
| Main Camp | 1261 | 2.2 | 41 | 23 | 15.40 | pm 4 & 5 Nov | 3.13 | 3.73 | 4.63 | 0.97 |
| Shapi | 923 | 2.8 | 0 | 21 | 11.49 | am 1 Nov | 1.82 | 2.55 | 3.12 | 1.03 |
| Central B | 1723 | 9.5 | -26 (154) | 4 | 3.23 | pm 7 Nov | 0.91 | 1.10 | 1.85 | 0.98 |
| Central A | 775 | 3.9 | 66 | 12 | 8.55 | am 9 Nov | 1.17 | 1.55 | 1.93 | 1.06 |
| Ngamo | 1629 | 2.5 | -52 (128) | 22 | 13.13 | am 7 Nov | 3.50 | 4.08 | 4.65 | 0.98 |
| Tsholotsho East | 910 | 6.9 | 90 | 9 | 4.95 | pm 9 Nov | 0.83 | 1.30 | 2.38 | 1.10 |
| Maitengwe | 1224 | 9.5 | 0 | 6 | 3.52 | am 10 Nov | 0.72 | 1.10 | 2.42 | 1.00 |
| Tsholotsho Far North | 474 | 10.0 | 0 | 8 | 3.44 | am 9 Nov | 0.25 | 0.57 | 1.20 | - ^c |
| Ngamo Forest | 1171 | 9.0 | 41 | 5 | 3.53 | pm 8 Nov | 0.70 | 0.97 | 1.75 | 1.02 |
| Sikumi Forest | 1173 | 7.1 | 41 | 9 | 5.01 | pm 6 Nov | 1.00 | 1.55 | 2.00 | 1.02 |
| Total / mean | 24570 | km² | | Overall | 8.11^b % | | 33.59 | 44.23 | 66.57 | 1.02 |

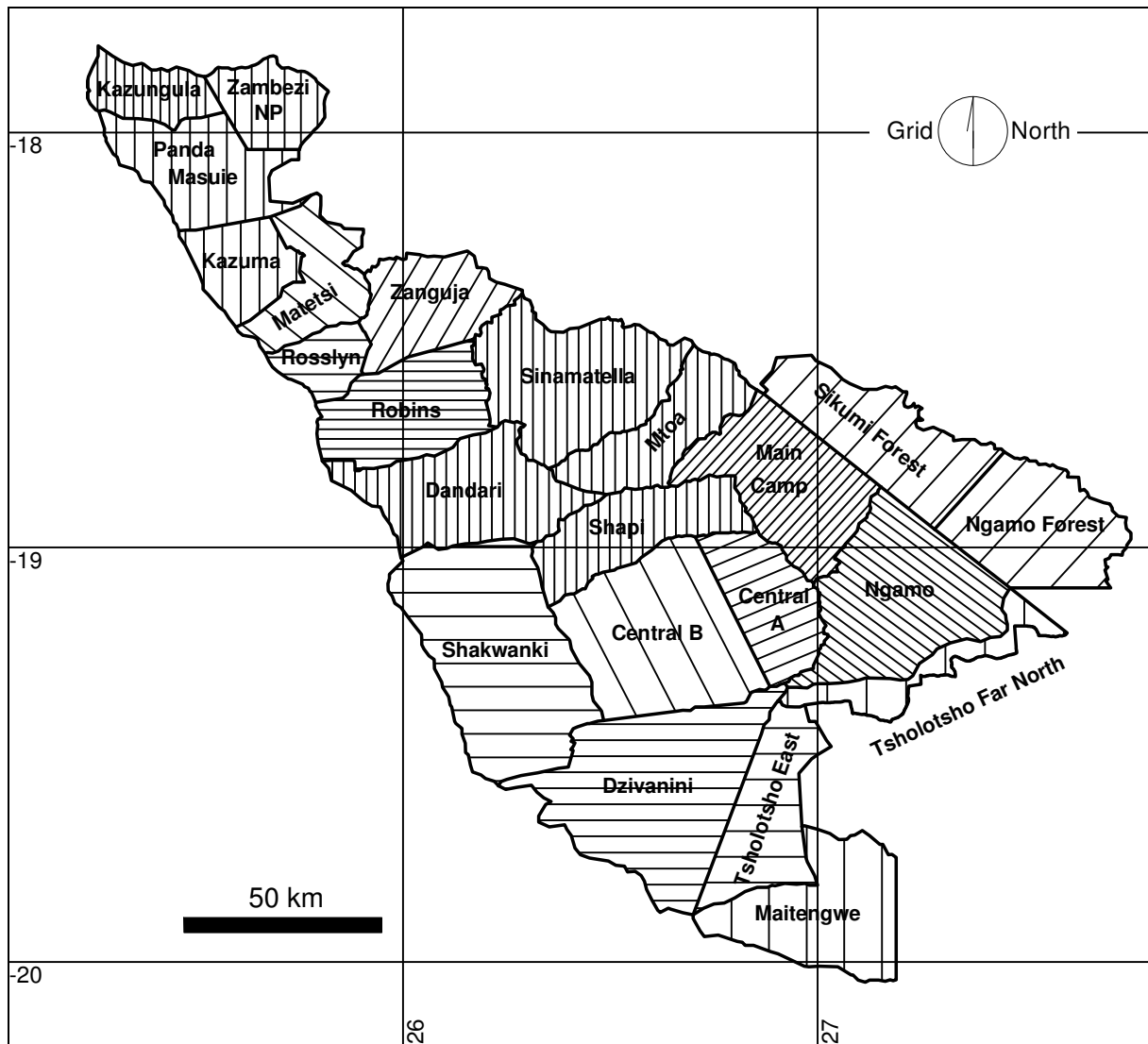
^a Transect time is the time spent searching the transects; stratum time is the transect time, plus the time spent travelling between transects in the same stratum; and total time is the stratum time, plus the time spent travelling between the stratum and the airstrip. ^b Weighted mean, with stratum area as a proportion of the total area as weight. ^c times used to estimate transect lengths.



Map 1. The four regions of Zimbabwe where elephant populations have been surveyed regularly. The box highlights the north-west Matabeleland survey region, which is shown in detail in Map 2.



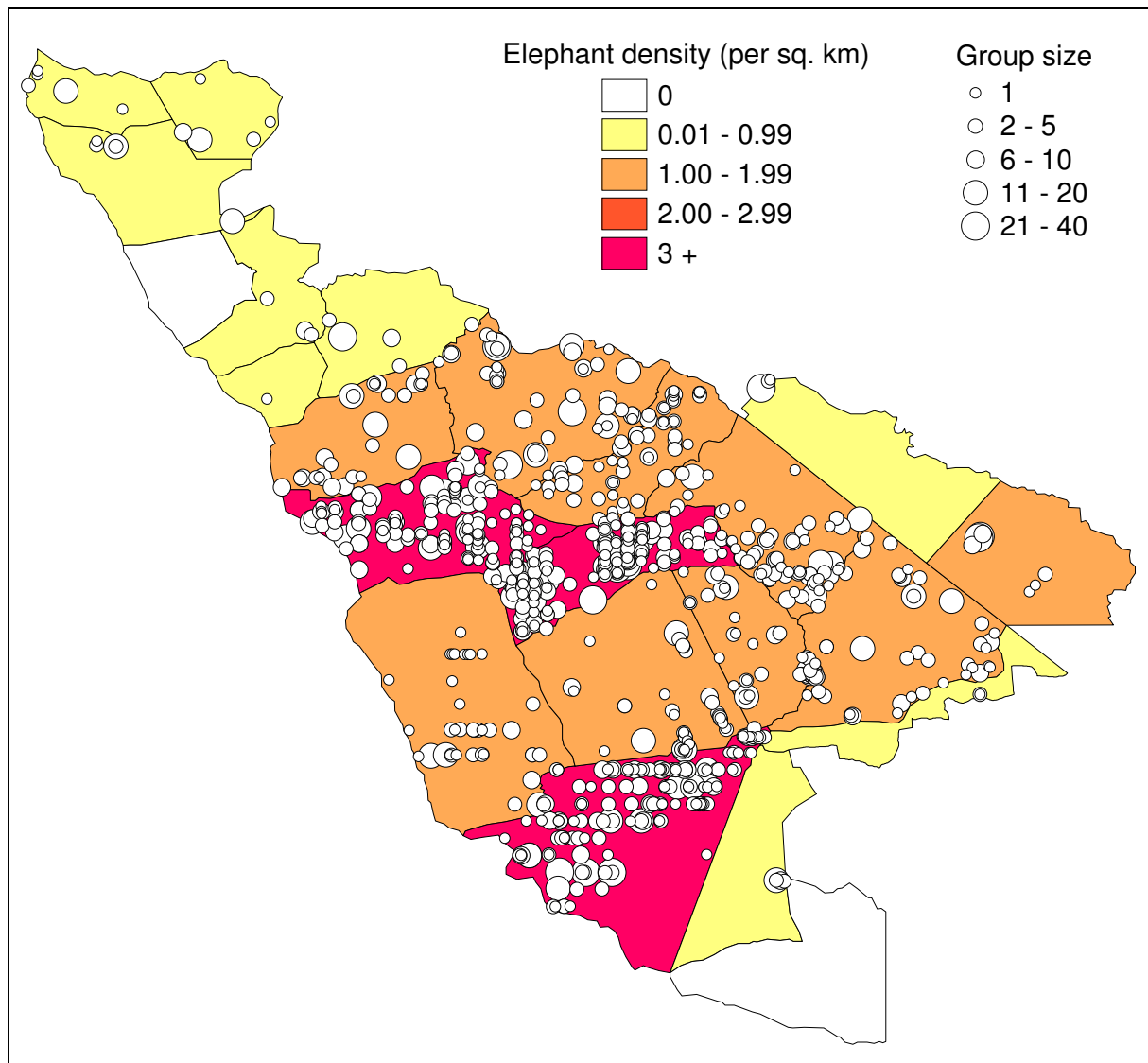
Map 2. Land use in and adjacent to the north-west Matabeleland survey area.



Map 3. Strata and transects used during the 2007 aerial survey of north-west Matabeleland. Bold lines indicate strata boundaries, thin parallel lines indicate transects and labels give strata names.

Table 2. Population estimates and statistics for Elephant in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 348 | 27 | 52133 | 160.8 | 0 | 906 | 0.64 |
| Kazungula | 152 | 22 | 10338 | 143.6 | 0 | 370 | 0.34 |
| Panda Masuie | 456 | 32 | 87890 | 145.0 | 0 | 1116 | 0.47 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 231 | 12 | 52154 | 254.2 | 0 | 818 | 0.33 |
| Rosslyn | 14 | 1 | 127 | 221.5 | 0 | 45 | 0.04 |
| Zanguja | 629 | 41 | 86093 | 110.3 | 0 | 1323 | 0.75 |
| Subtotals | 1829 | 135 | 288735 | 60.0 | 732 | 2927 | 0.42 |
| Hwange NP | | | | | | | |
| Robins | 1176 | 151 | 101376 | 58.5 | 489 | 1864 | 1.14 |
| Dandari | 4893 | 560 | 577755 | 32.1 | 3324 | 6461 | 3.79 |
| Shakwanki | 2353 | 124 | 602706 | 73.5 | 623 | 4083 | 1.10 |
| Dzivanini | 7950 | 609 | 1693601 | 35.4 | 5139 | 10761 | 3.79 |
| Sinamatella | 2702 | 317 | 355380 | 46.2 | 1454 | 3950 | 1.78 |
| Mtoa | 1326 | 144 | 65298 | 40.7 | 787 | 1865 | 1.61 |
| Main Camp | 1890 | 291 | 151475 | 42.7 | 1083 | 2697 | 1.50 |
| Shapi | 5812 | 668 | 893232 | 33.9 | 3840 | 7783 | 6.30 |
| Central B | 3187 | 103 | 1023253 | 101.0 | 0 | 6406 | 1.85 |
| Central A | 1334 | 114 | 230012 | 79.1 | 278 | 2390 | 1.72 |
| Ngamo | 1699 | 223 | 167429 | 50.1 | 848 | 2550 | 1.04 |
| Subtotals | 34322 | 3304 | 5861517 | 14.2 | 29459 | 39185 | 2.26 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 687 | 34 | 373029 | 205.0 | 0 | 2095 | 0.76 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 146 | 5 | 16404 | 208.1 | 0 | 448 | 0.31 |
| Subtotals | 833 | 39 | 389433 | 172.9 | 0 | 2272 | 0.32 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 2182 | 77 | 3335298 | 232.3 | 0 | 7252 | 1.86 |
| Sikumi Forest | 599 | 30 | 366759 | 233.2 | 0 | 1995 | 0.51 |
| Subtotals | 2781 | 107 | 3702057 | 192.1 | 0 | 8123 | 1.19 |
| Totals | 39765 | 3585 | 10241742 | 16.4 | 33229 | 46300 | 1.62 |



Map 4. Distribution of elephant cows in NW Matabeleland during October-November 2007

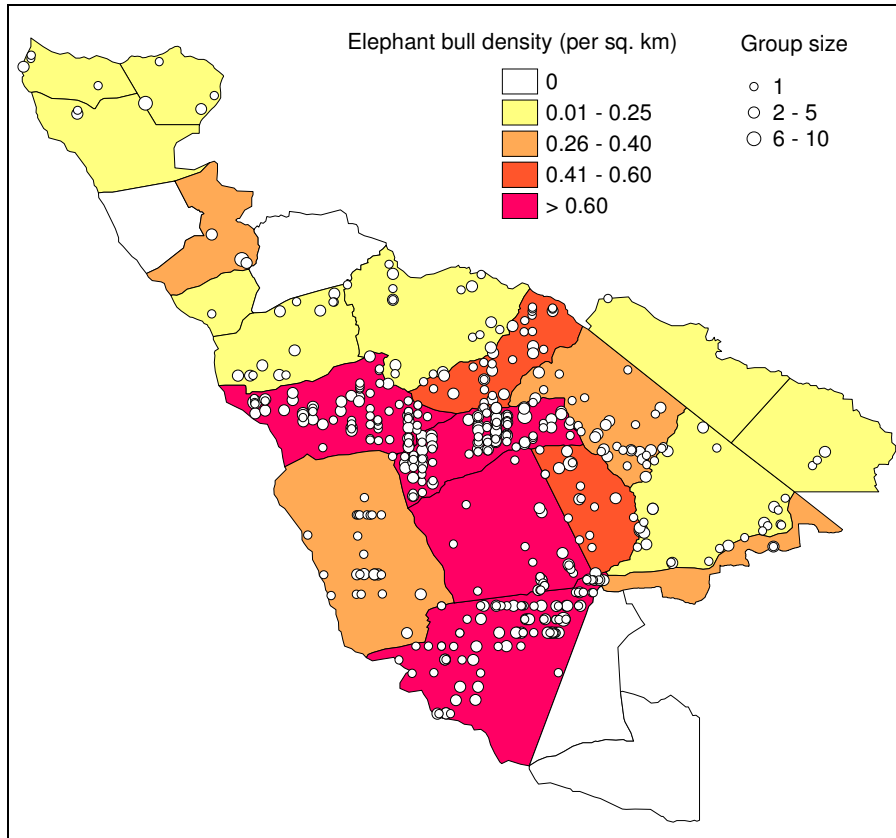
Colouring indicates the mean density of elephants within each stratum. Dots indicate the locations of elephants seen *within the search strips*, together with an indication of the size of each group. Small dots overlaying large dots indicate two or more groups of elephants in close proximity. Variation in dot density between strata is a reflection of differences between strata in *both* the density of elephant groups *and* the sampling intensity (which is given in Table 1).

Table 3. Population estimates and statistics for Elephant Bulls in north-west Matabeleland

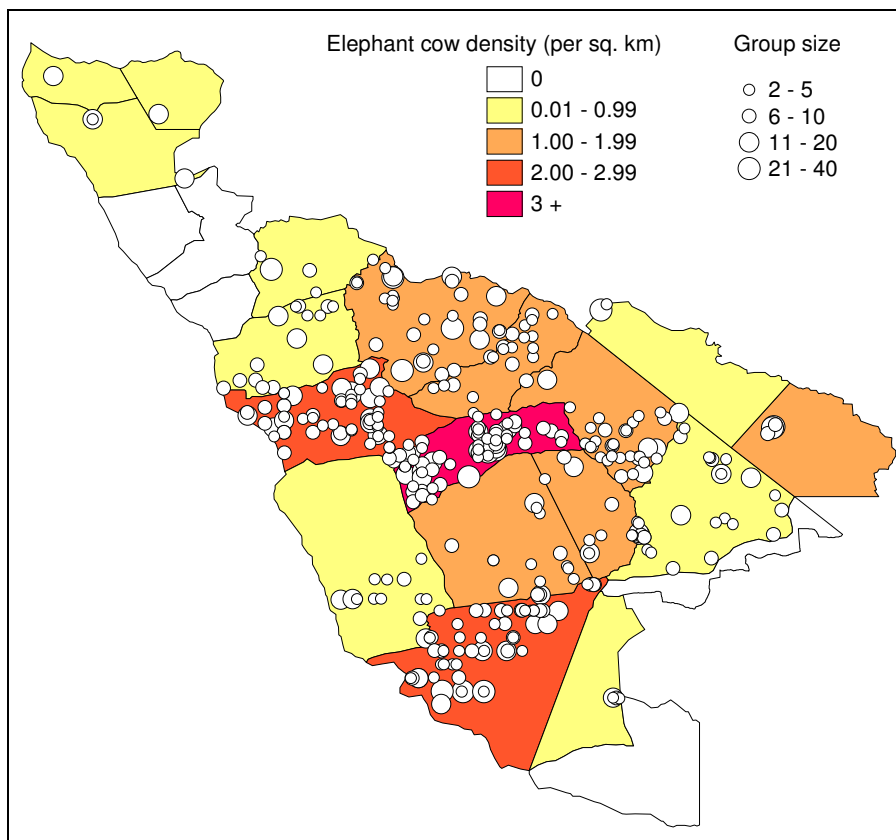
| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 129 | 10 | 6126 | 148.8 | 0 | 320 | 0.24 |
| Kazungula | 48 | 7 | 917 | 134.4 | 0 | 113 | 0.11 |
| Panda Masuie | 43 | 3 | 1880 | 226.2 | 0 | 139 | 0.04 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 231 | 12 | 52154 | 254.2 | 0 | 818 | 0.33 |
| Rosslyn | 14 | 1 | 127 | 221.5 | 0 | 45 | 0.04 |
| Zanguja | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 465 | 33 | 61204 | 130.2 | 0 | 1070 | 0.11 |
| Hwange NP | | | | | | | |
| Robins | 203 | 26 | 4671 | 72.9 | 55 | 350 | 0.20 |
| Dandari | 1066 | 122 | 38470 | 38.0 | 661 | 1471 | 0.83 |
| Shakwanki | 702 | 37 | 72787 | 85.6 | 101 | 1303 | 0.33 |
| Dzivanini | 2141 | 164 | 222050 | 47.5 | 1123 | 3159 | 1.02 |
| Sinamatella | 256 | 30 | 5967 | 63.2 | 94 | 417 | 0.17 |
| Mtoa | 479 | 52 | 15487 | 54.8 | 216 | 741 | 0.58 |
| Main Camp | 390 | 60 | 6302 | 42.2 | 225 | 554 | 0.31 |
| Shapi | 1479 | 170 | 78899 | 39.6 | 893 | 2065 | 1.60 |
| Central B | 1052 | 34 | 244178 | 149.5 | 0 | 2624 | 0.61 |
| Central A | 398 | 34 | 20446 | 79.1 | 83 | 713 | 0.51 |
| Ngamo | 343 | 45 | 9315 | 58.6 | 142 | 544 | 0.21 |
| Subtotals | 8507 | 774 | 718571 | 20.8 | 6739 | 10276 | 0.56 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 146 | 5 | 16404 | 208.1 | 0 | 448 | 0.31 |
| Subtotals | 146 | 5 | 16404 | 208.1 | 0 | 448 | 0.06 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 113 | 4 | 9401 | 237.4 | 0 | 383 | 0.10 |
| Sikumi Forest | 20 | 1 | 436 | 241.1 | 0 | 68 | 0.02 |
| Subtotals | 133 | 5 | 9837 | 206.5 | 0 | 409 | 0.06 |
| Totals | 9251 | 817 | 806016 | 20.0 | 7402 | 11100 | 0.38 |

Table 4. Population estimates and statistics for Elephant Cows in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 219 | 17 | 46006 | 239.9 | 0 | 744 | 0.40 |
| Kazungula | 104 | 15 | 9422 | 201.1 | 0 | 312 | 0.23 |
| Panda Masuie | 413 | 29 | 86011 | 158.3 | 0 | 1066 | 0.43 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 629 | 41 | 86093 | 110.3 | 0 | 1323 | 0.75 |
| Subtotals | 1365 | 102 | 227531 | 72.0 | 382 | 2347 | 0.31 |
| Hwange NP | | | | | | | |
| Robins | 974 | 125 | 96706 | 69.0 | 302 | 1646 | 0.95 |
| Dandari | 3827 | 438 | 539285 | 39.6 | 2311 | 5342 | 2.97 |
| Shakwanki | 1651 | 87 | 529919 | 98.2 | 29 | 3273 | 0.77 |
| Dzivanini | 5809 | 445 | 1471551 | 45.1 | 3189 | 8430 | 2.77 |
| Sinamatella | 2446 | 287 | 349413 | 50.6 | 1209 | 3683 | 1.61 |
| Mtoa | 847 | 92 | 49812 | 55.6 | 376 | 1318 | 1.03 |
| Main Camp | 1500 | 231 | 145173 | 52.7 | 710 | 2291 | 1.19 |
| Shapi | 4333 | 498 | 814333 | 43.4 | 2450 | 6215 | 4.69 |
| Central B | 2135 | 69 | 779075 | 131.5 | 0 | 4944 | 1.24 |
| Central A | 936 | 80 | 209565 | 107.6 | 0 | 1944 | 1.21 |
| Ngamo | 1356 | 178 | 158114 | 61.0 | 529 | 2183 | 0.83 |
| Subtotals | 25814 | 2530 | 5142946 | 17.6 | 21275 | 30354 | 1.70 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 687 | 34 | 373029 | 205.0 | 0 | 2095 | 0.76 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 687 | 34 | 373029 | 205.0 | 0 | 2095 | 0.26 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 2069 | 73 | 3325897 | 244.7 | 0 | 7131 | 1.77 |
| Sikumi Forest | 579 | 29 | 366323 | 241.1 | 0 | 1975 | 0.49 |
| Subtotals | 2648 | 102 | 3692220 | 201.5 | 0 | 7983 | 1.13 |
| Totals | 30514 | 2768 | 9435726 | 20.7 | 24211 | 36816 | 1.24 |



Map 5. Distribution of elephant bulls in NW Matabeleland during October-November 2007



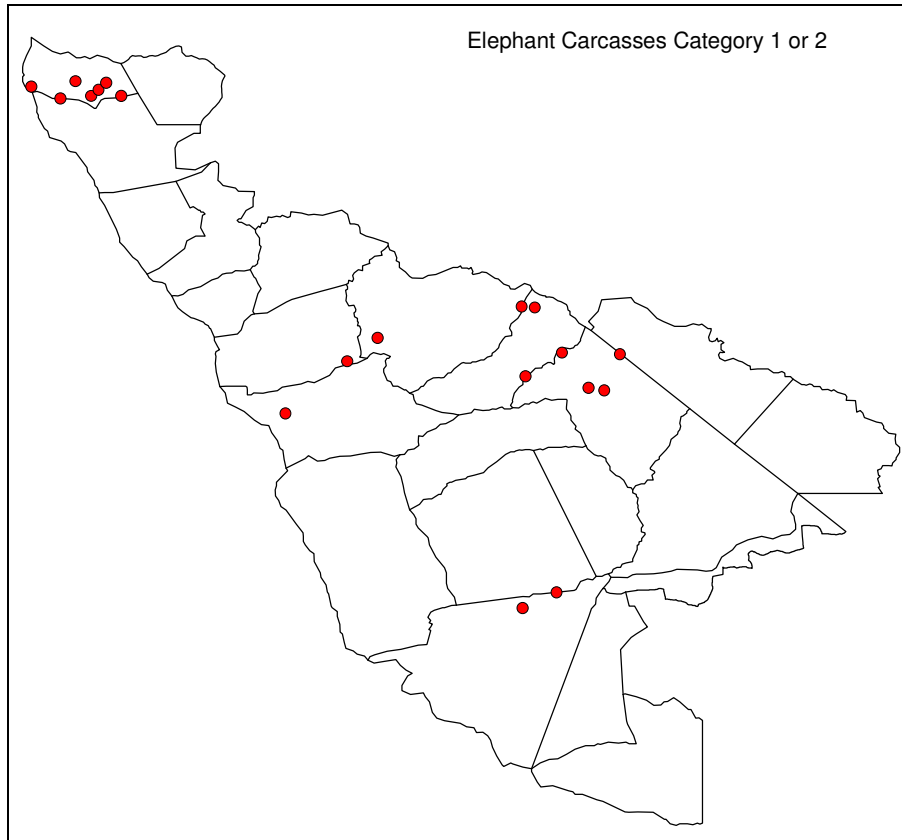
Map 6. Distribution of elephant cows in NW Matabeleland during October-November 2007

Table 5. Population estimates and statistics for Elephant Carcasses 1 in north-west Matabeleland

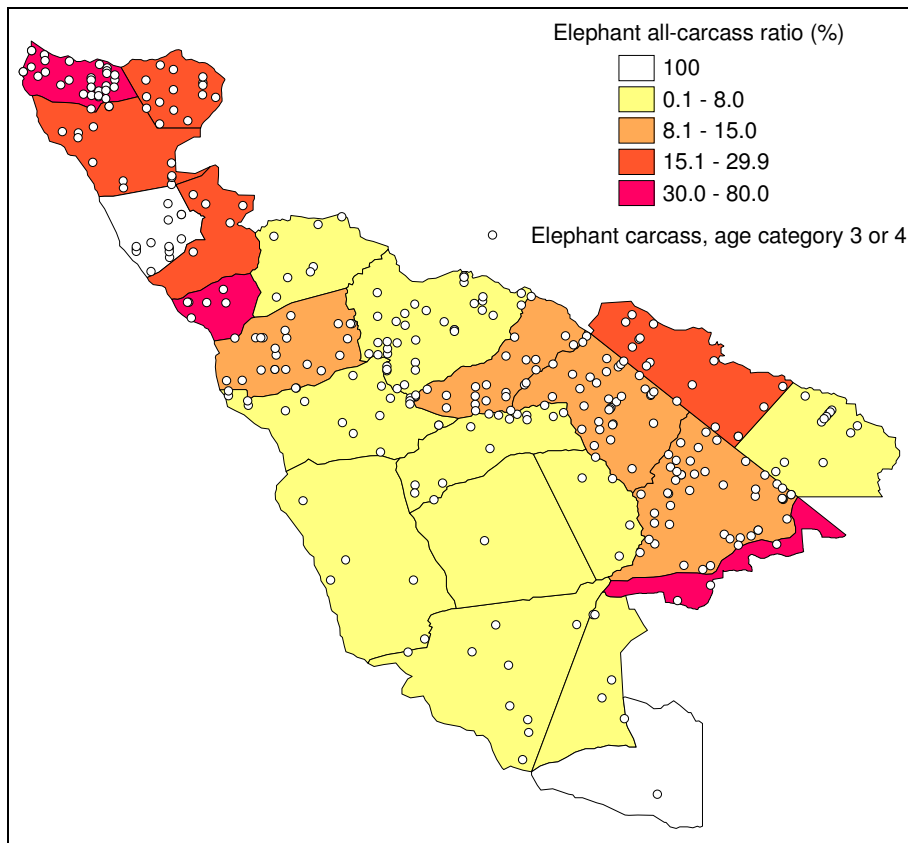
| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Matetsi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Zanguja | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Hwange NP | | | | | | | |
| Robins | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Dandari | 9 | 1 | 65 | 191.0 | 0 | 25 | 0.007 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Mtoa | 9 | 1 | 69 | 190.1 | 0 | 27 | 0.011 |
| Main Camp | 6 | 1 | 37 | 194.1 | 0 | 19 | 0.005 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Ngamo | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Subtotals | 24 | 3 | 171 | 107.2 | 0 | 51 | 0.002 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Totals | 24 | 3 | 171 | 107.2 | 0 | 51 | 0.001 |

Table 6. Population estimates and statistics for Elephant Carcasses 2 in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) | 1+2 Carcass Ratio (%) |
|------------------------|-----------------|-----------------|-----------------|-------------|-----------------|-----------------|----------------------------------|------------------------------|
| Matetsi Complex | | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Kazungula | 48 | 7 | 164 | 56.8 | 21 | 76 | 0.108 | 24.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | - |
| Matetsi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Zanguja | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Subtotals | 48 | 7 | 164 | 56.8 | 21 | 76 | 0.011 | 2.56 |
| Hwange NP | | | | | | | | |
| Robins | 8 | 1 | 47 | 190.6 | 0 | 23 | 0.008 | 0.68 |
| Dandari | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.18 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Dzivanini | 26 | 2 | 311 | 145.9 | 0 | 64 | 0.012 | 0.33 |
| Sinamatella | 17 | 2 | 128 | 139.0 | 0 | 41 | 0.011 | 0.63 |
| Mtoa | 9 | 1 | 69 | 190.6 | 0 | 27 | 0.011 | 1.34 |
| Main Camp | 19 | 3 | 180 | 143.0 | 0 | 47 | 0.015 | 1.36 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Ngamo | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Subtotals | 80 | 9 | 736 | 68.4 | 25 | 134 | 0.005 | 0.30 |
| Communal Areas | | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | - |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Forest Areas | | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 | 0.00 |
| Totals | 128 | 16 | 900 | 46.8 | 68 | 188 | 0.005 | 0.38 |



Map 7. Distribution of elephant carcasses (age category 1 or 2) in NW Matabeleland during October-November 2007



Map 8. Distribution of elephant all-carcass ratios and age category 3 or 4 carcasses in NW Matabeleland during October-November 2007

Table 7. Population estimates and statistics for Elephant Carcasses 3 in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Kazungula | 28 | 4 | 305 | 135.7 | 0 | 65 | 0.062 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Kazuma | 41 | 3 | 605 | 147.1 | 0 | 101 | 0.073 |
| Matetsi | 19 | 1 | 285 | 225.5 | 0 | 63 | 0.027 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Zanguja | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Subtotals | 88 | 8 | 1195 | 83.1 | 15 | 161 | 0.020 |
| Hwange NP | | | | | | | |
| Robins | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Dandari | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Sinamatella | 17 | 2 | 126 | 138.0 | 0 | 41 | 0.011 |
| Mtoa | 9 | 1 | 78 | 201.9 | 0 | 28 | 0.011 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Ngamo | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Subtotals | 26 | 3 | 204 | 110.5 | 0 | 55 | 0.002 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Sikumi Forest | 40 | 2 | 1405 | 216.6 | 0 | 126 | 0.034 |
| Subtotals | 40 | 2 | 1405 | 216.6 | 0 | 126 | 0.017 |
| Totals | 154 | 13 | 2805 | 71.2 | 44 | 263 | 0.006 |

Table 8. Population estimates and statistics for Elephant Carcasses 4 in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) | All Carcass Ratio (%) |
|------------------------|-----------------|-----------------|-----------------|-------------|-----------------|-----------------|----------------------------------|------------------------------|
| Matetsi Complex | | | | | | | | |
| Zambezi NP | 142 | 11 | 1388 | 64.4 | 50 | 233 | 0.261 | 29.0 |
| Kazungula | 104 | 15 | 1028 | 66.4 | 35 | 172 | 0.232 | 54.2 |
| Panda Masuie | 128 | 9 | 2808 | 92.1 | 10 | 246 | 0.133 | 21.9 |
| Kazuma | 95 | 7 | 997 | 80.9 | 18 | 173 | 0.170 | 100.0 |
| Matetsi | 39 | 2 | 501 | 149.4 | 0 | 96 | 0.055 | 20.1 |
| Rosslyn | 56 | 4 | 684 | 128.7 | 0 | 129 | 0.164 | 80.0 |
| Zanguja | 31 | 2 | 203 | 109.8 | 0 | 64 | 0.037 | 4.7 |
| Subtotals | 594 | 50 | 7608 | 29.7 | 418 | 771 | 0.135 | 28.5 |
| Hwange NP | | | | | | | | |
| Robins | 117 | 15 | 715 | 49.4 | 59 | 175 | 0.114 | 9.6 |
| Dandari | 149 | 17 | 1846 | 59.7 | 60 | 237 | 0.115 | 3.1 |
| Shakwanki | 95 | 5 | 1510 | 91.3 | 8 | 181 | 0.044 | 3.9 |
| Dzivanini | 65 | 5 | 913 | 100.0 | 0 | 131 | 0.031 | 1.1 |
| Sinamatella | 162 | 19 | 1501 | 50.1 | 81 | 243 | 0.106 | 6.8 |
| Mtoa | 138 | 15 | 1345 | 56.0 | 61 | 215 | 0.167 | 11.1 |
| Main Camp | 182 | 28 | 1973 | 50.7 | 90 | 274 | 0.144 | 9.9 |
| Shapi | 78 | 9 | 470 | 57.8 | 33 | 124 | 0.085 | 1.3 |
| Central B | 31 | 1 | 978 | 321.7 | 0 | 130 | 0.018 | 1.0 |
| Central A | 35 | 3 | 280 | 104.9 | 0 | 72 | 0.045 | 2.6 |
| Ngamo | 198 | 26 | 796 | 29.6 | 139 | 257 | 0.122 | 10.4 |
| Subtotals | 1250 | 143 | 12327 | 17.6 | 1030 | 1470 | 0.082 | 3.9 |
| Communal Areas | | | | | | | | |
| Tsholotsho East | 40 | 2 | 630 | 143.2 | 0 | 98 | 0.044 | 5.5 |
| Maitengwe | 28 | 1 | 605 | 222.4 | 0 | 92 | 0.023 | 100.0 |
| Tsholotsho Far North | 87 | 3 | 939 | 83.0 | 15 | 160 | 0.184 | 37.3 |
| Subtotals | 156 | 6 | 2174 | 62.7 | 58 | 254 | 0.060 | 15.8 |
| Forest Areas | | | | | | | | |
| Ngamo Forest | 57 | 2 | 772 | 136.1 | 0 | 134 | 0.048 | 2.5 |
| Sikumi Forest | 200 | 10 | 4493 | 77.4 | 45 | 354 | 0.170 | 28.6 |
| Subtotals | 256 | 12 | 5265 | 63.1 | 95 | 418 | 0.109 | 9.6 |
| Totals | 2257 | 211 | 27374 | 14.5 | 1929 | 2584 | 0.092 | 6.1 |

Table 9. Population estimates and statistics for Unidentified Carcasses in north-west Matabeleland

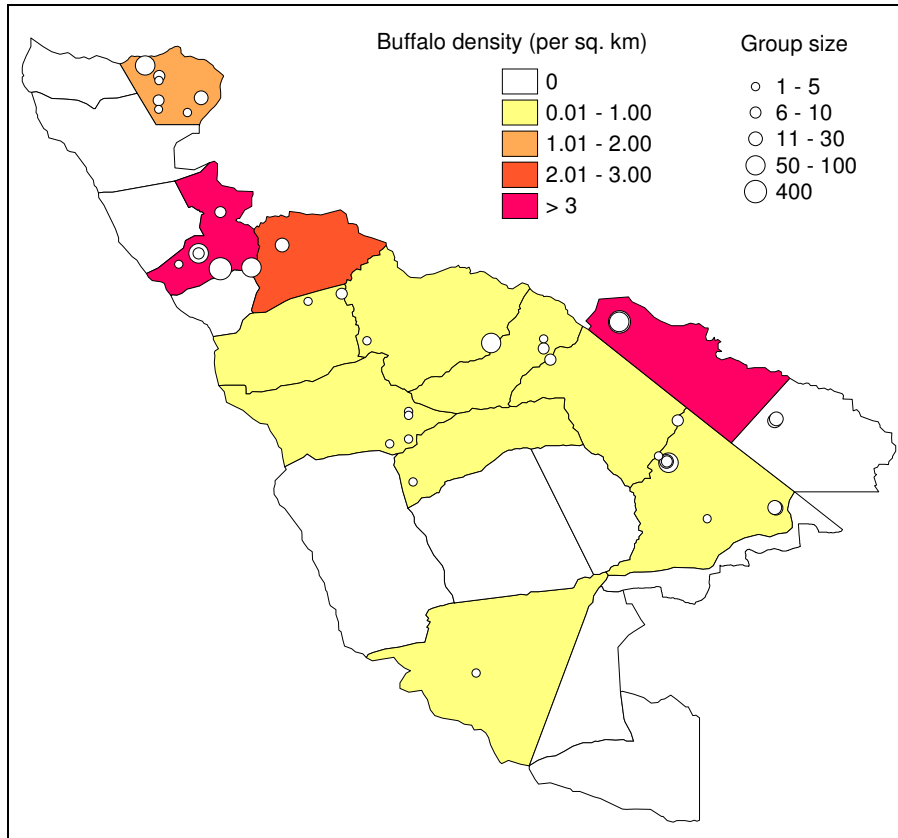
| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 51 | 4 | 294 | 81.5 | 10 | 93 | 0.095 |
| Kazungula | 90 | 13 | 569 | 57.0 | 39 | 141 | 0.201 |
| Panda Masuie | 71 | 5 | 1001 | 99.0 | 1 | 142 | 0.074 |
| Kazuma | 68 | 5 | 456 | 76.6 | 16 | 120 | 0.122 |
| Matetsi | 39 | 2 | 416 | 136.2 | 0 | 91 | 0.055 |
| Rosslyn | 28 | 2 | 136 | 114.9 | 0 | 61 | 0.082 |
| Zanguja | 77 | 5 | 770 | 85.5 | 11 | 142 | 0.091 |
| Subtotals | 424 | 36 | 3643 | 28.7 | 303 | 546 | 0.096 |
| Hwange NP | | | | | | | |
| Robins | 70 | 9 | 801 | 87.2 | 9 | 131 | 0.068 |
| Dandari | 9 | 1 | 64 | 188.9 | 0 | 25 | 0.007 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Dzivanini | 52 | 4 | 462 | 88.9 | 6 | 99 | 0.025 |
| Sinamatella | 145 | 17 | 766 | 40.0 | 87 | 203 | 0.095 |
| Mtoa | 55 | 6 | 389 | 75.4 | 14 | 97 | 0.067 |
| Main Camp | 65 | 10 | 501 | 71.5 | 19 | 111 | 0.052 |
| Shapi | 52 | 6 | 343 | 74.0 | 14 | 91 | 0.057 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Central A | 12 | 1 | 116 | 202.2 | 0 | 35 | 0.015 |
| Ngamo | 183 | 24 | 1738 | 47.4 | 96 | 270 | 0.112 |
| Subtotals | 643 | 78 | 5180 | 22.2 | 500 | 786 | 0.042 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 40 | 2 | 590 | 138.6 | 0 | 96 | 0.044 |
| Maitengwe | 28 | 1 | 560 | 214.1 | 0 | 89 | 0.023 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.000 |
| Subtotals | 69 | 3 | 1151 | 107.4 | 0 | 143 | 0.026 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 312 | 11 | 31469 | 158.0 | 0 | 804 | 0.266 |
| Sikumi Forest | 100 | 5 | 1652 | 93.9 | 6 | 194 | 0.085 |
| Subtotals | 412 | 16 | 33122 | 122.8 | 0 | 917 | 0.176 |
| Totals | 1547 | 133 | 43095 | 31.7 | 1056 | 2038 | 0.063 |

Table 10. Population estimates and statistics for Buffalo in north-west Matabeleland

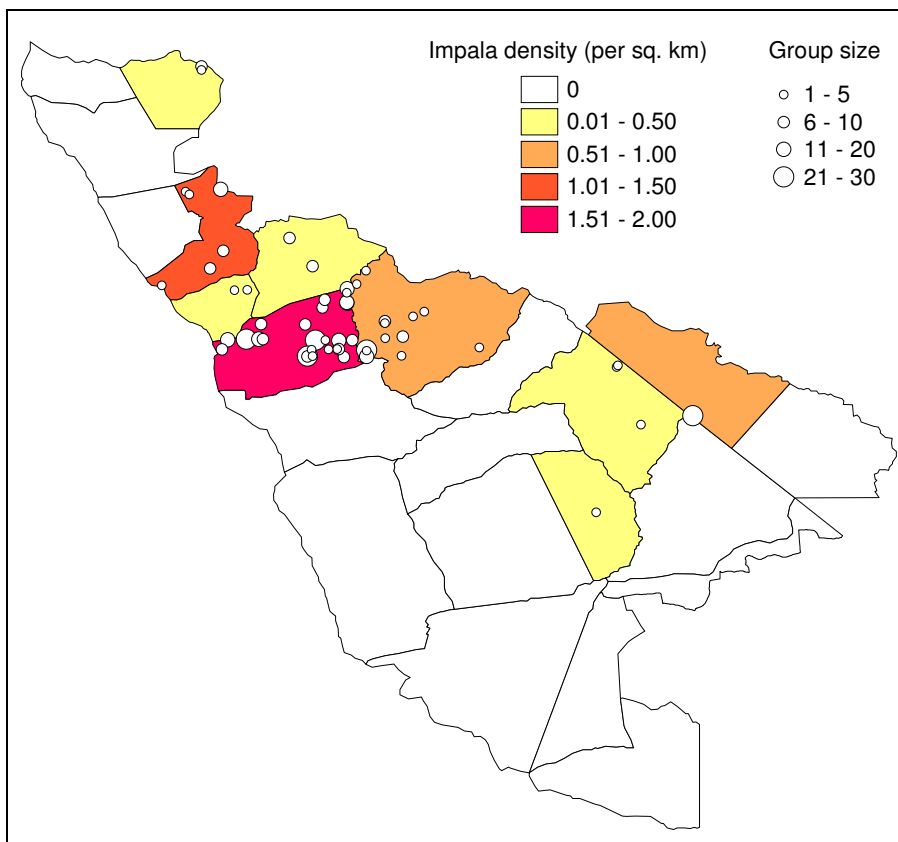
| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|------------------|--------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 1055 | 82 | 406733 | 147.9 | 0 | 2616 | 1.94 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 9683 | 503 | 99264049 | 264.5 | 0 | 35298 | 13.77 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 1688 | 110 | 1233481 | 155.6 | 0 | 4315 | 2.01 |
| Subtotals | 12427 | 695 | 100904264 | 207.8 | 0 | 38248 | 2.82 |
| Hwange NP | | | | | | | |
| Robins | 62 | 8 | 2804 | 183.5 | 0 | 177 | 0.06 |
| Dandari | 96 | 11 | 5636 | 161.2 | 0 | 251 | 0.07 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 13 | 1 | 155 | 206.0 | 0 | 40 | 0.01 |
| Sinamatella | 452 | 53 | 160657 | 185.7 | 0 | 1291 | 0.30 |
| Mtoa | 92 | 10 | 7027 | 192.1 | 0 | 269 | 0.11 |
| Main Camp | 104 | 16 | 4597 | 135.3 | 0 | 245 | 0.08 |
| Shapi | 26 | 3 | 523 | 182.7 | 0 | 74 | 0.03 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 1402 | 184 | 879618 | 139.2 | 0 | 3352 | 0.86 |
| Subtotals | 2247 | 286 | 1061015 | 93.8 | 140 | 4354 | 0.15 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 850 | 30 | 561701 | 244.7 | 0 | 2931 | 0.73 |
| Sikumi Forest | 8982 | 450 | 81853462 | 232.3 | 0 | 29845 | 7.66 |
| Subtotals | 9832 | 480 | 82415164 | 212.9 | 0 | 30767 | 4.19 |
| Totals | 24506 | 1461 | 184380443 | 120.7 | 0 | 54091 | 1.00 |

Table 11. Population estimates and statistics for Impala in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 116 | 9 | 13703 | 247.3 | 0 | 402 | 0.21 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 770 | 40 | 120696 | 116.0 | 0 | 1663 | 1.10 |
| Rosslyn | 85 | 6 | 5103 | 234.3 | 0 | 283 | 0.25 |
| Zanguja | 200 | 13 | 10265 | 120.1 | 0 | 439 | 0.24 |
| Subtotals | 1170 | 68 | 149766 | 78.2 | 255 | 2085 | 0.27 |
| Hwange NP | | | | | | | |
| Robins | 1815 | 233 | 829820 | 108.4 | 0 | 3783 | 1.76 |
| Dandari | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 1125 | 132 | 291508 | 100.4 | 0 | 2255 | 0.74 |
| Mtoa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Main Camp | 39 | 6 | 713 | 142.1 | 0 | 94 | 0.03 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 35 | 3 | 1005 | 198.8 | 0 | 105 | 0.05 |
| Ngamo | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 3015 | 374 | 1123046 | 73.1 | 811 | 5218 | 0.20 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 599 | 30 | 339911 | 224.5 | 0 | 1943 | 0.51 |
| Subtotals | 599 | 30 | 339911 | 224.5 | 0 | 1943 | 0.26 |
| Totals | 4783 | 472 | 1612723 | 54.0 | 2203 | 7364 | 0.19 |



Map 9. Distribution of buffalo in NW Matabeleland during October-November 2007



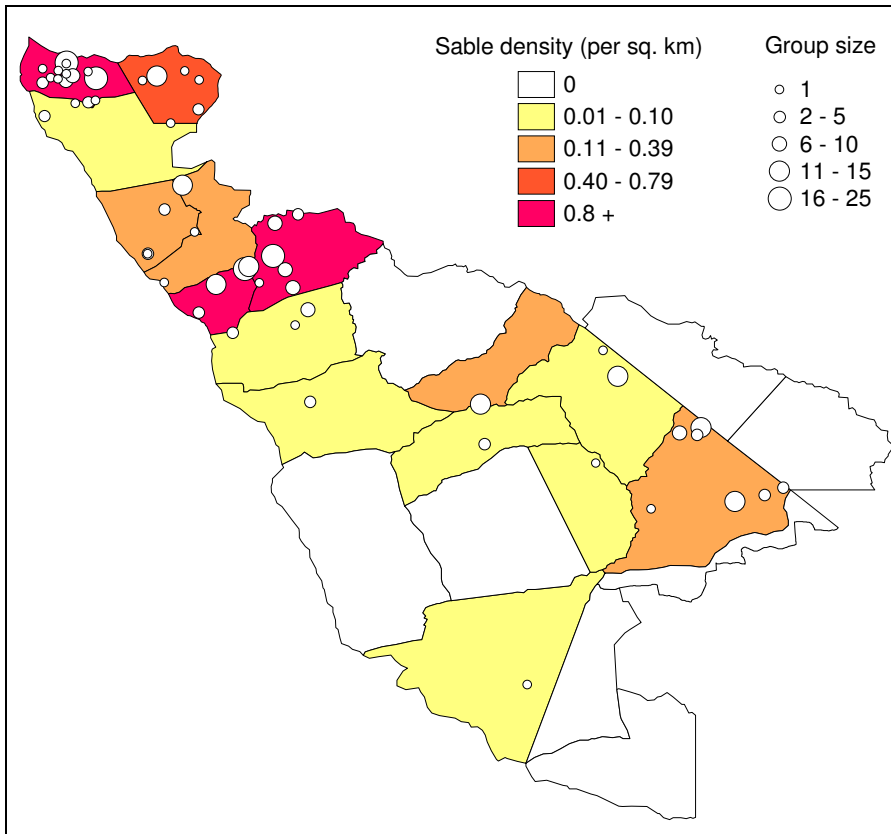
Map 10. Distribution of impala in NW Matabeleland during October-November 2007

Table 12. Population estimates and statistics for Sable in north-west Matabeleland

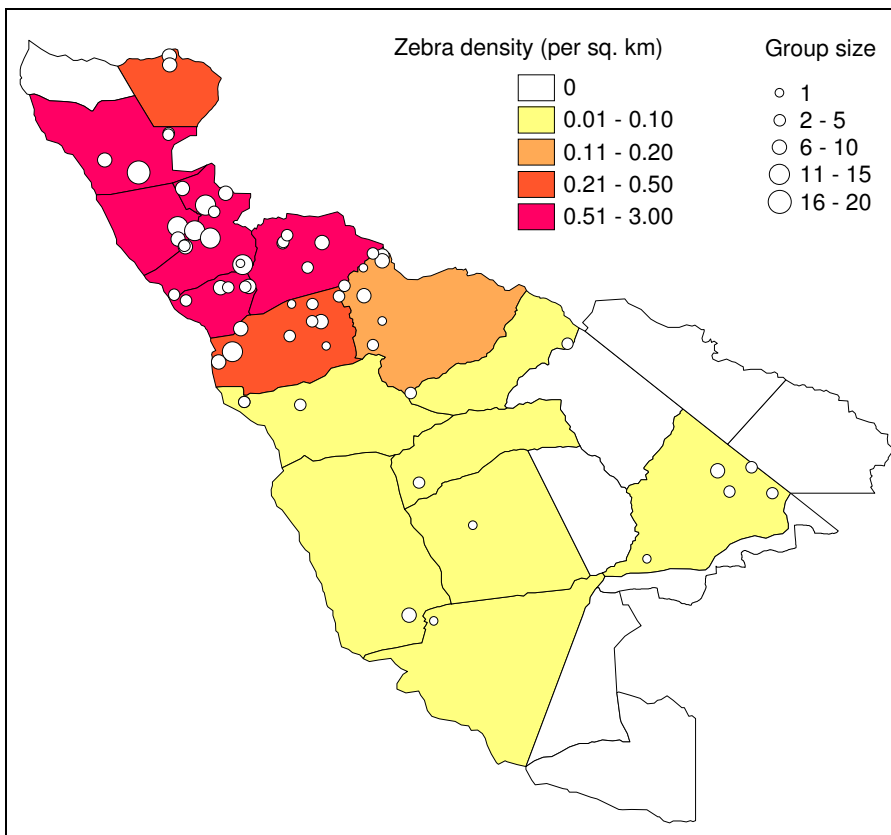
| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|-------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 270 | 21 | 20401 | 129.3 | 0 | 620 | 0.50 |
| Kazungula | 525 | 76 | 65073 | 104.3 | 0 | 1072 | 1.18 |
| Panda Masuie | 57 | 4 | 2196 | 183.4 | 0 | 161 | 0.06 |
| Kazuma | 82 | 6 | 1263 | 106.3 | 0 | 169 | 0.15 |
| Matetsi | 250 | 13 | 39389 | 203.9 | 0 | 761 | 0.36 |
| Rosslyn | 522 | 37 | 103876 | 171.4 | 0 | 1417 | 1.52 |
| Zanguja | 921 | 60 | 109524 | 85.0 | 138 | 1704 | 1.10 |
| Subtotals | 2627 | 217 | 341722 | 46.0 | 1417 | 3836 | 0.60 |
| Hwange NP | | | | | | | |
| Robins | 93 | 12 | 3048 | 127.5 | 0 | 213 | 0.09 |
| Dandari | 35 | 4 | 1048 | 191.2 | 0 | 102 | 0.03 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 13 | 1 | 155 | 206.0 | 0 | 40 | 0.01 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Mtoa | 101 | 11 | 8796 | 195.4 | 0 | 299 | 0.12 |
| Main Camp | 104 | 16 | 8330 | 182.1 | 0 | 293 | 0.08 |
| Shapi | 17 | 2 | 233 | 183.1 | 0 | 49 | 0.02 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 12 | 1 | 116 | 202.2 | 0 | 35 | 0.02 |
| Ngamo | 366 | 48 | 27369 | 94.1 | 22 | 710 | 0.22 |
| Subtotals | 741 | 95 | 49094 | 59.9 | 297 | 1186 | 0.05 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 3368 | 312 | 390816 | 37.9 | 2093 | 4643 | 0.14 |

Table 13. Population estimates and statistics for Zebra in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|-------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 193 | 15 | 33847 | 233.2 | 0 | 643 | 0.36 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 513 | 36 | 68586 | 113.9 | 0 | 1096 | 0.53 |
| Kazuma | 505 | 37 | 126863 | 172.7 | 0 | 1376 | 0.90 |
| Matetsi | 1290 | 67 | 107073 | 65.2 | 448 | 2131 | 1.84 |
| Rosslyn | 367 | 26 | 60698 | 186.5 | 0 | 1051 | 1.07 |
| Zanguja | 491 | 32 | 48249 | 105.8 | 0 | 1011 | 0.59 |
| Subtotals | 3358 | 213 | 445316 | 40.7 | 1991 | 4725 | 0.76 |
| Hwange NP | | | | | | | |
| Robins | 405 | 52 | 10608 | 54.9 | 183 | 628 | 0.39 |
| Dandari | 131 | 15 | 8666 | 146.6 | 0 | 323 | 0.10 |
| Shakwanki | 114 | 6 | 11704 | 211.7 | 0 | 355 | 0.05 |
| Dzivanini | 13 | 1 | 156 | 206.5 | 0 | 40 | 0.01 |
| Sinamatella | 298 | 35 | 22403 | 105.0 | 0 | 612 | 0.20 |
| Mtoa | 55 | 6 | 1590 | 152.3 | 0 | 139 | 0.07 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shapi | 26 | 3 | 517 | 181.7 | 0 | 74 | 0.03 |
| Central B | 31 | 1 | 978 | 321.7 | 0 | 130 | 0.02 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 129 | 17 | 3419 | 93.9 | 8 | 251 | 0.08 |
| Subtotals | 1203 | 136 | 60041 | 40.6 | 714 | 1692 | 0.08 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 4561 | 349 | 505357 | 31.6 | 3121 | 6001 | 0.19 |



Map 11. Distribution of sable antelope in NW Matabeleland during October-November 2007



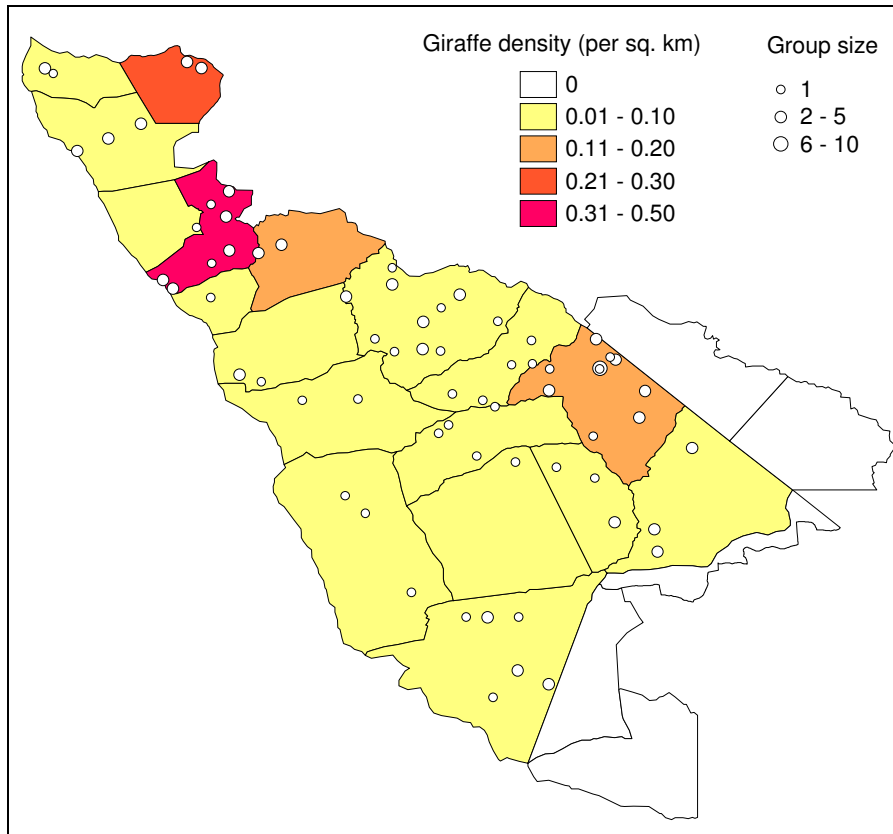
Map 12. Distribution of zebra in NW Matabeleland during October-November 2007

Table 14. Population estimates and statistics for Giraffe in north-west Matabeleland

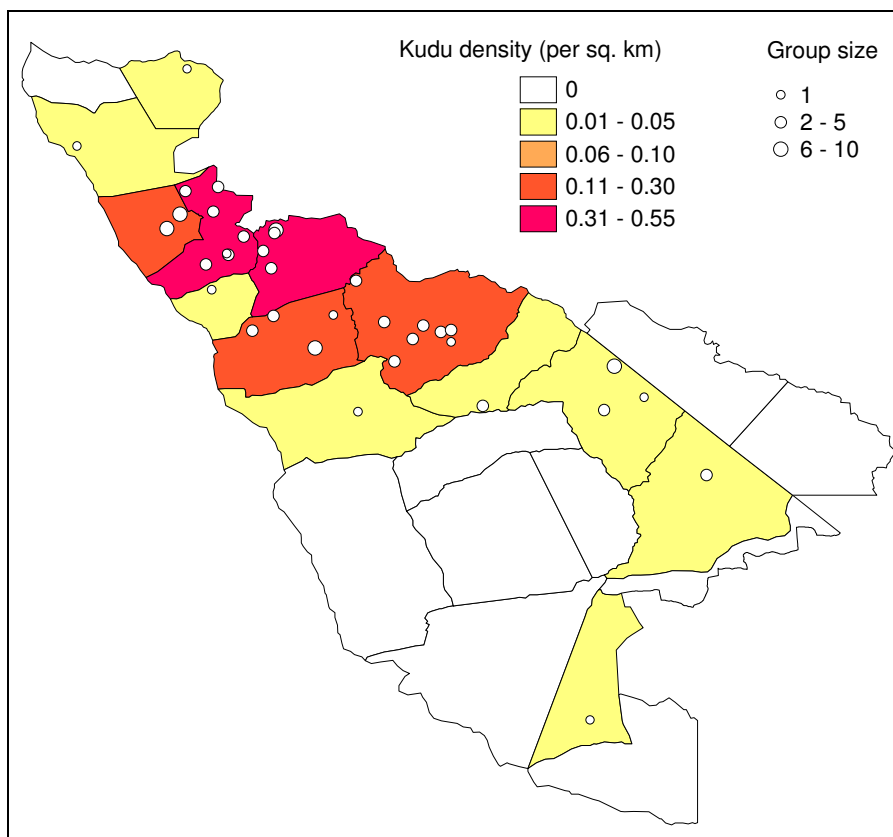
| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|-------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 116 | 9 | 5399 | 155.2 | 0 | 296 | 0.21 |
| Kazungula | 28 | 4 | 394 | 154.2 | 0 | 70 | 0.06 |
| Panda Masuie | 100 | 7 | 2384 | 109.2 | 0 | 208 | 0.10 |
| Kazuma | 14 | 1 | 209 | 259.1 | 0 | 49 | 0.02 |
| Matetsi | 327 | 17 | 10393 | 80.1 | 65 | 589 | 0.47 |
| Rosslyn | 14 | 1 | 103 | 199.9 | 0 | 42 | 0.04 |
| Zanguja | 92 | 6 | 2970 | 139.9 | 0 | 221 | 0.11 |
| Subtotals | 690 | 45 | 21852 | 45.4 | 377 | 1004 | 0.16 |
| Hwange NP | | | | | | | |
| Robins | 31 | 4 | 486 | 152.8 | 0 | 79 | 0.03 |
| Dandari | 17 | 2 | 120 | 129.5 | 0 | 40 | 0.01 |
| Shakwanki | 57 | 3 | 664 | 100.9 | 0 | 114 | 0.03 |
| Dzivanini | 117 | 9 | 2908 | 99.1 | 1 | 234 | 0.06 |
| Sinamatella | 136 | 16 | 2042 | 69.4 | 42 | 231 | 0.09 |
| Mtoa | 46 | 5 | 378 | 89.1 | 5 | 87 | 0.06 |
| Main Camp | 156 | 24 | 5204 | 96.0 | 6 | 306 | 0.12 |
| Shapi | 35 | 4 | 182 | 80.8 | 7 | 63 | 0.04 |
| Central B | 31 | 1 | 910 | 310.3 | 0 | 127 | 0.02 |
| Central A | 70 | 6 | 1843 | 134.6 | 0 | 165 | 0.09 |
| Ngamo | 84 | 11 | 2117 | 114.2 | 0 | 179 | 0.05 |
| Subtotals | 781 | 85 | 16854 | 33.0 | 523 | 1039 | 0.05 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 1471 | 130 | 38706 | 26.9 | 1076 | 1867 | 0.06 |

Table 15. Population estimates and statistics for Kudu in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 13 | 1 | 162 | 241.7 | 0 | 44 | 0.02 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 14 | 1 | 209 | 226.2 | 0 | 46 | 0.02 |
| Kazuma | 164 | 12 | 9260 | 143.9 | 0 | 399 | 0.29 |
| Matetsi | 385 | 20 | 12764 | 75.4 | 95 | 675 | 0.55 |
| Rosslyn | 14 | 1 | 142 | 234.3 | 0 | 47 | 0.04 |
| Zanguja | 261 | 17 | 28250 | 152.3 | 0 | 658 | 0.31 |
| Subtotals | 851 | 52 | 50787 | 55.9 | 375 | 1326 | 0.19 |
| Hwange NP | | | | | | | |
| Robins | 109 | 14 | 3545 | 117.9 | 0 | 238 | 0.11 |
| Dandari | 9 | 1 | 64 | 189.0 | 0 | 25 | 0.01 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 196 | 23 | 3020 | 58.7 | 81 | 311 | 0.13 |
| Mtoa | 18 | 2 | 291 | 195.4 | 0 | 54 | 0.02 |
| Main Camp | 65 | 10 | 1920 | 139.9 | 0 | 156 | 0.05 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 15 | 2 | 204 | 195.0 | 0 | 45 | 0.01 |
| Subtotals | 412 | 52 | 9044 | 46.3 | 221 | 603 | 0.03 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 20 | 1 | 298 | 197.1 | 0 | 60 | 0.02 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 20 | 1 | 298 | 197.1 | 0 | 60 | 0.01 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 1283 | 105 | 60129 | 39.4 | 777 | 1790 | 0.05 |



Map 13. Distribution of giraffe in NW Matabeleland during October-November 2007



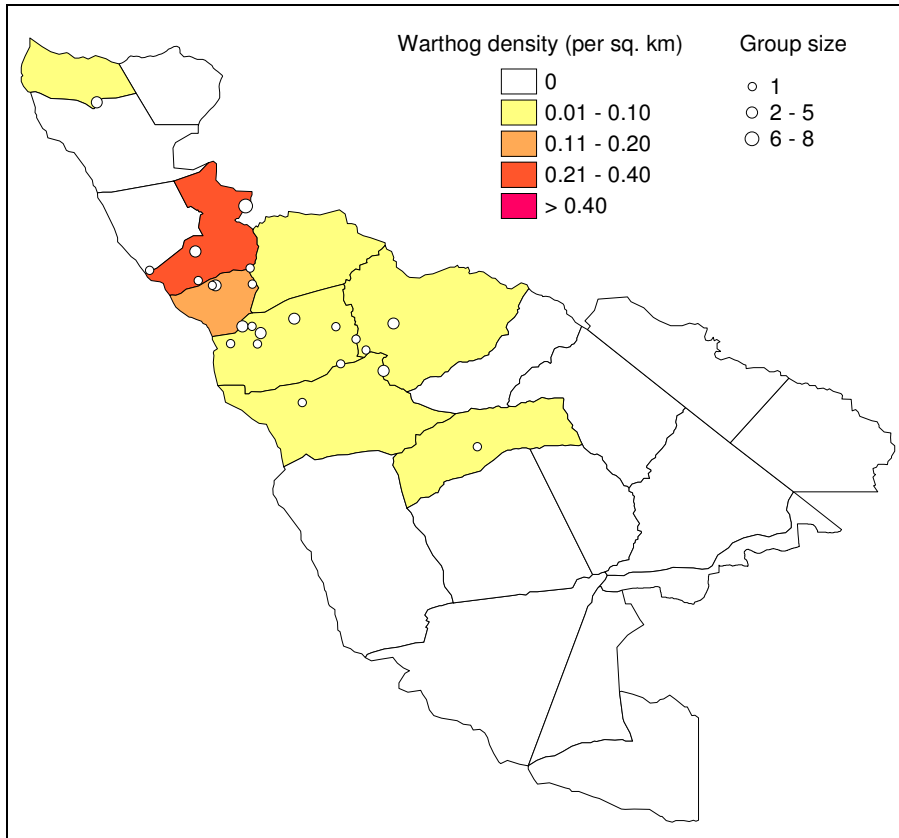
Map 14. Distribution of kudu in NW Matabeleland during October-November 2007

Table 16. Population estimates and statistics for Warthog in north-west Matabeleland

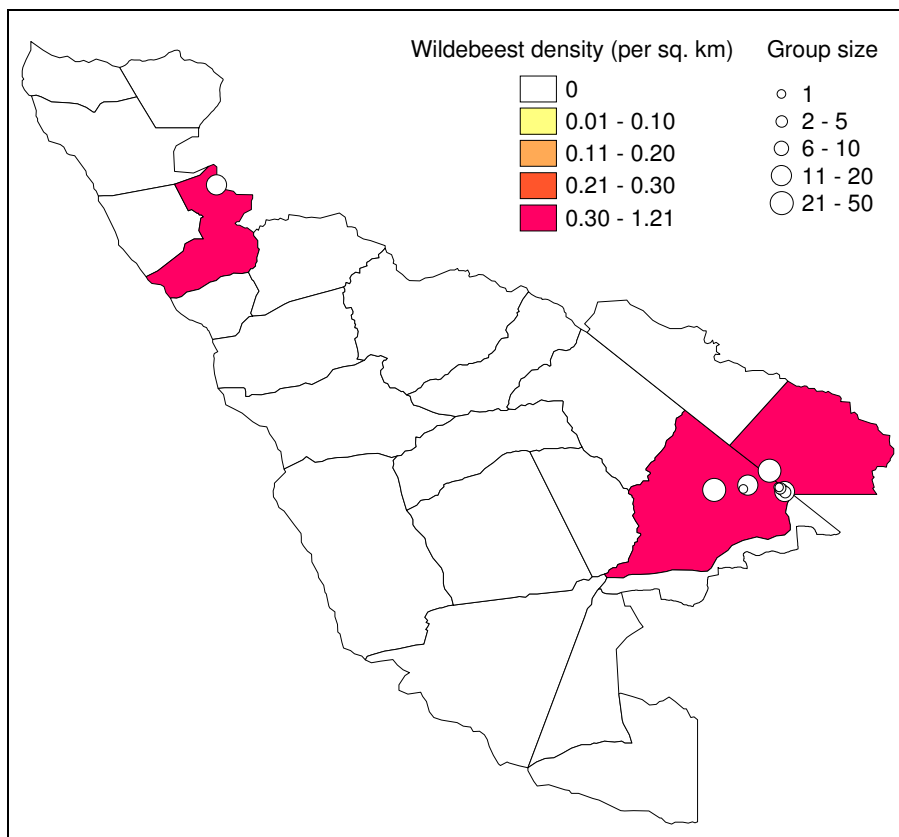
| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 14 | 2 | 168 | 201.5 | 0 | 42 | 0.03 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 231 | 12 | 23511 | 170.7 | 0 | 625 | 0.33 |
| Rosslyn | 56 | 4 | 2268 | 234.3 | 0 | 189 | 0.16 |
| Zanguja | 15 | 1 | 187 | 210.6 | 0 | 48 | 0.02 |
| Subtotals | 317 | 19 | 26134 | 125.0 | 0 | 712 | 0.07 |
| Hwange NP | | | | | | | |
| Robins | 93 | 12 | 1449 | 87.9 | 11 | 176 | 0.09 |
| Dandari | 17 | 2 | 120 | 129.6 | 0 | 40 | 0.01 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 68 | 8 | 1102 | 101.9 | 0 | 138 | 0.05 |
| Mtoa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shapi | 9 | 1 | 58 | 182.1 | 0 | 25 | 0.01 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 188 | 23 | 2730 | 56.6 | 81 | 294 | 0.01 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 504 | 42 | 28863 | 79.6 | 103 | 906 | 0.02 |

Table 17. Population estimates and statistics for Wildebeest in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 231 | 12 | 54553 | 260.0 | 0 | 831 | 0.33 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 231 | 12 | 54553 | 259.9 | 0 | 831 | 0.05 |
| Hwange NP | | | | | | | |
| Robins | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dandari | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Mtoa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 670 | 88 | 129269 | 111.6 | 0 | 1418 | 0.41 |
| Subtotals | 670 | 88 | 129269 | 111.5 | 0 | 1418 | 0.04 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 1417 | 50 | 1468574 | 237.4 | 0 | 4781 | 1.21 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 1417 | 50 | 1468574 | 237.4 | 0 | 4782 | 0.60 |
| Totals | 2318 | 150 | 1652396 | 142.5 | 0 | 5623 | 0.09 |



Map 15. Distribution of warthog in NW Matabeleland during October-November 2007



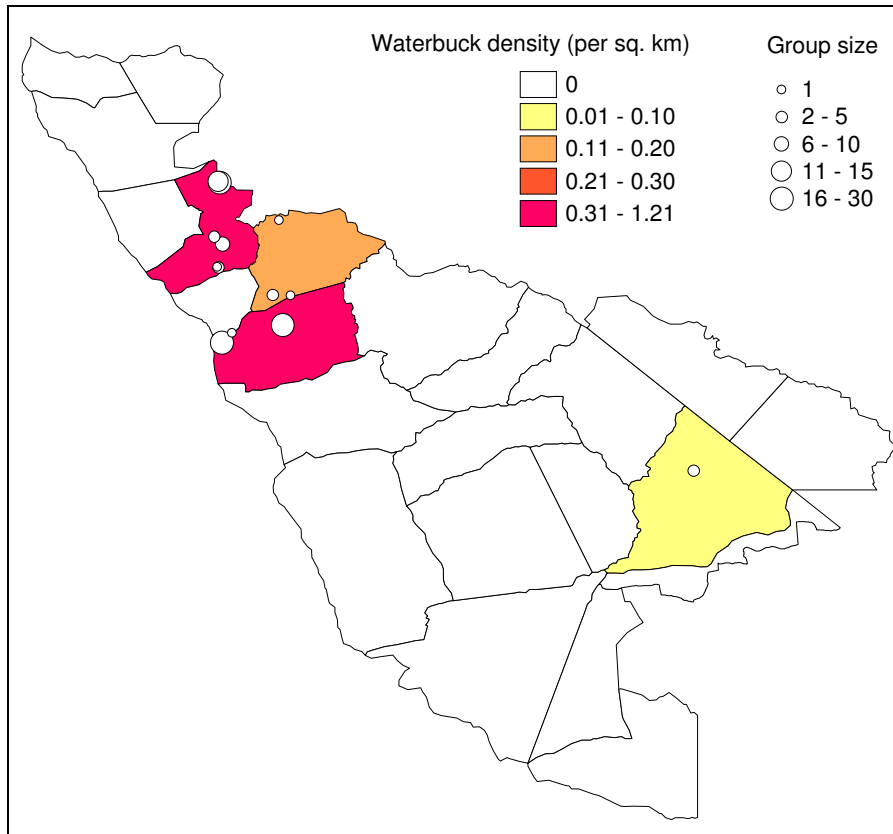
Map 16. Distribution of wildebeest in NW Matabeleland during October-November 2007

Table 18. Population estimates and statistics for Waterbuck in north-west Matabeleland

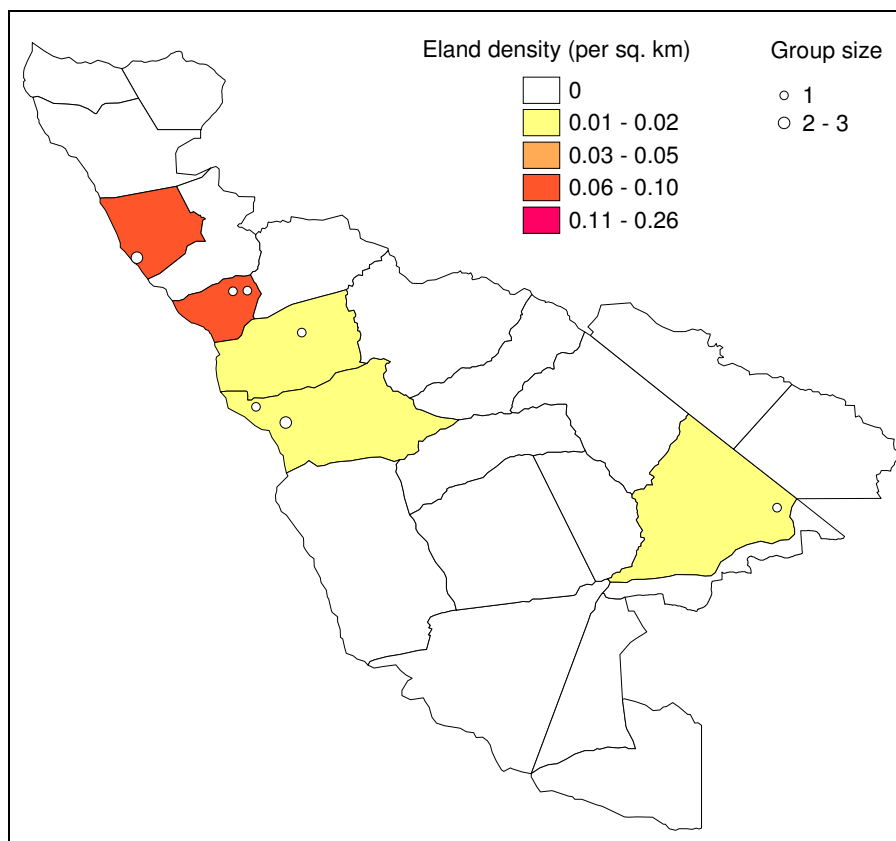
| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 847 | 44 | 314068 | 170.1 | 0 | 2288 | 1.21 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 107 | 7 | 3076 | 122.1 | 0 | 239 | 0.13 |
| Subtotals | 954 | 51 | 317143 | 151.7 | 0 | 2402 | 0.22 |
| Hwange NP | | | | | | | |
| Robins | 397 | 51 | 55261 | 127.8 | 0 | 905 | 0.39 |
| Dandari | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Mtoa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 38 | 5 | 1281 | 195.5 | 0 | 113 | 0.02 |
| Subtotals | 435 | 56 | 56542 | 118.0 | 0 | 949 | 0.03 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 1390 | 107 | 373686 | 107.6 | 0 | 2886 | 0.06 |

Table 19. Population estimates and statistics for Eland in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 41 | 3 | 1494 | 231.1 | 0 | 135 | 0.07 |
| Matetsi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Rosslyn | 28 | 2 | 567 | 234.3 | 0 | 94 | 0.08 |
| Zanguja | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 69 | 5 | 2061 | 148.6 | 0 | 172 | 0.02 |
| Hwange NP | | | | | | | |
| Robins | 8 | 1 | 50 | 195.3 | 0 | 23 | 0.01 |
| Dandari | 26 | 3 | 325 | 142.0 | 0 | 63 | 0.02 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Mtoa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 8 | 1 | 52 | 196.1 | 0 | 23 | 0.01 |
| Subtotals | 42 | 5 | 426 | 100.4 | 0 | 83 | 0.003 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 111 | 10 | 2487 | 97.3 | 3 | 218 | 0.005 |



Map 17. Distribution of waterbuck in NW Matabeleland during October-November 2007



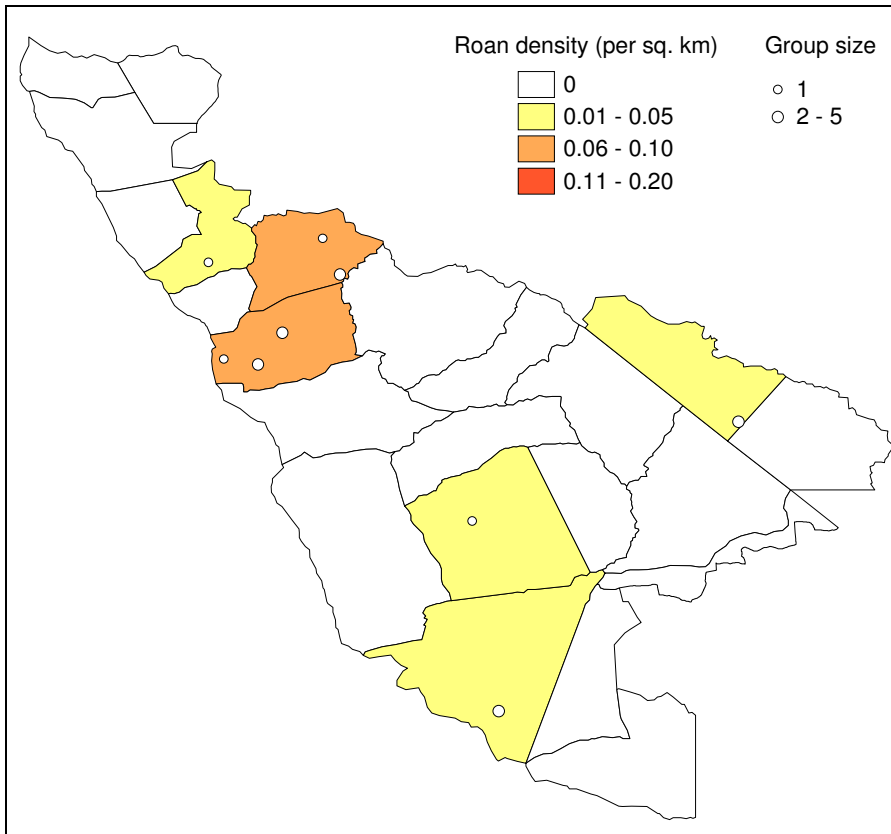
Map 18. Distribution of eland in NW Matabeleland during October-November 2007

Table 20. Population estimates and statistics for Roan Antelope in north-west Matabeleland

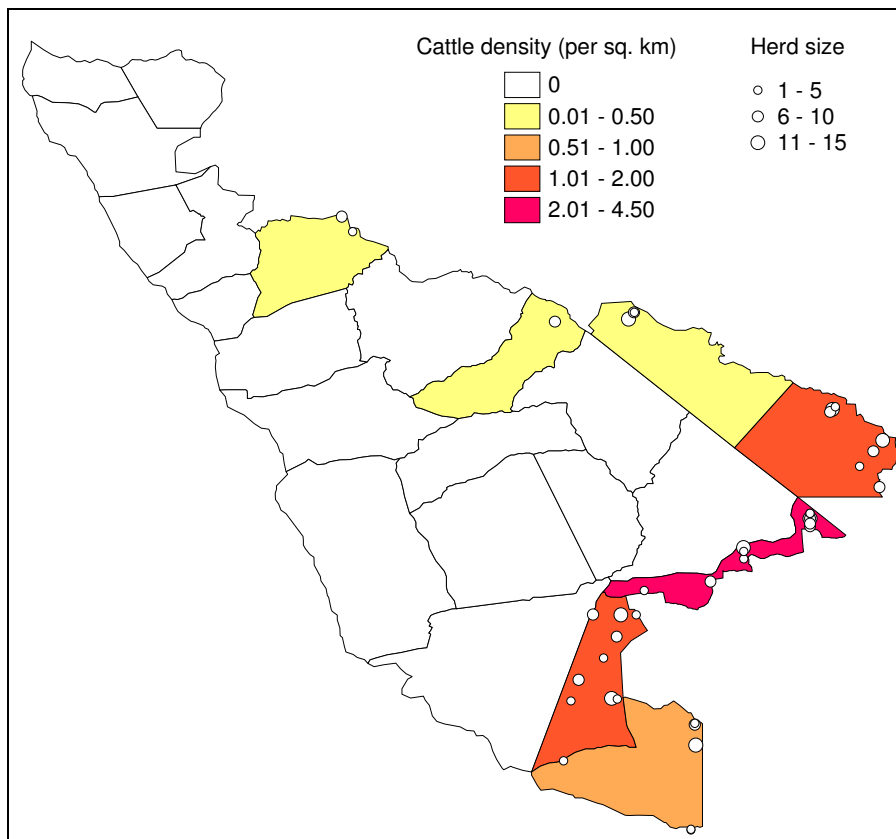
| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 19 | 1 | 421 | 274.2 | 0 | 72 | 0.03 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 61 | 4 | 1643 | 156.1 | 0 | 157 | 0.07 |
| Subtotals | 81 | 5 | 2065 | 124.0 | 0 | 181 | 0.02 |
| Hwange NP | | | | | | | |
| Robins | 70 | 9 | 1436 | 116.7 | 0 | 152 | 0.07 |
| Dandari | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 52 | 4 | 2629 | 212.1 | 0 | 163 | 0.03 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Mtoa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 31 | 1 | 978 | 321.7 | 0 | 130 | 0.02 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 153 | 14 | 5043 | 95.4 | 7 | 300 | 0.01 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 40 | 2 | 1405 | 216.6 | 0 | 126 | 0.03 |
| Subtotals | 40 | 2 | 1405 | 216.6 | 0 | 126 | 0.02 |
| Totals | 274 | 21 | 8513 | 67.9 | 88 | 460 | 0.01 |

Table 21. Population estimates and statistics for Cattle in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 153 | 10 | 6485 | 124.1 | 0 | 344 | 0.18 |
| Subtotals | 153 | 10 | 6485 | 121.0 | 0 | 339 | 0.03 |
| Hwange NP | | | | | | | |
| Robins | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dandari | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Mtoa | 64 | 7 | 3529 | 194.5 | 0 | 190 | 0.08 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 64 | 7 | 3529 | 194.4 | 0 | 190 | 0.004 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 1111 | 55 | 245854 | 102.9 | 0 | 2255 | 1.22 |
| Maitengwe | 910 | 32 | 506421 | 201.1 | 0 | 2739 | 0.74 |
| Tsholotsho Far North | 2125 | 73 | 1501564 | 136.4 | 0 | 5023 | 4.48 |
| Subtotals | 4146 | 160 | 2253840 | 78.2 | 903 | 7389 | 1.59 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 1700 | 60 | 637767 | 130.4 | 0 | 3917 | 1.45 |
| Sikumi Forest | 459 | 23 | 213830 | 232.3 | 0 | 1525 | 0.39 |
| Subtotals | 2159 | 83 | 851596 | 104.6 | 0 | 4418 | 0.92 |
| Totals | 6523 | 260 | 3115450 | 56.6 | 2829 | 10218 | 0.27 |



Map 19. Distribution of roan antelope in NW Matabeleland during October-November 2007



Map 20. Distribution of cattle in NW Matabeleland during October-November 2007

Table 22. Population estimates and statistics for Sheep and Goats in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Hwange NP | | | | | | | |
| Robins | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dandari | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Mtoa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 20 | 1 | 358 | 215.8 | 0 | 64 | 0.02 |
| Maitengwe | 142 | 5 | 14011 | 214.1 | 0 | 446 | 0.12 |
| Tsholotsho Far North | 728 | 25 | 197906 | 144.6 | 0 | 1780 | 1.54 |
| Subtotals | 890 | 31 | 212274 | 122.4 | 0 | 1979 | 0.34 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 890 | 31 | 212274 | 122.4 | 0 | 1979 | 0.04 |

Table 23. Population estimates and statistics for Donkey in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Hwange NP | | | | | | | |
| Robins | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dandari | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Mtoa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 40 | 2 | 1430 | 215.8 | 0 | 128 | 0.04 |
| Maitengwe | 28 | 1 | 533 | 208.8 | 0 | 88 | 0.02 |
| Tsholotsho Far North | 262 | 9 | 25254 | 143.5 | 0 | 638 | 0.55 |
| Subtotals | 331 | 12 | 27217 | 115.0 | 0 | 711 | 0.13 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 331 | 12 | 27217 | 115.0 | 0 | 711 | 0.01 |

Table 24. Population estimates and statistics for Ostrich in north-west Matabeleland

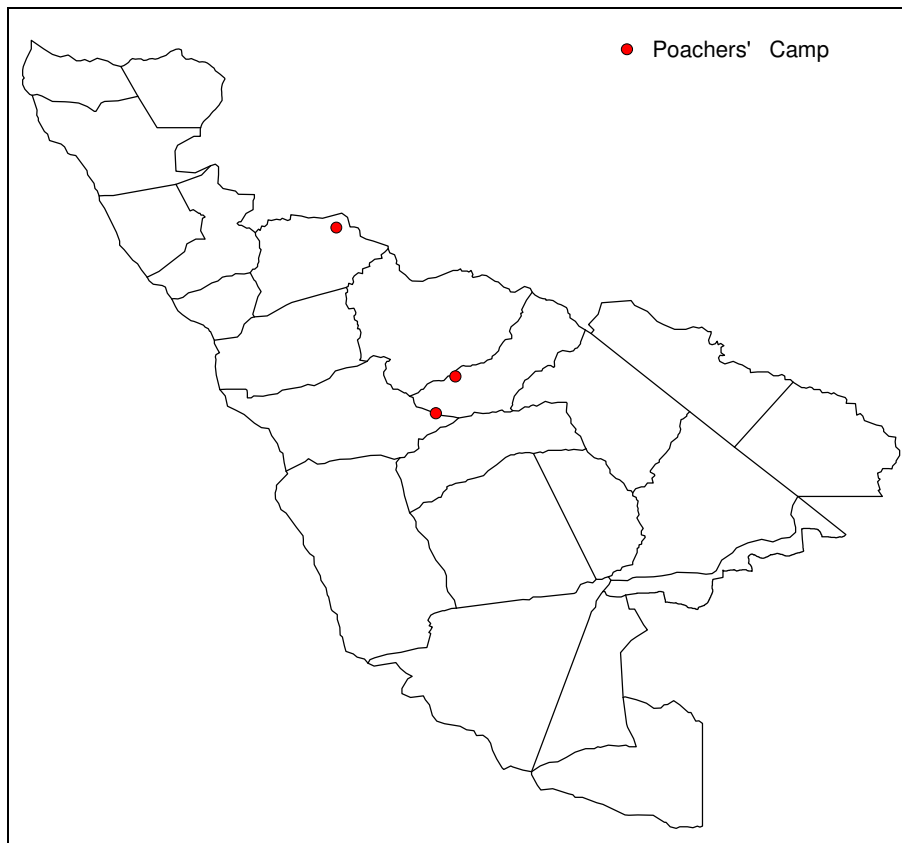
| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|---------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 28 | 2 | 727 | 211.0 | 0 | 89 | 0.03 |
| Kazuma | 27 | 2 | 614 | 222.3 | 0 | 88 | 0.05 |
| Matetsi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 56 | 4 | 1341 | 140.0 | 0 | 134 | 0.01 |
| Hwange NP | | | | | | | |
| Robins | 31 | 4 | 466 | 149.5 | 0 | 78 | 0.03 |
| Dandari | 9 | 1 | 65 | 191.0 | 0 | 25 | 0.01 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Mtoa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Main Camp | 32 | 5 | 930 | 194.8 | 0 | 96 | 0.03 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 15 | 2 | 206 | 196.2 | 0 | 45 | 0.01 |
| Subtotals | 88 | 12 | 1667 | 93.8 | 5 | 170 | 0.01 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 143 | 16 | 3008 | 76.8 | 33 | 253 | 0.01 |

Table 25. Population estimates and statistics for Ground Hornbill in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 55 | 4 | 2455 | 222.3 | 0 | 176 | 0.10 |
| Matetsi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 55 | 4 | 2455 | 222.3 | 0 | 176 | 0.01 |
| Hwange NP | | | | | | | |
| Robins | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dandari | 35 | 4 | 1048 | 191.2 | 0 | 102 | 0.03 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 26 | 2 | 657 | 212.1 | 0 | 81 | 0.01 |
| Sinamatella | 43 | 5 | 749 | 134.4 | 0 | 100 | 0.03 |
| Mtoa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Main Camp | 19 | 3 | 337 | 195.3 | 0 | 58 | 0.02 |
| Shapi | 26 | 3 | 529 | 183.9 | 0 | 74 | 0.03 |
| Central B | 31 | 1 | 910 | 310.3 | 0 | 127 | 0.02 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 30 | 4 | 483 | 150.0 | 0 | 76 | 0.02 |
| Subtotals | 211 | 22 | 4714 | 65.4 | 73 | 348 | 0.01 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 265 | 26 | 7169 | 64.7 | 93 | 437 | 0.01 |

Table 26. Population estimates and statistics for Poachers' Camps in north-west Matabeleland

| Stratum | Estimate | No. Seen | Variance | % CI | Lower CL | Upper CL | Density (km⁻²) |
|------------------------|-----------------|-----------------|-----------------|--------------|-----------------|-----------------|----------------------------------|
| Matetsi Complex | | | | | | | |
| Zambezi NP | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazungula | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Panda Masuie | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Kazuma | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Matetsi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Rosslyn | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Zanguja | 15 | 1 | 155 | 191.9 | 0 | 45 | 0.02 |
| Subtotals | 15 | 1 | 155 | 187.1 | 0 | 44 | 0.003 |
| Hwange NP | | | | | | | |
| Robins | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dandari | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shakwanki | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Dzivanini | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sinamatella | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Mtoa | 18 | 2 | 146 | 138.4 | 0 | 44 | 0.02 |
| Main Camp | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Shapi | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central B | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Central A | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Ngamo | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 18 | 2 | 146 | 138.4 | 0 | 44 | 0.001 |
| Communal Areas | | | | | | | |
| Tsholotsho East | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Maitengwe | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Tsholotsho Far North | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Forest Areas | | | | | | | |
| Ngamo Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Sikumi Forest | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Subtotals | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.00 |
| Totals | 34 | 3 | 301 | 106.9 | 0 | 70 | 0.001 |



Map 21. Distribution of poachers' camps in NW Matabeleland during October-November 2007

Appendix 1. Calibration of strip width

For each run (i.e. flight over the calibration numbers):

- Strip width (in meters) for one observer = $10 \times (1 + \text{Difference between outer and inner})$;
 - Combined strip width (in meters) at flying height = Left strip width + right strip width; and
 - Combined strip width at 300 ft agl¹ = Actual combined strip width \times 300 / (Flying height)
- ¹ agl: above ground level

Calibration 1

Calibration flights during 27-31 October 2007 at Hwange Main Camp airstrip

| Run no. | Left observer: Godfrey Mtare | | | Right observer: Colin Zhuwau | | | Combined strip width (m) at flying height | Flying height agl (ft) | Combined strip width (m) when flying at 300 ft |
|---------|---------------------------------|--------------|-----------------|---------------------------------|--------------|-----------------|---|------------------------|--|
| | Outer marker | Inner marker | Strip width (m) | Outer marker | Inner marker | Strip width (m) | | | |
| 1 | 18 | 6 | 130 | 20 | 5 | 160 | 290 | 300 | 290 |
| 2 | 19 | 4 | 160 | 22 | 7 | 160 | 320 | 300 | 320 |
| 3 | 21 | 6 | 160 | 19 | 7 | 130 | 290 | 300 | 290 |
| 4 | 21 | 4 | 180 | 23 | 8 | 160 | 340 | 300 | 340 |
| 5 | 23 | 3 | 210 | 18 | 5 | 140 | 350 | 250 | 420 |
| 6 | 20 | 5 | 160 | 26 | 5 | 220 | 380 | 250 | 456 |
| 7 | 24 | 6 | 190 | 23 | 7 | 170 | 360 | 300 | 360 |
| 8 | 22 | 5 | 180 | 25 | 10 | 160 | 340 | 330 | 309 |
| 9 | 22 | 6 | 170 | 29 | 11 | 190 | 360 | 350 | 309 |
| 10 | 29 | 10 | 200 | 22 | 7 | 160 | 360 | 350 | 309 |
| 11 | 20 | 5 | 160 | 27 | 13 | 150 | 310 | 300 | 310 |
| 12 | 21 | 4 | 180 | 24 | 11 | 140 | 320 | 300 | 320 |
| 13 | 25 | 9 | 170 | 22 | 7 | 160 | 330 | 270 | 367 |
| 14 | 20 | 6 | 150 | 23 | 8 | 160 | 310 | 290 | 321 |
| 15 | 28 | 7 | 220 | 25 | 8 | 180 | 400 | 300 | 400 |
| 16 | 25 | 9 | 170 | 23 | 6 | 180 | 350 | 300 | 350 |
| 17 | 24 | 5 | 200 | 25 | 8 | 180 | 380 | 280 | 407 |
| 18 | 29 | 8 | 220 | 24 | 9 | 160 | 380 | 350 | 326 |
| 19 | 28 | 10 | 190 | 18 | 4 | 150 | 340 | 300 | 340 |
| 20 | 25 | 9 | 170 | 20 | 3 | 180 | 350 | 290 | 362 |
| 21 | 25 | 11 | 150 | 19 | 4 | 160 | 310 | 300 | 310 |
| 22 | 25 | 7 | 190 | 22 | 6 | 170 | 360 | 300 | 360 |
| 23 | 24 | 9 | 160 | 20 | 4 | 170 | 330 | 280 | 354 |
| 24 | 28 | 10 | 190 | 21 | 4 | 180 | 370 | 300 | 370 |
| 25 | 21 | 6 | 160 | 27 | 7 | 210 | 370 | 290 | 383 |
| 26 | 20 | 5 | 160 | 25 | 9 | 170 | 330 | 300 | 330 |
| 27 | 25 | 9 | 170 | 24 | 3 | 220 | 390 | 280 | 418 |
| 28 | 28 | 10 | 190 | 25 | 8 | 180 | 370 | 330 | 336 |
| 29 | 29 | 11 | 190 | 19 | 4 | 160 | 350 | 300 | 350 |

| Run no. | Left observer: Godfrey Mtare | | | Right observer: Colin Zhuwau | | | Combined strip width (m) at flying height | Flying height agl (ft) | Combined strip width (m) when flying at 300 ft |
|---------|---------------------------------|--------------|-----------------|---------------------------------|--------------|-----------------|---|------------------------|--|
| | Outer marker | Inner marker | Strip width (m) | Outer marker | Inner marker | Strip width (m) | | | |
| 30 | 30 | 13 | 180 | 25 | 5 | 210 | 390 | 290 | 403 |
| 31 | 24 | 8 | 170 | 25 | 11 | 150 | 320 | 300 | 320 |
| 32 | 20 | 4 | 170 | 29 | 11 | 190 | 360 | 310 | 348 |
| 33 | 19 | 5 | 150 | 21 | 7 | 150 | 300 | 300 | 300 |
| 34 | 24 | 8 | 170 | 19 | 7 | 130 | 300 | 300 | 300 |
| 35 | 30 | 11 | 200 | 26 | 11 | 160 | 360 | 290 | 372 |
| 36 | 26 | 12 | 150 | 18 | 5 | 140 | 290 | 300 | 290 |
| 37 | 23 | 9 | 150 | 22 | 7 | 160 | 310 | 270 | 344 |
| 38 | 22 | 6 | 170 | 24 | 8 | 170 | 340 | 300 | 340 |
| 39 | 25 | 10 | 160 | 18 | 4 | 150 | 310 | 280 | 332 |
| 40 | 28 | 10 | 190 | 20 | 6 | 150 | 340 | 290 | 352 |
| 41 | 22 | 7 | 160 | 22 | 7 | 160 | 320 | 280 | 343 |
| 42 | 26 | 11 | 160 | 20 | 5 | 160 | 320 | 290 | 331 |

This first calibration exercise did not – for one observer - produce a positive linear relationship between the observer’s actual strip width and flying height. Hence, the calibration exercise was repeated (below).

Calibration 2

Calibration flights during 4-8 November 2007 at Hwange Main Camp airstrip

| Run no. | Left observer: Godfrey Mtare | | | Right observer: Colin Zhuwau | | | Combined strip width (m) at flying height | Flying height agl (ft) | Combined strip width (m) when flying at 300 ft |
|---------|---------------------------------|--------------|-----------------|---------------------------------|--------------|-----------------|---|------------------------|--|
| | Outer marker | Inner marker | Strip width (m) | Outer marker | Inner marker | Strip width (m) | | | |
| 1 | 24 | 9 | 160 | 24 | 7 | 180 | 340 | 300 | 340 |
| 2 | 28 | 12 | 170 | 22 | 7 | 160 | 330 | 290 | 341 |
| 3 | 25 | 8 | 180 | 24 | 9 | 160 | 340 | 320 | 319 |
| 4 | 23 | 8 | 160 | 17 | 5 | 130 | 290 | 250 | 348 |
| 5 | 29 | 13 | 170 | 14 | 3 | 120 | 290 | 250 | 348 |
| 6 | 24 | 9 | 160 | 23 | 8 | 160 | 320 | 280 | 343 |
| 7 | 29 | 13 | 170 | 25 | 8 | 180 | 350 | 280 | 375 |
| 8 | 26 | 11 | 160 | - | - | | - | 310 | |
| 9 | 28 | 11 | 180 | 21 | 9 | 130 | 310 | 300 | 310 |
| 10 | 30 | 11 | 200 | 19 | 5 | 150 | 350 | 290 | 362 |
| 11 | 26 | 10 | 170 | - | - | | - | 300 | |
| 12 | 25 | 9 | 170 | 20 | 6 | 150 | 320 | 300 | 320 |
| 13 | 27 | 10 | 180 | 16 | 2 | 150 | 330 | 260 | 381 |
| 14 | 19 | 8 | 120 | 17 | 2 | 160 | 280 | 270 | 311 |
| 15 | 30 | 13 | 180 | 21 | 13 | 90 | 270 | 350 | 231 |

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| Run no. | Left observer: Godfrey Mtare | | | Right observer: Colin Zhuwau | | | Combined strip width (m) at flying height | Flying height agl (ft) | Combined strip width (m) when flying at 300 ft |
|--|---------------------------------|--------------|-----------------|---------------------------------|--------------|-----------------|---|------------------------|--|
| | Outer marker | Inner marker | Strip width (m) | Outer marker | Inner marker | Strip width (m) | | | |
| 16 | 25 | 8 | 180 | 19 | 5 | 150 | 330 | 320 | 309 |
| 17 | 30 | 12 | 190 | 20 | 4 | 170 | 360 | 310 | 348 |
| 18 | 23 | 9 | 150 | 22 | 7 | 160 | 310 | 310 | 300 |
| 19 | 30 | 12 | 190 | 15 | 2 | 140 | 330 | 360 | 275 |
| 20 | 25 | 10 | 160 | 15 | 3 | 130 | 290 | 240 | 363 |
| 21 | 24 | 9 | 160 | 20 | 5 | 160 | 320 | 290 | 331 |
| 22 | 22 | 6 | 170 | 15 | 0 | 160 | 330 | 240 | 413 |
| 23 | 26 | 11 | 160 | 22 | 7 | 160 | 320 | 320 | 300 |
| 24 | 24 | 10 | 150 | 18 | 4 | 150 | 300 | 270 | 333 |
| 25 | 30 | 12 | 190 | 28 | 6 | 230 | 420 | 350 | 360 |
| 26 | 25 | 10 | 160 | 25 | 6 | 200 | 360 | 320 | 338 |
| 27 | 28 | 12 | 170 | 22 | 9 | 140 | 310 | 320 | 291 |
| 28 | 20 | 5 | 160 | 20 | 7 | 140 | 300 | 260 | 346 |
| 29 | 30 | 14 | 170 | 22 | 6 | 170 | 340 | 310 | 329 |
| 30 | 24 | 9 | 160 | 21 | 10 | 120 | 280 | 310 | 271 |
| 31 | 30 | 12 | 190 | 25 | 8 | 180 | 370 | 350 | 317 |
| 32 | 29 | 12 | 180 | 20 | 7 | 140 | 320 | 320 | 300 |
| 33 | 22 | 4 | 190 | 30 | 13 | 180 | 370 | 350 | 317 |
| 34 | 28 | 13 | 160 | 19 | 6 | 140 | 300 | 280 | 321 |
| 35 | 20 | 4 | 170 | 24 | 11 | 140 | 310 | 280 | 332 |
| 36 | 28 | 11 | 180 | 19 | 10 | 100 | 280 | 310 | 271 |
| 37 | 26 | 9 | 180 | 25 | 11 | 150 | 330 | 320 | 309 |
| 38 | 27 | 10 | 180 | 22 | 8 | 150 | 330 | 310 | 319 |
| 39 | 22 | 5 | 180 | 20 | 6 | 150 | 330 | 280 | 354 |
| 40 | 24 | 5 | 200 | 18 | 7 | 120 | 320 | 260 | 369 |
| Mean combined strip width (in meters) when flying at 300 feet agl = | | | | | | | | | 328 |
| Standard error of mean combined strip width as a percentage of the mean | | | | | | | | | 1.7 |

Appendix 2. Survey flight summary

| Date | Time take off | Time land | Flight time (hours) | Duty |
|--------------|---------------|-----------|---------------------|---|
| 26-Oct-07 | 11:45 | 13:45 | 2.00 | Positioning, Harare to Main Camp |
| 27-Oct-07 | 7:07 | 8:00 | 0.88 | Calibration |
| 27-Oct-07 | 8:55 | 11:50 | 2.92 | Stratum Kazungula |
| 27-Oct-07 | 15:07 | 17:20 | 2.22 | Stratum Zambezi NP + calibration |
| 28-Oct-07 | 6:09 | 8:56 | 2.78 | Stratum Panda Masuie |
| 28-Oct-07 | 9:56 | 12:21 | 2.42 | Stratum Kazuma |
| 29-Oct-07 | 6:17 | 8:15 | 1.97 | Stratum Matetsi |
| 29-Oct-07 | 10:12 | 11:50 | 1.63 | Stratum Rosslyn + calibration |
| 29-Oct-07 | 14:56 | 17:22 | 2.43 | Stratum Zanguja + calibration |
| 30-Oct-07 | 6:12 | 8:21 | 2.15 | Stratum Robins Camp + calibration |
| 30-Oct-07 | 9:01 | 10:53 | 1.87 | Stratum Robins Camp continued |
| 30-Oct-07 | 14:26 | 17:03 | 2.62 | Stratum Mtoa + calibration |
| 31-Oct-07 | 6:09 | 8:10 | 2.02 | Stratum Sinamatella |
| 31-Oct-07 | 8:46 | 10:15 | 1.48 | Stratum Sinamatella + calibration |
| 31-Oct-07 | 14:35 | 16:12 | 1.62 | Stratum Sinamatella + calibration |
| 01-Nov-07 | 6:22 | 9:29 | 3.12 | Stratum Shapi |
| 01-Nov-07 | 11:49 | 14:00 | 2.18 | Positioning, Main Camp to Harare |
| 04-Nov-07 | 12:39 | 14:46 | 2.12 | Positioning, Harare to Main Camp |
| 04-Nov-07 | 15:13 | 18:00 | 2.78 | Stratum Main Camp + calibration |
| 05-Nov-07 | 6:10 | 6:33 | 0.38 | Calibration |
| 05-Nov-07 | 7:48 | 10:16 | 2.47 | Stratum Dandari |
| 05-Nov-07 | 10:36 | 12:28 | 1.87 | Stratum Dandari continued |
| 05-Nov-07 | 15:18 | 17:09 | 1.85 | Stratum Main Camp continued + calibration |
| 06-Nov-07 | 6:09 | 9:50 | 3.68 | Stratum Shakwanki + calibration |
| 06-Nov-07 | 15:00 | 17:00 | 2.00 | Stratum Sikumi Forest + calibration |
| 07-Nov-07 | 6:08 | 8:28 | 2.33 | Stratum Ngamo |
| 07-Nov-07 | 9:00 | 11:16 | 2.27 | Stratum Ngamo continued |
| 07-Nov-07 | 15:00 | 16:51 | 1.85 | Stratum Central B + calibration |
| 08-Nov-07 | 6:06 | 10:36 | 4.50 | Stratum Dzivanini + calibration |
| 08-Nov-07 | 15:00 | 16:45 | 1.75 | Stratum Ngamo Forest |
| 09-Nov-07 | 6:10 | 8:06 | 1.93 | Stratum Central A |
| 09-Nov-07 | 8:55 | 10:07 | 1.20 | Stratum Tsholotsho North |
| 09-Nov-07 | 15:07 | 17:30 | 2.38 | Stratum Tsholotsho East |
| 10-Nov-07 | 6:15 | 8:40 | 2.42 | Stratum Maitengwe |
| 10-Nov-07 | 10:41 | 12:44 | 2.05 | Positioning, Main Camp to Harare |
| Total | | | 76.13 | |

Appendix 3. Transect start and end points, and lengths

Degrees and decimal minutes; datum WGS84

Kazungula

Number of transects : 16
Transect Bearing : 0.00 Degrees
Transect Spacing : 2.30 km

Transect # : 1A
Start Lat : S 17 : 55.209 Start Lon : E 25 : 14.500
Finish Lat : S 17 : 54.061 Finish Lon : E 25 : 14.500
Length : 2.13 km

Transect # : 1B
Start Lat : S 17 : 53.654 Start Lon : E 25 : 14.500
Finish Lat : S 17 : 51.904 Finish Lon : E 25 : 14.500
Length : 3.24 km

Transect # : 2
Start Lat : S 17 : 49.070 Start Lon : E 25 : 15.803
Finish Lat : S 17 : 56.784 Finish Lon : E 25 : 15.803
Length : 14.28 km

Transect # : 3
Start Lat : S 17 : 56.798 Start Lon : E 25 : 17.107
Finish Lat : S 17 : 48.265 Finish Lon : E 25 : 17.107
Length : 15.80 km

Transect # : 4
Start Lat : S 17 : 49.146 Start Lon : E 25 : 18.411
Finish Lat : S 17 : 57.365 Finish Lon : E 25 : 18.411
Length : 15.22 km

Transect # : 5
Start Lat : S 17 : 57.907 Start Lon : E 25 : 19.714
Finish Lat : S 17 : 49.869 Finish Lon : E 25 : 19.714
Length : 14.89 km

Transect # : 6
Start Lat : S 17 : 50.221 Start Lon : E 25 : 21.018
Finish Lat : S 17 : 57.953 Finish Lon : E 25 : 21.018
Length : 14.32 km

Transect # : 7
Start Lat : S 17 : 58.034 Start Lon : E 25 : 22.322
Finish Lat : S 17 : 50.004 Finish Lon : E 25 : 22.322
Length : 14.87 km

Transect # : 8
Start Lat : S 17 : 50.925 Start Lon : E 25 : 23.626
Finish Lat : S 17 : 58.163 Finish Lon : E 25 : 23.626
Length : 13.40 km

Transect # : 9
Start Lat : S 17 : 58.572 Start Lon : E 25 : 24.929
Finish Lat : S 17 : 50.739 Finish Lon : E 25 : 24.929
Length : 14.50 km

Transect # : 10
Start Lat : S 17 : 50.939 Start Lon : E 25 : 26.233
Finish Lat : S 17 : 59.295 Finish Lon : E 25 : 26.233
Length : 15.47 km

Transect # : 11
Start Lat : S 17 : 58.765 Start Lon : E 25 : 27.537
Finish Lat : S 17 : 50.565 Finish Lon : E 25 : 27.537
Length : 15.19 km

Transect # : 12
Start Lat : S 17 : 50.938 Start Lon : E 25 : 28.840
Finish Lat : S 17 : 57.889 Finish Lon : E 25 : 28.840
Length : 12.87 km

Transect # : 13
Start Lat : S 17 : 57.846 Start Lon : E 25 : 30.144
Finish Lat : S 17 : 51.635 Finish Lon : E 25 : 30.144
Length : 11.50 km

Transect # : 14
Start Lat : S 17 : 52.283 Start Lon : E 25 : 31.448
Finish Lat : S 17 : 57.664 Finish Lon : E 25 : 31.448
Length : 9.97 km

Transect # : 15
Start Lat : S 17 : 57.352 Start Lon : E 25 : 32.752
Finish Lat : S 17 : 54.500 Finish Lon : E 25 : 32.752
Length : 5.28 km

Transect # : 16 ¹
Start Lat : S 17 : 56.716 Start Lon : E 25 : 34.055
Finish Lat : S 17 : 57.040 Finish Lon : E 25 : 34.055
Length : 0.60 km

¹ Not flown

Zambezi NP

Number of transects : 7
Transect Bearing : 0.00 Degrees
Transect Spacing : 4.20 km

Transect # : 1
Start Lat : S 17 : 55.513 Start Lon : E 25 : 33.348
Finish Lat : S 17 : 50.541 Finish Lon : E 25 : 33.348
Length : 9.21 km

Transect # : 2
Start Lat : S 17 : 50.793 Start Lon : E 25 : 35.729
Finish Lat : S 17 : 59.477 Finish Lon : E 25 : 35.729
Length : 16.08 km

Transect # : 3
Start Lat : S 18 : 2.401 Start Lon : E 25 : 38.111
Finish Lat : S 17 : 50.336 Finish Lon : E 25 : 38.111
Length : 22.34 km

Transect # : 4
Start Lat : S 17 : 49.084 Start Lon : E 25 : 40.492
Finish Lat : S 18 : 2.402 Finish Lon : E 25 : 40.492
Length : 24.66 km

Transect # : 5
Start Lat : S 18 : 2.404 Start Lon : E 25 : 42.873
Finish Lat : S 17 : 50.634 Finish Lon : E 25 : 42.873
Length : 21.80 km

Transect # : 6
Start Lat : S 17 : 51.111 Start Lon : E 25 : 45.255
Finish Lat : S 18 : 1.765 Finish Lon : E 25 : 45.255
Length : 19.73 km

Transect # : 7
Start Lat : S 17 : 59.217 Start Lon : E 25 : 47.636
Finish Lat : S 17 : 52.719 Finish Lon : E 25 : 47.636
Length : 12.03 km

Panda Masuie

Number of transects : 11
Transect Bearing : 0.00 Degrees
Transect Spacing : 4.70 km

Transect # : 1
Start Lat : S 18 : 3.426 Start Lon : E 25 : 18.544
Finish Lat : S 17 : 57.431 Finish Lon : E 25 : 18.544
Length : 11.10 km

Transect # : 2
Start Lat : S 17 : 57.959 Start Lon : E 25 : 21.210
Finish Lat : S 18 : 5.404 Finish Lon : E 25 : 21.210
Length : 13.79 km

Transect # : 3
Start Lat : S 18 : 7.706 Start Lon : E 25 : 23.875
Finish Lat : S 17 : 58.187 Finish Lon : E 25 : 23.875
Length : 17.63 km

Transect # : 4
Start Lat : S 17 : 59.502 Start Lon : E 25 : 26.541
Finish Lat : S 18 : 11.829 Finish Lon : E 25 : 26.541
Length : 22.83 km

Transect # : 5
Start Lat : S 18 : 14.100 Start Lon : E 25 : 29.206
Finish Lat : S 17 : 57.877 Finish Lon : E 25 : 29.206
Length : 30.04 km

Transect # : 6
Start Lat : S 17 : 57.563 Start Lon : E 25 : 31.872
Finish Lat : S 18 : 13.761 Finish Lon : E 25 : 31.872
Length : 30.00 km

Transect # : 7
Start Lat : S 18 : 13.279 Start Lon : E 25 : 34.537
Finish Lat : S 17 : 57.519 Finish Lon : E 25 : 34.537
Length : 29.19 km

Transect # : 8
Start Lat : S 18 : 1.910 Start Lon : E 25 : 37.202
Finish Lat : S 18 : 12.797 Finish Lon : E 25 : 37.202
Length : 20.16 km

Transect # : 9
Start Lat : S 18 : 12.315 Start Lon : E 25 : 39.868
Finish Lat : S 18 : 2.400 Finish Lon : E 25 : 39.868
Length : 18.36 km

Transect # : 10A
Start Lat : S 18 : 2.400 Start Lon : E 25 : 42.533
Finish Lat : S 18 : 4.637 Finish Lon : E 25 : 42.533
Length : 4.14 km

Transect # : 10B
Start Lat : S 18 : 10.061 Start Lon : E 25 : 42.533
Finish Lat : S 18 : 11.520 Finish Lon : E 25 : 42.533
Length : 2.70 km

Transect # : 11
Start Lat : S 18 : 10.543 Start Lon : E 25 : 45.199
Finish Lat : S 18 : 9.685 Finish Lon : E 25 : 45.199
Length : 1.59 km

Kazuma

Number of transects : 7
Transect Bearing : 0.00 Degrees
Transect Spacing : 4.70 km

Transect # : 1
Start Lat : S 18 : 16.357 Start Lon : E 25 : 28.540
Finish Lat : S 18 : 14.100 Finish Lon : E 25 : 28.540
Length : 4.18 km

Transect # : 2
Start Lat : S 18 : 13.881 Start Lon : E 25 : 31.211
Finish Lat : S 18 : 22.800 Finish Lon : E 25 : 31.211
Length : 16.52 km

Transect # : 3
Start Lat : S 18 : 25.595 Start Lon : E 25 : 33.882
Finish Lat : S 18 : 13.398 Finish Lon : E 25 : 33.882
Length : 22.59 km

Transect # : 4
Start Lat : S 18 : 12.914 Start Lon : E 25 : 36.553
Finish Lat : S 18 : 27.774 Finish Lon : E 25 : 36.553
Length : 27.52 km

Transect # : 5
Start Lat : S 18 : 26.071 Start Lon : E 25 : 39.224
Finish Lat : S 18 : 12.431 Finish Lon : E 25 : 39.224
Length : 25.26 km

Transect # : 6
Start Lat : S 18 : 14.289 Start Lon : E 25 : 41.895
Finish Lat : S 18 : 23.997 Finish Lon : E 25 : 41.895
Length : 17.98 km

Transect # : 7
Start Lat : S 18 : 21.600 Start Lon : E 25 : 44.566
Finish Lat : S 18 : 17.069 Finish Lon : E 25 : 44.566
Length : 8.39 km

Matetsi

Number of transects : 6
Transect Bearing : -50.00 Degrees
Transect Spacing : 6.90 km

Transect # : 1
Start Lat : S 18 : 31.695 Start Lon : E 25 : 41.646
Finish Lat : S 18 : 27.721 Finish Lon : E 25 : 36.663
Length : 11.45 km

Transect # : 2
Start Lat : S 18 : 25.493 Start Lon : E 25 : 39.968
Finish Lat : S 18 : 29.954 Finish Lon : E 25 : 45.561
Length : 12.85 km

Transect # : 3
Start Lat : S 18 : 28.028 Start Lon : E 25 : 49.246
Finish Lat : S 18 : 22.683 Finish Lon : E 25 : 42.544
Length : 15.40 km

Transect # : 4
Start Lat : S 18 : 19.821 Start Lon : E 25 : 45.054
Finish Lat : S 18 : 26.858 Finish Lon : E 25 : 53.877
Length : 20.27 km

Transect # : 5
Start Lat : S 18 : 23.022 Start Lon : E 25 : 55.167
Finish Lat : S 18 : 11.963 Finish Lon : E 25 : 41.300
Length : 31.86 km

Transect # : 6
Start Lat : S 18 : 10.356 Start Lon : E 25 : 45.383
Finish Lat : S 18 : 16.816 Finish Lon : E 25 : 53.484
Length : 18.61 km

Rosslyn

Number of transects : 5
Transect Bearing : 90.00 Degrees
Transect Spacing : 4.60 km

Transect # : 1
Start Lat : S 18 : 27.517 Start Lon : E 25 : 53.630
Finish Lat : S 18 : 27.517 Finish Lon : E 25 : 52.887
Length : 1.31 km

Transect # : 2
Start Lat : S 18 : 30.001 Start Lon : E 25 : 45.484
Finish Lat : S 18 : 30.001 Finish Lon : E 25 : 55.094
Length : 16.89 km

Transect # : 3
Start Lat : S 18 : 32.485 Start Lon : E 25 : 54.597

Finish Lat : S 18 : 32.485 Finish Lon : E 25 : 40.348
Length : 25.04 km

Transect # : 4
Start Lat : S 18 : 34.969 Start Lon : E 25 : 42.432
Finish Lat : S 18 : 34.969 Finish Lon : E 25 : 54.206
Length : 20.69 km

Transect # : 5
Start Lat : S 18 : 37.453 Start Lon : E 25 : 52.091
Finish Lat : S 18 : 37.453 Finish Lon : E 25 : 46.619
Length : 9.61 km

Zanguja

Number of transects : 8
Transect Bearing : 29.00 Degrees
Transect Spacing : 5.10 km

Transect # : 1
Start Lat : S 18 : 20.536 Start Lon : E 25 : 54.451
Finish Lat : S 18 : 20.352 Finish Lon : E 25 : 54.558
Length : 0.39 km

Transect # : 2A
Start Lat : S 18 : 18.061 Start Lon : E 25 : 59.210
Finish Lat : S 18 : 25.224 Finish Lon : E 25 : 55.030
Length : 15.17 km

Transect # : 2B
Start Lat : S 18 : 26.775 Start Lon : E 25 : 54.125
Finish Lat : S 18 : 27.574 Finish Lon : E 25 : 53.659
Length : 1.69 km

Transect # : 3
Start Lat : S 18 : 30.369 Start Lon : E 25 : 55.343
Finish Lat : S 18 : 17.712 Finish Lon : E 26 : 2.728
Length : 26.80 km

Transect # : 4
Start Lat : S 18 : 17.988 Start Lon : E 26 : 5.882
Finish Lat : S 18 : 34.827 Finish Lon : E 25 : 56.056
Length : 35.65 km

Transect # : 5
Start Lat : S 18 : 32.468 Start Lon : E 26 : 0.747
Finish Lat : S 18 : 17.299 Finish Lon : E 26 : 9.599
Length : 32.12 km

Transect # : 6
Start Lat : S 18 : 19.537 Start Lon : E 26 : 11.608
Finish Lat : S 18 : 31.377 Finish Lon : E 26 : 4.699
Length : 25.07 km

Transect # : 7
Start Lat : S 18 : 30.308 Start Lon : E 26 : 8.637
Finish Lat : S 18 : 21.647 Finish Lon : E 26 : 13.691
Length : 18.34 km

Transect # : 8
Start Lat : S 18 : 22.524 Start Lon : E 26 : 16.494
Finish Lat : S 18 : 25.047 Finish Lon : E 26 : 15.021
Length : 5.34 km

Robins Camp

Number of transects : 14
Transect Bearing : 90.00 Degrees
Transect Spacing : 2.60 km

Transect # : 1
Start Lat : S 18 : 30.287 Start Lon : E 26 : 10.270
Finish Lat : S 18 : 30.287 Finish Lon : E 26 : 8.717
Length : 2.73 km

Transect # : 2
Start Lat : S 18 : 31.691 Start Lon : E 26 : 3.563
Finish Lat : S 18 : 31.691 Finish Lon : E 26 : 10.091
Length : 11.47 km

Transect # : 3
Start Lat : S 18 : 33.094 Start Lon : E 26 : 10.250
Finish Lat : S 18 : 33.094 Finish Lon : E 25 : 59.477
Length : 18.93 km

Transect # : 4
Start Lat : S 18 : 34.499 Start Lon : E 25 : 56.980
Finish Lat : S 18 : 34.499 Finish Lon : E 26 : 11.678
Length : 25.83 km

Transect # : 5
Start Lat : S 18 : 35.903 Start Lon : E 26 : 12.000
Finish Lat : S 18 : 35.903 Finish Lon : E 25 : 52.850
Length : 33.65 km

Transect # : 6
Start Lat : S 18 : 37.306 Start Lon : E 25 : 52.140
Finish Lat : S 18 : 37.306 Finish Lon : E 26 : 12.484

Length : 35.75 km

Transect # : 7
Start Lat : S 18 : 38.711 Start Lon : E 26 : 12.254
Finish Lat : S 18 : 38.711 Finish Lon : E 25 : 49.292
Length : 40.35 km

Transect # : 8
Start Lat : S 18 : 40.115 Start Lon : E 25 : 47.701
Finish Lat : S 18 : 40.115 Finish Lon : E 26 : 12.336
Length : 43.29 km

Transect # : 9
Start Lat : S 18 : 41.519 Start Lon : E 26 : 12.611
Finish Lat : S 18 : 41.519 Finish Lon : E 25 : 47.654
Length : 43.85 km

Transect # : 10
Start Lat : S 18 : 42.923 Start Lon : E 25 : 47.609
Finish Lat : S 18 : 42.923 Finish Lon : E 26 : 12.993
Length : 44.60 km

Transect # : 11
Start Lat : S 18 : 44.327 Start Lon : E 26 : 8.162
Finish Lat : S 18 : 44.327 Finish Lon : E 25 : 47.647
Length : 36.05 km

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Transect # : 12
Start Lat : S 18 : 45.731 Start Lon : E 25 : 47.903
Finish Lat : S 18 : 45.731 Finish Lon : E 26 : 6.793
Length : 33.19 km

Transect # : 13
Start Lat : S 18 : 47.135 Start Lon : E 26 : 1.652
Finish Lat : S 18 : 47.135 Finish Lon : E 25 : 48.249
Length : 23.55 km

Sinamatella

Number of transects : 20
Transect Bearing : 0.00 Degrees
Transect Spacing : 2.90 km

Transect # : 1
Start Lat : S 18 : 33.590 Start Lon : E 26 : 10.559
Finish Lat : S 18 : 29.197 Finish Lon : E 26 : 10.559
Length : 8.14 km

Transect # : 2A
Start Lat : S 18 : 27.383 Start Lon : E 26 : 12.208
Finish Lat : S 18 : 37.015 Finish Lon : E 26 : 12.208
Length : 17.84 km

Transect # : 2B
Start Lat : S 18 : 38.750 Start Lon : E 26 : 12.208
Finish Lat : S 18 : 39.661 Finish Lon : E 26 : 12.208
Length : 1.69 km

Transect # : 3
Start Lat : S 18 : 42.369 Start Lon : E 26 : 13.857
Finish Lat : S 18 : 26.359 Finish Lon : E 26 : 13.857
Length : 29.65 km

Transect # : 4
Start Lat : S 18 : 24.988 Start Lon : E 26 : 15.506
Finish Lat : S 18 : 41.796 Finish Lon : E 26 : 15.506
Length : 31.13 km

Transect # : 5A
Start Lat : S 18 : 46.441 Start Lon : E 26 : 17.156
Finish Lat : S 18 : 42.600 Finish Lon : E 26 : 17.156
Length : 7.11 km

Transect # : 5B
Start Lat : S 18 : 42.070 Start Lon : E 26 : 17.156
Finish Lat : S 18 : 23.382 Finish Lon : E 26 : 17.156
Length : 34.61 km

Transect # : 6
Start Lat : S 18 : 25.875 Start Lon : E 26 : 18.805
Finish Lat : S 18 : 47.400 Finish Lon : E 26 : 18.805
Length : 39.86 km

Transect # : 7
Start Lat : S 18 : 48.109 Start Lon : E 26 : 20.454
Finish Lat : S 18 : 27.933 Finish Lon : E 26 : 20.454
Length : 37.36 km

Transect # : 8
Start Lat : S 18 : 28.828 Start Lon : E 26 : 22.104
Finish Lat : S 18 : 48.159 Finish Lon : E 26 : 22.104
Length : 35.80 km

Transect # : 14A
Start Lat : S 18 : 48.539 Start Lon : E 25 : 53.056
Finish Lat : S 18 : 48.539 Finish Lon : E 25 : 54.151
Length : 1.92 km

Transect # : 14B
Start Lat : S 18 : 48.539 Start Lon : E 25 : 54.458
Finish Lat : S 18 : 48.539 Finish Lon : E 25 : 56.051
Length : 2.80 km

Transect # : 9
Start Lat : S 18 : 46.864 Start Lon : E 26 : 23.753
Finish Lat : S 18 : 28.580 Finish Lon : E 26 : 23.753
Length : 33.86 km

Transect # : 10
Start Lat : S 18 : 28.211 Start Lon : E 26 : 25.402
Finish Lat : S 18 : 45.949 Finish Lon : E 26 : 25.402
Length : 32.85 km

Transect # : 11
Start Lat : S 18 : 45.731 Start Lon : E 26 : 27.051
Finish Lat : S 18 : 27.579 Finish Lon : E 26 : 27.051
Length : 33.61 km

Transect # : 12
Start Lat : S 18 : 27.000 Start Lon : E 26 : 28.701
Finish Lat : S 18 : 44.373 Finish Lon : E 26 : 28.701
Length : 32.17 km

Transect # : 13
Start Lat : S 18 : 43.366 Start Lon : E 26 : 30.350
Finish Lat : S 18 : 27.075 Finish Lon : E 26 : 30.350
Length : 30.17 km

Transect # : 14
Start Lat : S 18 : 28.178 Start Lon : E 26 : 31.999
Finish Lat : S 18 : 43.200 Finish Lon : E 26 : 31.999
Length : 27.82 km

Transect # : 15
Start Lat : S 18 : 42.900 Start Lon : E 26 : 33.648
Finish Lat : S 18 : 27.770 Finish Lon : E 26 : 33.648
Length : 28.02 km

Transect # : 16
Start Lat : S 18 : 28.578 Start Lon : E 26 : 35.298
Finish Lat : S 18 : 41.655 Finish Lon : E 26 : 35.298
Length : 24.22 km

Transect # : 17
Start Lat : S 18 : 39.475 Start Lon : E 26 : 36.947
Finish Lat : S 18 : 29.627 Finish Lon : E 26 : 36.947
Length : 18.24 km

Transect # : 18
Start Lat : S 18 : 30.700 Start Lon : E 26 : 38.596
Finish Lat : S 18 : 36.548 Finish Lon : E 26 : 38.596
Length : 10.83 km

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Transect # : 19
Start Lat : S 18 : 34.298 Start Lon : E 26 : 40.246
Finish Lat : S 18 : 30.035 Finish Lon : E 26 : 40.246
Length : 7.89 km

Transect # : 20
Start Lat : S 18 : 30.312 Start Lon : E 26 : 41.895
Finish Lat : S 18 : 31.042 Finish Lon : E 26 : 41.895
Length : 1.35 km

Mtoa

Number of transects : 18
Transect Bearing : 0.00 Degrees
Transect Spacing : 3.00 km

Transect # : 1
Start Lat : S 18 : 50.400 Start Lon : E 26 : 22.169
Finish Lat : S 18 : 48.132 Finish Lon : E 26 : 22.169
Length : 4.20 km

Transect # : 10
Start Lat : S 18 : 38.838 Start Lon : E 26 : 37.534
Finish Lat : S 18 : 51.300 Finish Lon : E 26 : 37.534
Length : 23.08 km

Transect # : 2
Start Lat : S 18 : 46.683 Start Lon : E 26 : 23.876
Finish Lat : S 18 : 50.937 Finish Lon : E 26 : 23.876
Length : 7.88 km

Transect # : 11
Start Lat : S 18 : 48.296 Start Lon : E 26 : 39.241
Finish Lat : S 18 : 36.009 Finish Lon : E 26 : 39.241
Length : 22.75 km

Transect # : 3
Start Lat : S 18 : 51.624 Start Lon : E 26 : 25.583
Finish Lat : S 18 : 45.935 Finish Lon : E 26 : 25.583
Length : 10.53 km

Transect # : 12
Start Lat : S 18 : 32.422 Start Lon : E 26 : 40.949
Finish Lat : S 18 : 45.778 Finish Lon : E 26 : 40.949
Length : 24.73 km

Transect # : 4
Start Lat : S 18 : 45.483 Start Lon : E 26 : 27.290
Finish Lat : S 18 : 51.985 Finish Lon : E 26 : 27.290
Length : 12.04 km

Transect # : 13
Start Lat : S 18 : 44.336 Start Lon : E 26 : 42.656
Finish Lat : S 18 : 31.226 Finish Lon : E 26 : 42.656
Length : 24.28 km

Transect # : 5
Start Lat : S 18 : 52.244 Start Lon : E 26 : 28.998
Finish Lat : S 18 : 44.136 Finish Lon : E 26 : 28.998
Length : 15.01 km

Transect # : 14
Start Lat : S 18 : 31.871 Start Lon : E 26 : 44.363
Finish Lat : S 18 : 43.611 Finish Lon : E 26 : 44.363
Length : 21.74 km

Transect # : 6
Start Lat : S 18 : 43.425 Start Lon : E 26 : 30.705
Finish Lat : S 18 : 52.132 Finish Lon : E 26 : 30.705
Length : 16.12 km

Transect # : 15
Start Lat : S 18 : 42.155 Start Lon : E 26 : 46.070
Finish Lat : S 18 : 32.429 Finish Lon : E 26 : 46.070
Length : 18.01 km

Transect # : 7
Start Lat : S 18 : 51.420 Start Lon : E 26 : 32.412
Finish Lat : S 18 : 43.192 Finish Lon : E 26 : 32.412
Length : 15.24 km

Transect # : 16
Start Lat : S 18 : 33.251 Start Lon : E 26 : 47.778
Finish Lat : S 18 : 40.803 Finish Lon : E 26 : 47.778
Length : 13.98 km

Transect # : 8
Start Lat : S 18 : 42.606 Start Lon : E 26 : 34.120
Finish Lat : S 18 : 51.551 Finish Lon : E 26 : 34.120
Length : 16.56 km

Transect # : 17
Start Lat : S 18 : 40.445 Start Lon : E 26 : 49.485
Finish Lat : S 18 : 35.655 Finish Lon : E 26 : 49.485
Length : 8.87 km

Transect # : 9
Start Lat : S 18 : 51.367 Start Lon : E 26 : 35.827
Finish Lat : S 18 : 41.297 Finish Lon : E 26 : 35.827
Length : 18.65 km

Transect # : 18
Start Lat : S 18 : 37.182 Start Lon : E 26 : 51.192
Finish Lat : S 18 : 37.277 Finish Lon : E 26 : 51.192
Length : 0.18 km

Shapi

Number of transects : 21
Transect Bearing : 0.00 Degrees
Transect Spacing : 2.80 km

Transect # : 1A
Start Lat : S 18 : 59.924 Start Lon : E 26 : 18.728

Finish Lat : S 19 : 0.332 Finish Lon : E 26 : 18.728
Length : 0.76 km

Transect # : 1B
Start Lat : S 19 : 0.801 Start Lon : E 26 : 18.728
Finish Lat : S 19 : 1.492 Finish Lon : E 26 : 18.728
Length : 1.28 km

Transect # : 2
Start Lat : S 19 : 6.400 Start Lon : E 26 : 20.324
Finish Lat : S 18 : 58.839 Finish Lon : E 26 : 20.324
Length : 14.00 km

Transect # : 3
Start Lat : S 18 : 58.098 Start Lon : E 26 : 21.920
Finish Lat : S 19 : 8.144 Finish Lon : E 26 : 21.920
Length : 18.61 km

Transect # : 4
Start Lat : S 19 : 6.879 Start Lon : E 26 : 23.516
Finish Lat : S 18 : 55.778 Finish Lon : E 26 : 23.516
Length : 20.56 km

Transect # : 5
Start Lat : S 18 : 54.830 Start Lon : E 26 : 25.112
Finish Lat : S 19 : 6.545 Finish Lon : E 26 : 25.112
Length : 21.69 km

Transect # : 6
Start Lat : S 19 : 5.263 Start Lon : E 26 : 26.708
Finish Lat : S 18 : 53.891 Finish Lon : E 26 : 26.708
Length : 21.06 km

Transect # : 7
Start Lat : S 18 : 53.279 Start Lon : E 26 : 28.304
Finish Lat : S 19 : 3.866 Finish Lon : E 26 : 28.304
Length : 19.61 km

Transect # : 8
Start Lat : S 19 : 3.428 Start Lon : E 26 : 29.900
Finish Lat : S 18 : 52.271 Finish Lon : E 26 : 29.900
Length : 20.66 km

Transect # : 9
Start Lat : S 18 : 51.995 Start Lon : E 26 : 31.496
Finish Lat : S 19 : 2.858 Finish Lon : E 26 : 31.496
Length : 20.12 km

Transect # : 10
Start Lat : S 19 : 2.426 Start Lon : E 26 : 33.092
Finish Lat : S 18 : 51.522 Finish Lon : E 26 : 33.092
Length : 20.19 km

Transect # : 11
Start Lat : S 18 : 51.517 Start Lon : E 26 : 34.688
Finish Lat : S 19 : 1.294 Finish Lon : E 26 : 34.688
Length : 18.10 km

Ngamo Forest

Number of transects : 5
Transect Bearing : 41.00 Degrees
Transect Spacing : 9.00 km

Transect # : 1
Start Lat : S 18 : 59.253 Start Lon : E 27 : 19.314
Finish Lat : S 18 : 47.203 Finish Lon : E 27 : 30.370
Length : 29.57 km

Transect # : 12
Start Lat : S 19 : 0.134 Start Lon : E 26 : 36.283
Finish Lat : S 18 : 51.181 Finish Lon : E 26 : 36.283
Length : 16.58 km

Transect # : 13
Start Lat : S 18 : 51.300 Start Lon : E 26 : 37.879
Finish Lat : S 18 : 58.908 Finish Lon : E 26 : 37.879
Length : 14.09 km

Transect # : 14
Start Lat : S 18 : 58.451 Start Lon : E 26 : 39.475
Finish Lat : S 18 : 51.129 Finish Lon : E 26 : 39.475
Length : 13.56 km

Transect # : 15
Start Lat : S 18 : 50.425 Start Lon : E 26 : 41.071
Finish Lat : S 18 : 58.275 Finish Lon : E 26 : 41.071
Length : 14.54 km

Transect # : 16
Start Lat : S 18 : 58.414 Start Lon : E 26 : 42.667
Finish Lat : S 18 : 50.243 Finish Lon : E 26 : 42.667
Length : 15.13 km

Transect # : 17
Start Lat : S 18 : 49.540 Start Lon : E 26 : 44.263
Finish Lat : S 18 : 58.189 Finish Lon : E 26 : 44.263
Length : 16.02 km

Transect # : 18
Start Lat : S 18 : 57.900 Start Lon : E 26 : 45.859
Finish Lat : S 18 : 49.741 Finish Lon : E 26 : 45.859
Length : 15.11 km

Transect # : 19
Start Lat : S 18 : 49.650 Start Lon : E 26 : 47.455
Finish Lat : S 18 : 57.834 Finish Lon : E 26 : 47.455
Length : 15.16 km

Transect # : 20
Start Lat : S 18 : 57.786 Start Lon : E 26 : 49.051
Finish Lat : S 18 : 53.573 Finish Lon : E 26 : 49.051
Length : 7.80 km

Transect # : 21
Start Lat : S 18 : 56.133 Start Lon : E 26 : 50.647
Finish Lat : S 18 : 57.892 Finish Lon : E 26 : 50.647
Length : 3.26 km

Transect # : 2
Start Lat : S 18 : 48.753 Start Lon : E 27 : 35.744
Finish Lat : S 19 : 2.330 Finish Lon : E 27 : 23.287
Length : 33.31 km

Transect # : 3
Start Lat : S 19 : 5.407 Start Lon : E 27 : 27.261
Finish Lat : S 18 : 52.451 Finish Lon : E 27 : 39.148
Length : 31.79 km

Transect # : 5
Start Lat : S 19 : 5.850 Start Lon : E 27 : 40.448
Finish Lat : S 19 : 4.288 Finish Lon : E 27 : 41.881
Length : 3.83 km

Transect # : 4
Start Lat : S 18 : 55.323 Start Lon : E 27 : 43.310
Finish Lat : S 19 : 5.850 Finish Lon : E 27 : 33.651
Length : 25.83 km

Shakwanki

Number of transects : 11
Transect Bearing : 90.00 Degrees
Transect Spacing : 6.30 km

Transect # : 1A
Start Lat : S 18 : 59.764 Start Lon : E 26 : 18.857
Finish Lat : S 18 : 59.764 Finish Lon : E 26 : 7.284
Length : 20.27 km

Transect # : 6
Start Lat : S 19 : 16.775 Start Lon : E 26 : 4.524
Finish Lat : S 19 : 16.775 Finish Lon : E 26 : 25.486
Length : 36.72 km

Transect # : 1B
Start Lat : S 18 : 59.764 Start Lon : E 26 : 4.288
Finish Lat : S 18 : 59.764 Finish Lon : E 26 : 3.100
Length : 2.08 km

Transect # : 7
Start Lat : S 19 : 20.177 Start Lon : E 26 : 27.334
Finish Lat : S 19 : 20.177 Finish Lon : E 26 : 5.711
Length : 37.88 km

Transect # : 2
Start Lat : S 19 : 3.166 Start Lon : E 25 : 58.787
Finish Lat : S 19 : 3.166 Finish Lon : E 26 : 19.560
Length : 36.39 km

Transect # : 8
Start Lat : S 19 : 23.578 Start Lon : E 26 : 7.157
Finish Lat : S 19 : 23.578 Finish Lon : E 26 : 28.633
Length : 37.62 km

Transect # : 3
Start Lat : S 19 : 6.569 Start Lon : E 26 : 20.375
Finish Lat : S 19 : 6.569 Finish Lon : E 25 : 58.088
Length : 39.04 km

Transect # : 9
Start Lat : S 19 : 26.981 Start Lon : E 26 : 24.205
Finish Lat : S 19 : 26.981 Finish Lon : E 26 : 8.555
Length : 27.41 km

Transect # : 4
Start Lat : S 19 : 9.971 Start Lon : E 26 : 0.663
Finish Lat : S 19 : 9.971 Finish Lon : E 26 : 21.992
Length : 37.36 km

Transect # : 10
Start Lat : S 19 : 30.383 Start Lon : E 26 : 9.530
Finish Lat : S 19 : 30.383 Finish Lon : E 26 : 24.338
Length : 25.94 km

Transect # : 5
Start Lat : S 19 : 13.373 Start Lon : E 26 : 24.072
Finish Lat : S 19 : 13.373 Finish Lon : E 26 : 2.722
Length : 37.40 km

Transect # : 11
Start Lat : S 19 : 33.785 Start Lon : E 26 : 14.487
Finish Lat : S 19 : 33.785 Finish Lon : E 26 : 13.084
Length : 2.46 km

Dzivanini

Number of transects : 14
Transect Bearing : 90.00 Degrees
Transect Spacing : 4.30 km

Transect # : 1
Start Lat : S 19 : 20.914 Start Lon : E 26 : 55.371
Finish Lat : S 19 : 20.914 Finish Lon : E 26 : 50.622
Length : 8.31 km

Transect # : 3
Start Lat : S 19 : 25.558 Start Lon : E 26 : 52.366
Finish Lat : S 19 : 25.558 Finish Lon : E 26 : 26.479
Length : 45.27 km

Transect # : 2
Start Lat : S 19 : 23.236 Start Lon : E 26 : 42.105
Finish Lat : S 19 : 23.236 Finish Lon : E 26 : 53.515
Length : 19.96 km

Transect # : 4
Start Lat : S 19 : 27.880 Start Lon : E 26 : 24.459
Finish Lat : S 19 : 27.880 Finish Lon : E 26 : 51.503
Length : 47.29 km

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Transect # : 5

Start Lat : S 19 : 30.202 Start Lon : E 26 : 50.630
Finish Lat : S 19 : 30.202 Finish Lon : E 26 : 24.389
Length : 45.89 km

Transect # : 6

Start Lat : S 19 : 32.524 Start Lon : E 26 : 19.947
Finish Lat : S 19 : 32.524 Finish Lon : E 26 : 49.758
Length : 52.13 km

Transect # : 7A

Start Lat : S 19 : 34.846 Start Lon : E 26 : 48.886
Finish Lat : S 19 : 34.846 Finish Lon : E 26 : 18.948
Length : 52.36 km

Transect # : 7B

Start Lat : S 19 : 34.846 Start Lon : E 26 : 15.848
Finish Lat : S 19 : 34.846 Finish Lon : E 26 : 14.530
Length : 2.30 km

Transect # : 8

Start Lat : S 19 : 37.168 Start Lon : E 26 : 20.722
Finish Lat : S 19 : 37.168 Finish Lon : E 26 : 48.013
Length : 47.73 km

Transect # : 9

Start Lat : S 19 : 39.490 Start Lon : E 26 : 47.141
Finish Lat : S 19 : 39.490 Finish Lon : E 26 : 19.667
Length : 48.05 km

Transect # : 10

Start Lat : S 19 : 41.812 Start Lon : E 26 : 24.420
Finish Lat : S 19 : 41.812 Finish Lon : E 26 : 46.269
Length : 38.21 km

Transect # : 11

Start Lat : S 19 : 44.134 Start Lon : E 26 : 45.396
Finish Lat : S 19 : 44.134 Finish Lon : E 26 : 25.395
Length : 34.98 km

Transect # : 12

Start Lat : S 19 : 46.456 Start Lon : E 26 : 32.234
Finish Lat : S 19 : 46.456 Finish Lon : E 26 : 44.524
Length : 21.49 km

Transect # : 13

Start Lat : S 19 : 48.778 Start Lon : E 26 : 43.652
Finish Lat : S 19 : 48.778 Finish Lon : E 26 : 35.077
Length : 15.00 km

Transect # : 14

Start Lat : S 19 : 51.101 Start Lon : E 26 : 36.060
Finish Lat : S 19 : 51.101 Finish Lon : E 26 : 42.779
Length : 11.75 km

Tsholotsho East

Number of transects : 9

Transect Bearing : 90.00 Degrees

Transect Spacing : 6.90 km

Transect # : 1

Start Lat : S 19 : 22.405 Start Lon : E 26 : 54.133
Finish Lat : S 19 : 22.405 Finish Lon : E 26 : 54.707
Length : 1.00 km

Transect # : 2

Start Lat : S 19 : 26.132 Start Lon : E 27 : 0.259
Finish Lat : S 19 : 26.132 Finish Lon : E 26 : 52.119
Length : 14.22 km

Transect # : 3

Start Lat : S 19 : 29.858 Start Lon : E 26 : 50.760
Finish Lat : S 19 : 29.858 Finish Lon : E 27 : 0.231
Length : 16.55 km

Transect # : 4

Start Lat : S 19 : 33.583 Start Lon : E 26 : 57.335
Finish Lat : S 19 : 33.583 Finish Lon : E 26 : 49.360
Length : 13.94 km

Transect # : 5

Start Lat : S 19 : 37.309 Start Lon : E 26 : 47.960
Finish Lat : S 19 : 37.309 Finish Lon : E 26 : 57.579
Length : 16.81 km

Transect # : 6

Start Lat : S 19 : 41.036 Start Lon : E 26 : 57.859
Finish Lat : S 19 : 41.036 Finish Lon : E 26 : 46.561
Length : 19.74 km

Transect # : 7

Start Lat : S 19 : 44.762 Start Lon : E 26 : 45.161
Finish Lat : S 19 : 44.762 Finish Lon : E 26 : 58.305
Length : 22.97 km

Transect # : 8

Start Lat : S 19 : 48.487 Start Lon : E 26 : 59.871
Finish Lat : S 19 : 48.487 Finish Lon : E 26 : 43.761
Length : 28.15 km

Transect # : 9

Start Lat : S 19 : 52.214 Start Lon : E 26 : 42.361
Finish Lat : S 19 : 52.214 Finish Lon : E 26 : 43.479
Length : 1.95 km

Maitengwe

Number of transects : 6
Transect Bearing : 0.00 Degrees
Transect Spacing : 9.50 km

Transect # : 1
Start Lat : S 19 : 42.975 Start Lon : E 27 : 9.303
Finish Lat : S 20 : 2.700 Finish Lon : E 27 : 9.303
Length : 36.53 km

Transect # : 2
Start Lat : S 20 : 1.256 Start Lon : E 27 : 3.859
Finish Lat : S 19 : 42.248 Finish Lon : E 27 : 3.859
Length : 35.20 km

Transect # : 3A
Start Lat : S 19 : 40.372 Start Lon : E 26 : 58.414
Finish Lat : S 19 : 45.254 Finish Lon : E 26 : 58.414
Length : 9.04 km

Transect # : 3B
Start Lat : S 19 : 48.704 Start Lon : E 26 : 58.414
Finish Lat : S 20 : 0.640 Finish Lon : E 26 : 58.414
Length : 22.11 km

Transect # : 4
Start Lat : S 19 : 58.409 Start Lon : E 26 : 52.969
Finish Lat : S 19 : 49.106 Finish Lon : E 26 : 52.969
Length : 17.23 km

Transect # : 5
Start Lat : S 19 : 50.938 Start Lon : E 26 : 47.525
Finish Lat : S 19 : 56.720 Finish Lon : E 26 : 47.525
Length : 10.71 km

Transect # : 6
Start Lat : S 19 : 53.844 Start Lon : E 26 : 42.080
Finish Lat : S 19 : 53.123 Finish Lon : E 26 : 42.080
Length : 1.33 km

Tsholotsho Far North

Number of transects : 8
Transect Bearing : 0.00 Degrees
Transect Spacing : 10.00 km

Transect # : 1
Start Lat : S 19 : 23.034 Start Lon : E 26 : 55.677
Finish Lat : S 19 : 20.250 Finish Lon : E 26 : 55.677
Length : 5.15 km

Transect # : 2
Start Lat : S 19 : 19.725 Start Lon : E 27 : 1.384
Finish Lat : S 19 : 22.488 Finish Lon : E 27 : 1.384
Length : 5.10 km

Transect # : 3
Start Lat : S 19 : 24.218 Start Lon : E 27 : 7.091
Finish Lat : S 19 : 18.902 Finish Lon : E 27 : 7.091
Length : 9.80 km

Transect # : 4
Start Lat : S 19 : 19.143 Start Lon : E 27 : 12.798
Finish Lat : S 19 : 23.111 Finish Lon : E 27 : 12.798
Length : 7.32 km

Transect # : 5
Start Lat : S 19 : 18.432 Start Lon : E 27 : 18.504
Finish Lat : S 19 : 14.132 Finish Lon : E 27 : 18.504
Length : 7.93 km

Transect # : 6
Start Lat : S 19 : 13.378 Start Lon : E 27 : 24.211
Finish Lat : S 19 : 15.658 Finish Lon : E 27 : 24.211
Length : 4.21 km

Transect # : 7
Start Lat : S 19 : 11.351 Start Lon : E 27 : 29.918
Finish Lat : S 19 : 7.493 Finish Lon : E 27 : 29.918
Length : 7.11 km

Transect # : 8
Start Lat : S 19 : 11.992 Start Lon : E 27 : 35.625
Finish Lat : S 19 : 12.907 Finish Lon : E 27 : 35.625
Length : 0.03 km

Dandari

Number of transects : 25
Transect Bearing : 0.00 Degrees
Transect Spacing : 2.90 km

Transect # : 1
Start Lat : S 18 : 52.403 Start Lon : E 26 : 29.384
Finish Lat : S 18 : 52.335 Finish Lon : E 26 : 29.384
Length : 0.13 km

Transect # : 2
Start Lat : S 18 : 52.036 Start Lon : E 26 : 27.733

Finish Lat : S 18 : 53.580 Finish Lon : E 26 : 27.733
Length : 2.86 km

Transect # : 3
Start Lat : S 18 : 54.114 Start Lon : E 26 : 26.082
Finish Lat : S 18 : 51.765 Finish Lon : E 26 : 26.082
Length : 4.35 km

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Transect # : 4
Start Lat : S 18 : 51.164 Start Lon : E 26 : 24.431
Finish Lat : S 18 : 55.103 Finish Lon : E 26 : 24.431
Length : 7.29 km

Transect # : 5
Start Lat : S 18 : 55.973 Start Lon : E 26 : 22.780
Finish Lat : S 18 : 50.546 Finish Lon : E 26 : 22.780
Length : 10.05 km

Transect # : 6
Start Lat : S 18 : 48.647 Start Lon : E 26 : 21.129
Finish Lat : S 18 : 58.292 Finish Lon : E 26 : 21.129
Length : 17.86 km

Transect # : 7
Start Lat : S 18 : 59.161 Start Lon : E 26 : 19.478
Finish Lat : S 18 : 47.709 Finish Lon : E 26 : 19.478
Length : 21.21 km

Transect # : 8
Start Lat : S 18 : 46.852 Start Lon : E 26 : 17.827
Finish Lat : S 18 : 59.308 Finish Lon : E 26 : 17.827
Length : 23.07 km

Transect # : 9
Start Lat : S 18 : 58.765 Start Lon : E 26 : 16.176
Finish Lat : S 18 : 41.884 Finish Lon : E 26 : 16.176
Length : 31.26 km

Transect # : 10
Start Lat : S 18 : 41.762 Start Lon : E 26 : 14.525
Finish Lat : S 18 : 58.790 Finish Lon : E 26 : 14.525
Length : 31.53 km

Transect # : 11
Start Lat : S 18 : 59.011 Start Lon : E 26 : 12.874
Finish Lat : S 18 : 42.980 Finish Lon : E 26 : 12.874
Length : 29.69 km

Transect # : 12
Start Lat : S 18 : 43.543 Start Lon : E 26 : 11.223
Finish Lat : S 18 : 59.311 Finish Lon : E 26 : 11.223
Length : 29.20 km

Transect # : 13
Start Lat : S 18 : 59.451 Start Lon : E 26 : 9.572
Finish Lat : S 18 : 43.875 Finish Lon : E 26 : 9.572
Length : 28.84 km

Transect # : 14
Start Lat : S 18 : 44.634 Start Lon : E 26 : 7.921
Finish Lat : S 18 : 59.657 Finish Lon : E 26 : 7.921
Length : 27.82 km

Main Camp

Number of transects : 23
Transect Bearing : 41.00 Degrees
Transect Spacing : 2.20 km

Transect # : 1A
Start Lat : S 18 : 48.649 Start Lon : E 26 : 38.986
Finish Lat : S 18 : 47.265 Finish Lon : E 26 : 40.256
Length : 3.40 km

Transect # : 15
Start Lat : S 19 : 0.164 Start Lon : E 26 : 6.270
Finish Lat : S 18 : 45.980 Finish Lon : E 26 : 6.270
Length : 26.27 km

Transect # : 16
Start Lat : S 18 : 46.770 Start Lon : E 26 : 4.619
Finish Lat : S 18 : 59.980 Finish Lon : E 26 : 4.619
Length : 24.46 km

Transect # : 17
Start Lat : S 18 : 59.866 Start Lon : E 26 : 2.968
Finish Lat : S 18 : 46.768 Finish Lon : E 26 : 2.968
Length : 24.26 km

Transect # : 18
Start Lat : S 18 : 47.188 Start Lon : E 26 : 1.317
Finish Lat : S 19 : 0.697 Finish Lon : E 26 : 1.317
Length : 25.02 km

Transect # : 19
Start Lat : S 19 : 1.249 Start Lon : E 25 : 59.666
Finish Lat : S 18 : 47.453 Finish Lon : E 25 : 59.666
Length : 25.55 km

Transect # : 20
Start Lat : S 18 : 48.182 Start Lon : E 25 : 58.015
Finish Lat : S 18 : 56.481 Finish Lon : E 25 : 58.015
Length : 15.37 km

Transect # : 21
Start Lat : S 18 : 54.106 Start Lon : E 25 : 56.365
Finish Lat : S 18 : 48.468 Finish Lon : E 25 : 56.365
Length : 10.44 km

Transect # : 22
Start Lat : S 18 : 48.550 Start Lon : E 25 : 54.714
Finish Lat : S 18 : 53.517 Finish Lon : E 25 : 54.714
Length : 9.20 km

Transect # : 23
Start Lat : S 18 : 52.225 Start Lon : E 25 : 53.063
Finish Lat : S 18 : 48.900 Finish Lon : E 25 : 53.063
Length : 6.16 km

Transect # : 24
Start Lat : S 18 : 47.400 Start Lon : E 25 : 51.412
Finish Lat : S 18 : 51.206 Finish Lon : E 25 : 51.412
Length : 7.05 km

Transect # : 25
Start Lat : S 18 : 50.373 Start Lon : E 25 : 49.761
Finish Lat : S 18 : 47.400 Finish Lon : E 25 : 49.761
Length : 5.50 km

Transect # : 1B
Start Lat : S 18 : 46.998 Start Lon : E 26 : 40.500
Finish Lat : S 18 : 44.303 Finish Lon : E 26 : 42.971
Length : 6.61 km

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Transect # : 2A
Start Lat : S 18 : 40.813 Start Lon : E 26 : 47.832
Finish Lat : S 18 : 42.911 Finish Lon : E 26 : 45.908
Length : 5.15 km

Transect # : 2B
Start Lat : S 18 : 43.438 Start Lon : E 26 : 45.425
Finish Lat : S 18 : 50.922 Finish Lon : E 26 : 38.563
Length : 18.36 km

Transect # : 3
Start Lat : S 18 : 50.669 Start Lon : E 26 : 40.455
Finish Lat : S 18 : 37.815 Finish Lon : E 26 : 52.241
Length : 31.54 km

Transect # : 4
Start Lat : S 18 : 38.578 Start Lon : E 26 : 53.202
Finish Lat : S 18 : 50.199 Finish Lon : E 26 : 42.547
Length : 28.51 km

Transect # : 5
Start Lat : S 18 : 49.611 Start Lon : E 26 : 44.746
Finish Lat : S 18 : 39.341 Finish Lon : E 26 : 54.163
Length : 25.20 km

Transect # : 6
Start Lat : S 18 : 40.104 Start Lon : E 26 : 55.124
Finish Lat : S 18 : 49.671 Finish Lon : E 26 : 46.351
Length : 23.48 km

Transect # : 7
Start Lat : S 18 : 49.669 Start Lon : E 26 : 48.014
Finish Lat : S 18 : 40.867 Finish Lon : E 26 : 56.084
Length : 21.60 km

Transect # : 8
Start Lat : S 18 : 41.630 Start Lon : E 26 : 57.045
Finish Lat : S 18 : 51.441 Finish Lon : E 26 : 48.049
Length : 24.07 km

Transect # : 9
Start Lat : S 18 : 52.473 Start Lon : E 26 : 48.763
Finish Lat : S 18 : 42.393 Finish Lon : E 26 : 58.006
Length : 24.73 km

Transect # : 10
Start Lat : S 18 : 43.156 Start Lon : E 26 : 58.967
Finish Lat : S 18 : 53.779 Finish Lon : E 26 : 49.226
Length : 26.07 km

Transect # : 11
Start Lat : S 18 : 54.986 Start Lon : E 26 : 49.780
Finish Lat : S 18 : 43.919 Finish Lon : E 26 : 59.928
Length : 27.16 km

Transect # : 12
Start Lat : S 18 : 44.682 Start Lon : E 27 : 0.888
Finish Lat : S 18 : 55.938 Finish Lon : E 26 : 50.568
Length : 27.62 km

Transect # : 13
Start Lat : S 18 : 57.178 Start Lon : E 26 : 51.091
Finish Lat : S 18 : 45.445 Finish Lon : E 27 : 1.849
Length : 28.79 km

Transect # : 14
Start Lat : S 18 : 46.208 Start Lon : E 27 : 2.810
Finish Lat : S 18 : 58.296 Finish Lon : E 26 : 51.726
Length : 29.66 km

Transect # : 15
Start Lat : S 18 : 59.082 Start Lon : E 26 : 52.666
Finish Lat : S 18 : 46.971 Finish Lon : E 27 : 3.771
Length : 29.72 km

Transect # : 16
Start Lat : S 18 : 47.734 Start Lon : E 27 : 4.731
Finish Lat : S 18 : 59.399 Finish Lon : E 26 : 54.035
Length : 28.62 km

Transect # : 17
Start Lat : S 19 : 0.322 Start Lon : E 26 : 54.850
Finish Lat : S 18 : 48.497 Finish Lon : E 27 : 5.692
Length : 29.02 km

Transect # : 18
Start Lat : S 18 : 49.260 Start Lon : E 27 : 6.653
Finish Lat : S 19 : 1.423 Finish Lon : E 26 : 55.500
Length : 29.85 km

Transect # : 19
Start Lat : S 19 : 2.458 Start Lon : E 26 : 56.212
Finish Lat : S 18 : 50.023 Finish Lon : E 27 : 7.614
Length : 30.51 km

Transect # : 20
Start Lat : S 18 : 50.786 Start Lon : E 27 : 8.574
Finish Lat : S 19 : 3.103 Finish Lon : E 26 : 57.281
Length : 30.22 km

Transect # : 21
Start Lat : S 19 : 4.043 Start Lon : E 26 : 58.079
Finish Lat : S 18 : 53.767 Finish Lon : E 27 : 7.502
Length : 25.21 km

Transect # : 22
Start Lat : S 18 : 57.485 Start Lon : E 27 : 5.753
Finish Lat : S 19 : 4.860 Finish Lon : E 26 : 58.990
Length : 18.10 km

Transect # : 23
Start Lat : S 19 : 4.200 Start Lon : E 27 : 1.256
Finish Lat : S 19 : 2.097 Finish Lon : E 27 : 3.184
Length : 5.16 km

Central B

Number of transects : 4
Transect Bearing : -26.00 Degrees
Transect Spacing : 9.50 km

Transect # : 1
Start Lat : S 19 : 6.750 Start Lon : E 26 : 24.681
Finish Lat : S 19 : 24.443 Finish Lon : E 26 : 33.802
Length : 36.45 km

Transect # : 3
Start Lat : S 19 : 1.767 Start Lon : E 26 : 34.177
Finish Lat : S 19 : 22.945 Finish Lon : E 26 : 45.094
Length : 43.63 km

Transect # : 2
Start Lat : S 19 : 23.719 Start Lon : E 26 : 39.461
Finish Lat : S 19 : 3.576 Finish Lon : E 26 : 29.077
Length : 41.50 km

Transect # : 4
Start Lat : S 19 : 21.253 Start Lon : E 26 : 50.254
Finish Lat : S 18 : 58.650 Finish Lon : E 26 : 38.603
Length : 46.57 km

Central A

Number of transects : 12
Transect Bearing : 66.00 Degrees
Transect Spacing : 3.90 km

Transect # : 1
Start Lat : S 18 : 57.900 Start Lon : E 26 : 45.472
Finish Lat : S 18 : 59.096 Finish Lon : E 26 : 42.631
Length : 5.45 km

Transect # : 8
Start Lat : S 19 : 12.431 Start Lon : E 26 : 49.285
Finish Lat : S 19 : 7.801 Finish Lon : E 27 : 0.278
Length : 21.08 km

Transect # : 2
Start Lat : S 19 : 1.001 Start Lon : E 26 : 43.582
Finish Lat : S 18 : 57.725 Finish Lon : E 26 : 51.360
Length : 14.92 km

Transect # : 9
Start Lat : S 19 : 10.051 Start Lon : E 27 : 0.411
Finish Lat : S 19 : 14.336 Finish Lon : E 26 : 50.235
Length : 19.51 km

Transect # : 3
Start Lat : S 18 : 59.290 Start Lon : E 26 : 53.119
Finish Lat : S 19 : 2.906 Finish Lon : E 26 : 44.532
Length : 16.46 km

Transect # : 10
Start Lat : S 19 : 16.241 Start Lon : E 26 : 51.186
Finish Lat : S 19 : 12.155 Finish Lon : E 27 : 0.889
Length : 18.61 km

Transect # : 4
Start Lat : S 19 : 4.811 Start Lon : E 26 : 45.483
Finish Lat : S 19 : 0.737 Finish Lon : E 26 : 55.157
Length : 18.55 km

Transect # : 11
Start Lat : S 19 : 14.726 Start Lon : E 27 : 0.258
Finish Lat : S 19 : 18.146 Finish Lon : E 26 : 52.136
Length : 15.57 km

Transect # : 5
Start Lat : S 19 : 2.554 Start Lon : E 26 : 56.316
Finish Lat : S 19 : 6.716 Finish Lon : E 26 : 46.433
Length : 18.95 km

Transect # : 12A
Start Lat : S 19 : 20.051 Start Lon : E 26 : 53.087
Finish Lat : S 19 : 18.218 Finish Lon : E 26 : 57.440
Length : 8.35 km

Transect # : 6
Start Lat : S 19 : 8.621 Start Lon : E 26 : 47.384
Finish Lat : S 19 : 4.103 Finish Lon : E 26 : 58.113
Length : 20.57 km

Transect # : 12B
Start Lat : S 19 : 17.692 Start Lon : E 26 : 58.690
Finish Lat : S 19 : 17.397 Finish Lon : E 26 : 59.389
Length : 1.34 km

Transect # : 7
Start Lat : S 19 : 5.792 Start Lon : E 26 : 59.576
Finish Lat : S 19 : 10.526 Finish Lon : E 26 : 48.334
Length : 21.56 km

Ngamo

Number of transects : 22

Transect Bearing : -52.00 Degrees

Transect Spacing : 2.50 km

Transect # : 1

Start Lat : S 18 : 52.166 Start Lon : E 27 : 8.550
Finish Lat : S 19 : 6.253 Finish Lon : E 27 : 27.595
Length : 42.37 km

Transect # : 2

Start Lat : S 19 : 7.468 Start Lon : E 27 : 26.921
Finish Lat : S 18 : 53.188 Finish Lon : E 27 : 7.616
Length : 42.95 km

Transect # : 3

Start Lat : S 18 : 54.830 Start Lon : E 27 : 7.519
Finish Lat : S 19 : 8.958 Finish Lon : E 27 : 26.620
Length : 42.50 km

Transect # : 4

Start Lat : S 19 : 11.282 Start Lon : E 27 : 27.445
Finish Lat : S 18 : 55.959 Finish Lon : E 27 : 6.730
Length : 46.09 km

Transect # : 5

Start Lat : S 18 : 57.037 Start Lon : E 27 : 5.871
Finish Lat : S 19 : 12.546 Finish Lon : E 27 : 26.838
Length : 46.65 km

Transect # : 6

Start Lat : S 19 : 13.032 Start Lon : E 27 : 25.178
Finish Lat : S 18 : 58.249 Finish Lon : E 27 : 5.194
Length : 44.46 km

Transect # : 7

Start Lat : S 18 : 59.271 Start Lon : E 27 : 4.259
Finish Lat : S 19 : 13.612 Finish Lon : E 27 : 23.647
Length : 43.14 km

Transect # : 8

Start Lat : S 19 : 13.357 Start Lon : E 27 : 20.986
Finish Lat : S 19 : 0.300 Finish Lon : E 27 : 3.334
Length : 39.27 km

Transect # : 9

Start Lat : S 19 : 1.381 Start Lon : E 27 : 2.479
Finish Lat : S 19 : 13.791 Finish Lon : E 27 : 19.257
Length : 37.33 km

Transect # : 10

Start Lat : S 19 : 14.446 Start Lon : E 27 : 17.826
Finish Lat : S 19 : 3.417 Finish Lon : E 27 : 2.916
Length : 33.18 km

Transect # : 11

Start Lat : S 19 : 4.098 Start Lon : E 27 : 1.520
Finish Lat : S 19 : 15.359 Finish Lon : E 27 : 16.745
Length : 33.87 km

Transect # : 12

Start Lat : S 19 : 16.216 Start Lon : E 27 : 15.587
Finish Lat : S 19 : 4.526 Finish Lon : E 26 : 59.783
Length : 35.16 km

Transect # : 13

Start Lat : S 19 : 6.641 Start Lon : E 27 : 0.326
Finish Lat : S 19 : 17.153 Finish Lon : E 27 : 14.537
Length : 31.62 km

Transect # : 14

Start Lat : S 19 : 18.387 Start Lon : E 27 : 13.890
Finish Lat : S 19 : 8.337 Finish Lon : E 27 : 0.304
Length : 30.23 km

Transect # : 15

Start Lat : S 19 : 10.187 Start Lon : E 27 : 0.488
Finish Lat : S 19 : 19.156 Finish Lon : E 27 : 12.614
Length : 26.98 km

Transect # : 16A

Start Lat : S 19 : 18.965 Start Lon : E 27 : 10.039
Finish Lat : S 19 : 12.656 Finish Lon : E 27 : 1.511
Length : 18.98 km

Transect # : 16B

Start Lat : S 19 : 12.576 Start Lon : E 27 : 1.401
Finish Lat : S 19 : 12.197 Finish Lon : E 27 : 0.889
Length : 1.14 km

Transect # : 17

Start Lat : S 19 : 13.951 Start Lon : E 27 : 0.944
Finish Lat : S 19 : 18.914 Finish Lon : E 27 : 7.654
Length : 14.93 km

Transect # : 18

Start Lat : S 19 : 19.241 Start Lon : E 27 : 5.780
Finish Lat : S 19 : 15.089 Finish Lon : E 27 : 0.167
Length : 12.49 km

Transect # : 19

Start Lat : S 19 : 16.453 Start Lon : E 26 : 59.694
Finish Lat : S 19 : 19.554 Finish Lon : E 27 : 3.887
Length : 9.33 km

Transect # : 20

Start Lat : S 19 : 19.711 Start Lon : E 27 : 1.783
Finish Lat : S 19 : 17.634 Finish Lon : E 26 : 58.975
Length : 6.25 km

Transect # : 21

Start Lat : S 19 : 18.213 Start Lon : E 26 : 57.443
Finish Lat : S 19 : 19.781 Finish Lon : E 26 : 59.561
Length : 4.71 km

Transect # : 22

Start Lat : S 19 : 20.297 Start Lon : E 26 : 57.944
Finish Lat : S 19 : 18.900 Finish Lon : E 26 : 56.055
Length : 4.20 km

Sikumi Forest

Number of transects : 9

Transect Bearing : 41.00 Degrees

Transect Spacing : 7.10 km

Transect # : 1

Start Lat : S 18 : 36.511 Start Lon : E 26 : 52.000
Finish Lat : S 18 : 32.425 Finish Lon : E 26 : 55.743
Length : 10.03 km

Transect # : 2

Start Lat : S 18 : 33.280 Start Lon : E 27 : 0.314
Finish Lat : S 18 : 39.616 Finish Lon : E 26 : 54.509
Length : 15.55 km

Transect # : 3

Start Lat : S 18 : 42.077 Start Lon : E 26 : 57.608
Finish Lat : S 18 : 35.617 Finish Lon : E 27 : 3.527
Length : 15.85 km

Transect # : 4

Start Lat : S 18 : 37.125 Start Lon : E 27 : 7.499
Finish Lat : S 18 : 44.538 Finish Lon : E 27 : 0.707
Length : 18.19 km

Transect # : 5

Start Lat : S 18 : 47.000 Start Lon : E 27 : 3.807
Finish Lat : S 18 : 37.500 Finish Lon : E 27 : 12.510
Length : 23.31 km

Transect # : 6

Start Lat : S 18 : 41.050 Start Lon : E 27 : 14.611
Finish Lat : S 18 : 49.461 Finish Lon : E 27 : 6.906
Length : 20.64 km

Transect # : 7

Start Lat : S 18 : 51.921 Start Lon : E 27 : 10.006
Finish Lat : S 18 : 43.151 Finish Lon : E 27 : 18.040
Length : 21.52 km

Transect # : 8

Start Lat : S 18 : 44.400 Start Lon : E 27 : 22.250
Finish Lat : S 18 : 54.379 Finish Lon : E 27 : 13.108
Length : 24.49 km

Transect # : 9

Start Lat : S 18 : 56.837 Start Lon : E 27 : 16.210
Finish Lat : S 18 : 45.750 Finish Lon : E 27 : 26.367
Length : 27.20 km

Appendix 4. Transect summaries of sightings

Species codes:

| Code | Species |
|-------------|----------------------------------|
| Bbk | Bushbuck |
| BRh | Black rhino |
| Buff | Buffalo |
| Camp | Poachers' camp |
| Catt | Cattle |
| Croc | Crocodile |
| Dkr | Common Duiker |
| Donk | Donkey |
| EIC1 | Elephant carcass, age category 1 |
| EIC2 | Elephant carcass, age category 2 |
| EIC3 | Elephant carcass, age category 3 |
| EIC4 | Elephant carcass, age category 4 |
| Eld | Eland |
| EleF | Elephant cow |
| EleM | Elephant bull |
| Ghb | Ground hornbill |
| Grf | Giraffe |
| Hipo | Hippopotamus |
| Imp | Impala |
| Jack | Jackal |
| Kudu | Kudu |
| Lion | Lion |
| Ost | Ostrich |
| Roan | Roan antelope |
| Rhin | Rhino (species not recorded) |
| Sab | Sable |
| Sbk | Steinbuck |
| Shoa | Sheep and/or goats |
| UnCa | Carcass of unidentified species |
| Wbck | Waterbuck |
| Wbst | Wildebeest |
| Whog | Warthog |
| WRh | White rhino |
| Zeb | Zebra |

Other abbreviations

| Abbreviation | Meaning |
|---------------------|---|
| n | number of transects sampled |
| N | possible number of transects in stratum |
| t | Student's <i>t</i> value, $P = 0.05$ |
| T # | transect number |
| - | no animals were seen in search strips |

The following tables list, for each stratum, the number of individuals of each species that were seen inside the search strips on each transect.

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 09/11/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 775 km²
 N : 136 n : 12
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Central A
 Base Line Length : 44.8 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.201
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EleF | Sab | Imp | EIC4 | UnCa | Grf | Dkr | Sbk |
|-----|------|------|-----|-----|------|------|-----|-----|-----|
| 1 | 1 | - | - | - | - | - | - | - | - |
| 2 | 2 | 7 | - | - | - | - | - | - | - |
| 3 | 14 | 18 | - | - | - | - | 1 | 1 | - |
| 4 | - | - | 1 | - | - | 1 | - | - | - |
| 5 | 1 | - | - | - | 1 | - | 1 | - | - |
| 6 | 4 | - | - | - | - | - | - | - | - |
| 7 | 4 | 6 | - | 3 | - | - | - | 2 | - |
| 8 | - | - | - | - | - | - | - | - | - |
| 9 | 3 | 7 | - | - | 1 | - | 4 | - | 2 |
| 10 | 3 | 42 | - | - | - | - | - | - | - |
| 11 | - | - | - | - | 1 | - | - | - | - |
| 12 | 2 | - | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Sab | Imp | EIC4 | UnCa | Grf | Dkr | Sbk |
|--|------|------|-----|-----|------|------|-----|-----|-----|
| | 34 | 80 | 1 | 3 | 3 | 1 | 6 | 3 | 2 |

Date of Survey : 07/11/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 1723 km²
 N : 127 n : 4
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Central B
 Base Line Length : 42 km
 Calibrated Strip Width at 300ft : 328 m
 t : 3.182
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EleF | Zeb | EIC4 | Roan | Grf | WRh | Ghb |
|-----|------|------|-----|------|------|-----|-----|-----|
| 1 | 2 | 7 | - | - | - | - | - | - |
| 2 | 1 | 17 | 1 | 1 | 1 | - | - | - |
| 3 | 12 | 6 | - | - | - | - | - | - |
| 4 | 19 | 39 | - | - | - | 1 | 1 | 1 |

Sighting Totals

| | EleM | EleF | Zeb | EIC4 | Roan | Grf | WRh | Ghb |
|--|------|------|-----|------|------|-----|-----|-----|
| | 34 | 69 | 1 | 1 | 1 | 1 | 1 | 1 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 05/11/07

Stratum Name : Dandari

Stratum Locality : NW Matabeleland

Base Line Length : 71.8 km

Stratum Area : 1290 km²

Calibrated Strip Width at 300ft : 328 m

N : 217 n : 25

t : 2.064

Pilot : C Mackie

Observer : G Mtare / C Zhuwau

Map overlay file : None

Transect summary table :

| T # | EleM | EleF | Buff | Sab | Zeb | Kudu | EIC1 | EIC4 | UnCa | Grf | Whog | Ost | Eld | Ghb | Dkr |
|-----|------|------|------|-----|-----|------|------|------|------|-----|------|-----|-----|-----|-----|
| 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 3 | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - |
| 4 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 21 | 11 | 9 | - | - | - | - | 3 | - | - | - | - | - | - | - |
| 7 | 1 | 6 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 8 | 4 | 21 | 2 | - | - | - | - | 1 | - | - | - | - | - | - | - |
| 9 | 8 | 54 | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| 10 | 8 | 85 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 11 | 9 | 14 | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - |
| 12 | 10 | 41 | - | - | - | - | - | 1 | 1 | - | - | - | - | - | - |
| 13 | 4 | 41 | - | - | - | - | - | 1 | - | - | 1 | - | - | - | - |
| 14 | 1 | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 15 | 6 | 8 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 16 | 6 | 18 | - | 4 | - | - | - | - | - | - | - | - | - | 4 | - |
| 17 | 8 | 5 | - | - | 5 | - | - | 1 | - | 1 | 1 | - | - | - | - |
| 18 | 6 | 12 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 19 | 3 | 63 | - | - | - | - | 1 | 1 | - | - | - | 1 | 2 | - | 1 |
| 20 | - | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 21 | 7 | 14 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 22 | 14 | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
| 23 | - | 23 | - | - | 10 | - | - | 2 | - | - | - | - | - | - | - |
| 24 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25 | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Buff | Sab | Zeb | Kudu | EIC1 | EIC4 | UnCa | Grf | Whog | Ost | Eld | Ghb | Dkr |
|--|------|------|------|-----|-----|------|------|------|------|-----|------|-----|-----|-----|-----|
| | 122 | 438 | 11 | 4 | 15 | 1 | 1 | 17 | 1 | 2 | 2 | 1 | 3 | 4 | 1 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 08/11/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 2098 km²
 N : 185 n : 14
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Dzivanini
 Base Line Length : 61.1 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.16
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EleF | Buff | Sab | Zeb | EIC2 | EIC4 | UnCa | Grf | Roan | Ghb |
|-----|------|------|------|-----|-----|------|------|------|-----|------|-----|
| 1 | 13 | 25 | - | - | - | - | - | - | - | - | - |
| 2 | 13 | 28 | - | - | - | 1 | - | - | - | - | - |
| 3 | 30 | 86 | - | - | - | 1 | - | - | - | - | - |
| 4 | 28 | 52 | - | - | 1 | - | 2 | - | 4 | - | - |
| 5 | 32 | 28 | - | - | - | - | - | - | - | - | - |
| 6 | 13 | 69 | - | - | - | - | 1 | 1 | - | - | - |
| 7 | 12 | 12 | - | - | - | - | - | 1 | - | - | - |
| 8 | 4 | 48 | 1 | - | - | - | - | - | 2 | - | - |
| 9 | 4 | 85 | - | 1 | - | - | - | - | 2 | - | - |
| 10 | 5 | 12 | - | - | - | - | - | 1 | 1 | - | - |
| 11 | 10 | - | - | - | - | - | 1 | - | - | 4 | 2 |
| 12 | - | - | - | - | - | - | - | 1 | - | - | - |
| 13 | - | - | - | - | - | - | - | - | - | - | - |
| 14 | - | - | - | - | - | - | 1 | - | - | - | - |

Sighting Totals

| | EleM | EleF | Buff | Sab | Zeb | EIC2 | EIC4 | UnCa | Grf | Roan | Ghb |
|--|------|------|------|-----|-----|------|------|------|-----|------|-----|
| | 164 | 445 | 1 | 1 | 1 | 2 | 5 | 4 | 9 | 4 | 2 |

Date of Survey : 28/10/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 561 km²
 N : 96 n : 7
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Kazuma
 Base Line Length : 32.2 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.447
 Observer : G Mtare / C Zhumau

Transect summary table :

| T # | Sab | Zeb | Kudu | EIC3 | EIC4 | UnCa | Eld | Grf | Ost | Ghb |
|-----|-----|-----|------|------|------|------|-----|-----|-----|-----|
| 1 | - | - | - | - | - | - | - | - | - | - |
| 2 | - | - | - | - | - | - | - | - | - | - |
| 3 | - | - | - | 1 | 1 | 1 | 3 | - | - | - |
| 4 | 3 | - | - | - | 1 | 1 | - | - | - | - |
| 5 | 2 | - | 6 | 2 | 3 | 1 | - | - | 2 | 4 |
| 6 | - | 22 | 6 | - | 2 | 2 | - | - | - | - |
| 7 | 1 | 15 | - | - | - | - | - | 1 | - | - |

Sighting Totals

| | Sab | Zeb | Kudu | EIC3 | EIC4 | UnCa | Eld | Grf | Ost | Ghb |
|--|-----|-----|------|------|------|------|-----|-----|-----|-----|
| | 6 | 37 | 12 | 3 | 7 | 5 | 3 | 1 | 2 | 4 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 27/10/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 446 km²
 N : 106 n : 15
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Kazungula
 Base Line Length : 35.2 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.145
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EleF | Sab | Hipo | EIC2 | EIC3 | EIC4 | UnCa | Grf | Whog | Croc |
|-----|------|------|-----|------|------|------|------|------|-----|------|------|
| 1 | 4 | - | - | - | - | - | 2 | - | - | - | - |
| 2 | 2 | - | - | - | 1 | - | 1 | 2 | - | - | - |
| 3 | - | - | - | - | - | - | - | 1 | - | - | - |
| 4 | - | - | 5 | - | - | - | 2 | 1 | 3 | - | - |
| 5 | - | 15 | 1 | - | - | - | - | - | 1 | - | 2 |
| 6 | - | - | 2 | - | 1 | - | - | 1 | - | - | - |
| 7 | - | - | 36 | - | - | 2 | - | - | - | - | - |
| 8 | - | - | 6 | - | 1 | - | - | - | - | - | - |
| 9 | - | - | - | 2 | - | - | 1 | - | - | - | - |
| 10 | - | - | 3 | - | 1 | - | 4 | 2 | - | - | - |
| 11 | 1 | - | 23 | - | 1 | 2 | 1 | 1 | - | 2 | 1 |
| 12 | - | - | - | - | 1 | - | 3 | 3 | - | - | - |
| 13 | - | - | - | - | - | - | 1 | 2 | - | - | - |
| 14 | - | - | - | - | 1 | - | - | - | - | - | - |
| 15 | - | - | - | - | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Sab | Hipo | EIC2 | EIC3 | EIC4 | UnCa | Grf | Whog | Croc |
|--|------|------|-----|------|------|------|------|------|-----|------|------|
| | 7 | 15 | 76 | 2 | 7 | 4 | 15 | 13 | 4 | 2 | 3 |

Date of Survey : 10/11/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 1224 km²
 N : 158 n : 6
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Maitengwe
 Base Line Length : 51.2 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.571
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EIC4 | UnCa | Catt | Shoa | Donk | Dkr |
|-----|------|------|------|------|------|-----|
| 1 | - | - | 31 | - | 1 | - |
| 2 | - | 1 | - | 5 | - | 1 |
| 3 | 1 | - | - | - | - | - |
| 4 | - | - | - | - | - | - |
| 5 | - | - | 1 | - | - | - |
| 6 | - | - | - | - | - | - |

Sighting Totals

| | EIC4 | UnCa | Catt | Shoa | Donk | Dkr |
|--|------|------|------|------|------|-----|
| | 1 | 1 | 32 | 5 | 1 | 1 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 05/11/07

Stratum Name : Main Camp

Stratum Locality : NW Matabeleland

Base Line Length : 50.8 km

Stratum Area : 1261 km²

Calibrated Strip Width at 300ft : 328 m

N : 152 n : 23

t : 2.074

Pilot : C Mackie

Observer : G Mtare / C Zhuwau

Map overlay file : None

Transect summary table :

| T # | EleM | EleF | Buff | Sab | Imp | Kudu | EIC1 | EIC2 | EIC4 | UnCa | Grf | Ost | Ghb | Sbk |
|-----|------|------|------|-----|-----|------|------|------|------|------|-----|-----|-----|-----|
| 1 | - | 10 | - | - | - | - | - | - | - | 2 | - | - | - | - |
| 2 | 5 | - | 8 | - | - | - | - | 1 | 1 | 1 | - | - | 3 | - |
| 3 | - | 12 | - | - | - | - | - | - | 1 | - | 1 | - | - | - |
| 4 | 6 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | - | - | - | - | - | - | - | - | 1 | 1 | 5 | - | - | - |
| 6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | - | - | - | 1 | - | - | - | - | 2 | 1 | - | - | - | - |
| 8 | 1 | 4 | - | - | - | - | - | 2 | 1 | 1 | 11 | 5 | - | - |
| 9 | 1 | - | - | - | 4 | 7 | - | - | 3 | 2 | 2 | - | - | - |
| 10 | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - |
| 11 | 3 | - | - | 15 | - | - | - | - | 2 | - | - | - | - | - |
| 12 | 1 | 9 | - | - | - | 2 | - | - | 5 | 2 | - | - | - | - |
| 13 | - | 9 | - | - | - | - | - | - | 1 | - | - | - | - | - |
| 14 | 10 | 25 | - | - | - | - | - | - | 4 | - | 1 | - | - | 1 |
| 15 | - | - | - | - | - | 1 | - | - | 5 | - | 2 | - | - | - |
| 16 | 3 | 41 | - | - | - | - | - | - | - | - | - | - | - | - |
| 17 | 7 | 6 | - | - | 2 | - | - | - | - | - | 2 | - | - | - |
| 18 | 5 | 7 | - | - | - | - | - | - | 1 | - | - | - | - | - |
| 19 | 3 | 14 | - | - | - | - | - | - | - | - | - | - | - | - |
| 20 | 4 | 45 | - | - | - | - | - | - | 1 | - | - | - | - | - |
| 21 | 5 | 25 | 8 | - | - | - | - | - | - | - | - | - | - | - |
| 22 | 3 | 24 | - | - | - | - | - | - | - | - | - | - | - | - |
| 23 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Buff | Sab | Imp | Kudu | EIC1 | EIC2 | EIC4 | UnCa | Grf | Ost | Ghb | Sbk |
|--|------|------|------|-----|-----|------|------|------|------|------|-----|-----|-----|-----|
| | 60 | 231 | 16 | 16 | 6 | 10 | 1 | 3 | 28 | 10 | 24 | 5 | 3 | 1 |

Date of Survey : 29/10/07

Stratum Name : Rosslyn

Stratum Locality : NW Matabeleland

Base Line Length : 21.8 km

Stratum Area : 344 km²

Calibrated Strip Width at 300ft : 328 m

N : 62 n : 5

t : 2.776

Pilot : C Mackie

Observer : G Mtare / C Zhuwau

Map overlay file : None

Transect summary table :

| T # | EleM | Sab | Zeb | Imp | Kudu | EIC4 | UnCa | Eld | Whog | Grf | Sbk |
|-----|------|-----|-----|-----|------|------|------|-----|------|-----|-----|
| 1 | - | 20 | - | - | - | - | - | - | - | - | - |
| 2 | - | 12 | 22 | 6 | 1 | - | 1 | 2 | 4 | - | - |
| 3 | - | - | 4 | - | - | 3 | 1 | - | - | 1 | 1 |
| 4 | 1 | 5 | - | - | - | 1 | - | - | - | - | - |
| 5 | - | - | - | - | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | Sab | Zeb | Imp | Kudu | EIC4 | UnCa | Eld | Whog | Grf | Sbk |
|--|------|-----|-----|-----|------|------|------|-----|------|-----|-----|
| | 1 | 37 | 26 | 6 | 1 | 4 | 2 | 2 | 4 | 1 | 1 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 29/10/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 703 km²
 N : 120 n : 6
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Matetsi
 Base Line Length : 39.5 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.571
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | Buff | Sab | Zeb | Wbck | Imp | Kudu | EIC3 | EIC4 | UnCa | Grf | Whog | Sbk | Roan | Wbst | Jack |
|-----|------|------|-----|-----|------|-----|------|------|------|------|-----|------|-----|------|------|------|
| 1 | - | - | 1 | 2 | - | 1 | - | - | - | - | 5 | 1 | - | - | - | - |
| 2 | - | 5 | - | - | - | - | - | - | - | - | - | 1 | 1 | - | - | - |
| 3 | - | 488 | - | 11 | 4 | 6 | 2 | - | 1 | - | 1 | 2 | - | 1 | - | - |
| 4 | 12 | - | - | 25 | 10 | 10 | 4 | - | - | - | 3 | - | - | - | - | 2 |
| 5 | - | 10 | 12 | 21 | - | 3 | 10 | 1 | 1 | 1 | 3 | - | - | - | - | - |
| 6 | - | - | - | 8 | 30 | 20 | 4 | - | - | 1 | 5 | 8 | 1 | - | 12 | - |

Sighting Totals

| | EleM | Buff | Sab | Zeb | Wbck | Imp | Kudu | EIC3 | EIC4 | UnCa | Grf | Whog | Sbk | Roan | Wbst | Jack |
|--|------|------|-----|-----|------|-----|------|------|------|------|-----|------|-----|------|------|------|
| | 12 | 503 | 13 | 67 | 44 | 40 | 20 | 1 | 2 | 2 | 17 | 12 | 2 | 1 | 12 | 2 |

Date of Survey : 30/10/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 826 km²
 N : 163 n : 18
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Mtoa
 Base Line Length : 53.2 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.11
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EleF | Buff | Sab | Zeb | Kudu | EIC1 | EIC2 | EIC3 | EIC4 | UnCa | Camp | Catt | Grf | Sbk |
|-----|------|------|------|-----|-----|------|------|------|------|------|------|------|------|-----|-----|
| 1 | - | - | - | - | 2 | - | - | - | - | 2 | 1 | - | - | - | - |
| 2 | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - |
| 3 | 1 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - | - |
| 4 | 3 | 2 | - | - | - | - | - | - | - | 1 | 1 | - | - | - | - |
| 5 | 2 | 16 | - | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| 6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 1 | 5 | - | - | - | - | - | - | - | 3 | 1 | - | - | - | 1 |
| 8 | 12 | - | - | 11 | - | 2 | - | - | - | 2 | - | - | - | 1 | - |
| 9 | 9 | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 10 | 2 | 8 | - | - | - | - | - | - | - | 2 | 1 | - | - | - | - |
| 11 | 3 | 18 | - | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 12 | 2 | 8 | - | - | - | - | - | 1 | - | 1 | - | - | - | - | - |
| 13 | 11 | 24 | - | - | - | - | 1 | - | - | 2 | - | - | - | 2 | - |
| 14 | 1 | - | 10 | - | - | - | - | - | - | - | - | - | - | - | - |
| 15 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | 7 | - | - |
| 16 | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - |
| 17 | - | - | - | - | 4 | - | - | - | 1 | - | - | - | - | - | - |
| 18 | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Buff | Sab | Zeb | Kudu | EIC1 | EIC2 | EIC3 | EIC4 | UnCa | Camp | Catt | Grf | Sbk |
|--|------|------|------|-----|-----|------|------|------|------|------|------|------|------|-----|-----|
| | 52 | 92 | 10 | 11 | 6 | 2 | 1 | 1 | 1 | 15 | 6 | 2 | 7 | 5 | 1 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 07/11/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 1629 km²
 N : 172 n : 22
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Ngamo
 Base Line Length : 56.8 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.08
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EleF | Buff | Sab | Zeb | Wbck | Kudu | EIC4 | UnCa | Wbst | WRh | Ost | Eld | Grf | Ghb | Sbk | Dkr |
|-----|------|------|------|-----|-----|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|
| 1 | 3 | - | - | 17 | 5 | - | - | 3 | 5 | 34 | - | - | - | - | - | - | - |
| 2 | 2 | 32 | - | 3 | 2 | - | - | - | 3 | - | 2 | 2 | - | - | - | - | - |
| 3 | - | 31 | - | 12 | - | - | - | 1 | 1 | 13 | - | - | 1 | - | 1 | - | - |
| 4 | 3 | 19 | 55 | - | 7 | - | - | 2 | 1 | 1 | - | - | - | 5 | - | - | - |
| 5 | 2 | - | - | - | 2 | - | 2 | 1 | 2 | - | - | - | - | - | 3 | - | - |
| 6 | 5 | 7 | - | 15 | - | 5 | - | 2 | 2 | 40 | 1 | - | - | - | - | - | - |
| 7 | 1 | - | 124 | - | - | - | - | 4 | 3 | - | - | - | - | - | - | 1 | - |
| 8 | 1 | 6 | - | - | - | - | - | 2 | 1 | - | - | - | - | - | - | - | - |
| 9 | 1 | 2 | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - |
| 10 | - | - | 5 | - | - | - | - | 2 | 3 | - | - | - | - | - | - | - | - |
| 11 | 2 | 12 | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - |
| 12 | 1 | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - |
| 13 | 4 | 6 | - | 1 | - | - | - | 2 | - | - | - | - | - | - | - | - | - |
| 14 | 1 | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - | - | - |
| 15 | 1 | 9 | - | - | - | - | - | 1 | - | - | - | - | - | 3 | - | - | 2 |
| 16 | 12 | 37 | - | - | - | - | - | 1 | 2 | - | - | - | - | - | - | - | - |
| 17 | 5 | 17 | - | - | - | - | - | - | - | - | - | - | - | 3 | - | - | - |
| 18 | 1 | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - | - | - | - |
| 19 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 20 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 21 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 22 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Buff | Sab | Zeb | Wbck | Kudu | EIC4 | UnCa | Wbst | WRh | Ost | Eld | Grf | Ghb | Sbk | Dkr |
|--|------|------|------|-----|-----|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|
| | 45 | 178 | 184 | 48 | 17 | 5 | 2 | 26 | 24 | 88 | 3 | 2 | 1 | 11 | 4 | 1 | 2 |

Date of Survey : 08/11/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 1171 km²
 N : 131 n : 5
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Ngamo Forest
 Base Line Length : 43.5 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.776
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EleF | Buff | EIC4 | UnCa | Catt | Wbst | Dkr |
|-----|------|------|------|------|------|------|------|-----|
| 1 | - | 73 | 30 | 1 | - | - | - | - |
| 2 | - | - | - | 1 | 8 | 28 | 50 | 1 |
| 3 | 4 | - | - | - | 3 | - | - | - |
| 4 | - | - | - | - | - | 22 | - | - |
| 5 | - | - | - | - | - | 10 | - | - |

Sighting Totals

| | EleM | EleF | Buff | EIC4 | UnCa | Catt | Wbst | Dkr |
|--|------|------|------|------|------|------|------|-----|
| | 4 | 73 | 30 | 2 | 11 | 60 | 50 | 1 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 28/10/07
 Stratum Name : Panda Masuie
 Stratum Locality : NW Matabeleland
 Base Line Length : 54.2 km
 Stratum Area : 963 km²
 Calibrated Strip Width at 300ft : 328 m
 N : 162 n : 11
 t : 2.228
 Pilot : C Mackie
 Observer : G Mtare / C Zhuwau
 Map overlay file : None

Transect summary table :

| T # | EleM | EleF | Sab | Zeb | Kudu | EIC4 | UnCa | Grf | Sbk | Ost |
|-----|------|------|-----|-----|------|------|------|-----|-----|-----|
| 1 | - | - | 3 | - | - | - | - | - | - | - |
| 2 | - | - | - | - | - | - | 1 | - | - | - |
| 3 | 3 | - | 1 | - | 1 | 2 | 1 | 3 | - | - |
| 4 | - | 17 | - | - | - | 2 | - | - | - | - |
| 5 | - | - | - | 10 | - | 2 | - | 2 | - | 2 |
| 6 | - | - | - | - | - | - | 2 | - | - | - |
| 7 | - | - | - | 19 | - | - | - | 2 | 1 | - |
| 8 | - | - | - | - | - | - | - | - | - | - |
| 9 | - | - | - | 7 | - | 3 | 1 | - | - | - |
| 10 | - | 12 | - | - | - | - | - | - | - | - |
| 11 | - | - | - | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Sab | Zeb | Kudu | EIC4 | UnCa | Grf | Sbk | Ost |
|--|------|------|-----|-----|------|------|------|-----|-----|-----|
| | 3 | 29 | 4 | 36 | 1 | 9 | 5 | 7 | 1 | 2 |

Date of Survey : 30/10/07
 Stratum Name : Robins
 Stratum Locality : NW Matabeleland
 Base Line Length : 35.8 km
 Stratum Area : 1029 km²
 Calibrated Strip Width at 300ft : 328 m
 N : 107 n : 14
 t : 2.16
 Pilot : C Mackie
 Observer : G Mtare / C Zhuwau
 Map overlay file : None

Transect summary table :

| T # | EleM | EleF | Buff | Sab | Zeb | Wbck | Imp | Kudu | EIC2 | EIC4 | UnCa | Dkr | Whog | Eld | Roan | Grf | Ost | Lion |
|-----|------|------|------|-----|-----|------|-----|------|------|------|------|-----|------|-----|------|-----|-----|------|
| 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | 3 | - | 7 | - | 5 | - | 6 | - | - | - | - | - | - | - | - | - | - | - |
| 3 | 3 | 24 | 1 | - | 4 | - | 8 | - | - | - | - | 1 | - | - | - | - | - | - |
| 4 | 4 | 22 | - | 7 | - | - | - | 4 | - | 1 | - | - | - | - | - | - | - | - |
| 5 | - | - | - | - | 9 | - | 16 | - | - | 3 | - | - | 4 | - | - | - | - | - |
| 6 | - | - | - | 1 | 8 | 20 | - | 2 | - | - | 1 | 2 | 4 | 1 | - | - | - | - |
| 7 | - | 12 | - | 4 | 3 | 1 | 134 | - | - | 2 | 4 | - | 2 | - | 5 | - | - | 2 |
| 8 | - | - | - | - | 1 | 30 | 23 | 8 | - | - | 1 | 2 | 2 | - | - | - | - | - |
| 9 | 4 | - | - | - | 12 | - | 46 | - | - | 2 | - | - | - | - | - | - | - | - |
| 10 | - | 30 | - | - | 10 | - | - | - | 1 | 1 | - | - | - | - | 1 | - | - | - |
| 11 | 4 | - | - | - | - | - | - | - | - | 3 | 2 | - | - | - | 3 | - | 3 | - |
| 12 | 8 | 14 | - | - | - | - | - | - | - | 1 | 1 | - | - | - | - | 3 | 1 | - |
| 13 | - | 23 | - | - | - | - | - | - | - | 2 | - | 1 | - | - | - | 1 | - | - |
| 14 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Buff | Sab | Zeb | Wbck | Imp | Kudu | EIC2 | EIC4 | UnCa | Dkr | Whog | Eld | Roan | Grf | Ost | Lion |
|--|------|------|------|-----|-----|------|-----|------|------|------|------|-----|------|-----|------|-----|-----|------|
| | 26 | 125 | 8 | 12 | 52 | 51 | 233 | 14 | 1 | 15 | 9 | 6 | 12 | 1 | 9 | 4 | 4 | 2 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 06/11/07
 Stratum Name : Shakwanki
 Stratum Locality : NW Matabeleland
 Base Line Length : 66.2 km
 Stratum Area : 2143 km²
 Calibrated Strip Width at 300ft : 328 m
 N : 201 n : 11
 t : 2.228
 Pilot : C Mackie
 Observer : G Mtare / C Zhuwau
 Map overlay file : None

Transect summary table :

| T # | EleM | EleF | Zeb | EIC4 | Grf | Dkr | Sbk |
|-----|------|------|-----|------|-----|-----|-----|
| 1 | 1 | 7 | - | - | - | - | - |
| 2 | - | - | - | - | - | - | - |
| 3 | 1 | - | - | 1 | 1 | - | - |
| 4 | 7 | - | - | - | 1 | - | - |
| 5 | 2 | - | - | - | - | 1 | 2 |
| 6 | 1 | 5 | - | 1 | - | - | - |
| 7 | 16 | 12 | - | 2 | - | - | - |
| 8 | 7 | 43 | - | - | 1 | - | - |
| 9 | - | 8 | 6 | - | - | - | 1 |
| 10 | 2 | 12 | - | 1 | - | - | - |
| 11 | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Zeb | EIC4 | Grf | Dkr | Sbk |
|--|------|------|-----|------|-----|-----|-----|
| | 37 | 87 | 6 | 5 | 3 | 1 | 3 |

Date of Survey : 29/10/07
 Stratum Name : Zanguja
 Stratum Locality : NW Matabeleland
 Base Line Length : 37.2 km
 Stratum Area : 839 km²
 Calibrated Strip Width at 300ft : 328 m
 N : 109 n : 8
 t : 2.365
 Pilot : C Mackie
 Observer : G Mtare / C Zhuwau
 Map overlay file : None

Transect summary table :

| T # | EleF | Buff | Sab | Zeb | Wbck | Imp | Kudu | EIC4 | UnCa | Camp | Catt | Grf | Whog | Dkr | Roan |
|-----|------|------|-----|-----|------|-----|------|------|------|------|------|-----|------|-----|------|
| 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | 2 | 80 | 21 | - | 1 | - | 12 | - | 1 | - | - | 2 | 1 | - | - |
| 3 | 25 | 30 | 23 | 14 | - | 7 | 5 | - | - | - | - | 4 | - | - | - |
| 4 | - | - | 10 | - | 5 | - | - | 1 | 2 | - | - | - | - | 1 | - |
| 5 | 8 | - | 6 | 14 | 1 | 6 | - | 1 | 2 | 1 | 6 | - | - | - | 1 |
| 6 | 4 | - | - | - | - | - | - | - | - | - | 4 | - | - | - | - |
| 7 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 3 |
| 8 | 2 | - | - | 4 | - | - | - | - | - | - | - | - | - | - | - |

Sighting Totals

| | EleF | Buff | Sab | Zeb | Wbck | Imp | Kudu | EIC4 | UnCa | Camp | Catt | Grf | Whog | Dkr | Roan |
|--|------|------|-----|-----|------|-----|------|------|------|------|------|-----|------|-----|------|
| | 41 | 110 | 60 | 32 | 7 | 13 | 17 | 2 | 5 | 1 | 10 | 6 | 1 | 2 | 4 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 01/11/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 923 km²
 N : 172 n : 21
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Shapi
 Base Line Length : 57.2 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.086
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EleF | Buff | Sab | Zeb | EIC4 | UnCa | Grf | Whog | Ghb |
|-----|------|------|------|-----|-----|------|------|-----|------|-----|
| 1 | - | - | - | - | - | - | - | - | - | - |
| 2 | 7 | 38 | - | - | - | - | - | - | - | - |
| 3 | 19 | 33 | 3 | - | - | - | 2 | - | - | - |
| 4 | 17 | 69 | - | - | 3 | - | - | - | - | - |
| 5 | 11 | 28 | - | - | - | - | 1 | - | - | - |
| 6 | - | 17 | - | - | - | - | 1 | 1 | - | - |
| 7 | - | 2 | - | - | - | - | - | 1 | - | - |
| 8 | - | - | - | - | - | - | - | - | - | - |
| 9 | 3 | 30 | - | - | - | - | 1 | - | - | - |
| 10 | 20 | 76 | - | - | - | - | - | 1 | 1 | - |
| 11 | 10 | 38 | - | 2 | - | 1 | 1 | - | - | - |
| 12 | 27 | 97 | - | - | - | 1 | - | 1 | - | - |
| 13 | 16 | 20 | - | - | - | 1 | - | - | - | - |
| 14 | 1 | 15 | - | - | - | 1 | - | - | - | - |
| 15 | 18 | 8 | - | - | - | 2 | - | - | - | - |
| 16 | 4 | - | - | - | - | - | - | - | - | - |
| 17 | 2 | 7 | - | - | - | 1 | - | - | - | - |
| 18 | 7 | 10 | - | - | - | 1 | - | - | - | - |
| 19 | 4 | 10 | - | - | - | 1 | - | - | - | 3 |
| 20 | 4 | - | - | - | - | - | - | - | - | - |
| 21 | - | - | - | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Buff | Sab | Zeb | EIC4 | UnCa | Grf | Whog | Ghb |
|--|------|------|------|-----|-----|------|------|-----|------|-----|
| | 170 | 498 | 3 | 2 | 3 | 9 | 6 | 4 | 1 | 3 |

Date of Survey : 06/11/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 1173 km²
 N : 181 n : 9
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Sikumi Forest
 Base Line Length : 60.2 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.306
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EleF | Buff | Imp | EIC3 | EIC4 | UnCa | Catt | Roan |
|-----|------|------|------|-----|------|------|------|------|------|
| 1 | 1 | 29 | - | - | - | - | - | - | - |
| 2 | - | - | 450 | - | - | 2 | - | 23 | - |
| 3 | - | - | - | - | - | 3 | 1 | - | - |
| 4 | - | - | - | - | - | 1 | 1 | - | - |
| 5 | - | - | - | - | - | - | - | - | - |
| 6 | - | - | - | - | - | 2 | 1 | - | - |
| 7 | - | - | - | 30 | - | - | - | - | - |
| 8 | - | - | - | - | - | 1 | - | - | - |
| 9 | - | - | - | - | 2 | 1 | 2 | - | 2 |

Sighting Totals

| | EleM | EleF | Buff | Imp | EIC3 | EIC4 | UnCa | Catt | Roan |
|--|------|------|------|-----|------|------|------|------|------|
| | 1 | 29 | 450 | 30 | 2 | 10 | 5 | 23 | 2 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 31/10/07

Stratum Name : Sinamatella

Stratum Locality : NW Matabeleland

Base Line Length : 57.5 km

Stratum Area : 1522 km²

Calibrated Strip Width at 300ft : 328 m

N : 169 n : 20

t : 2.093

Pilot : C Mackie

Observer : G Mtare / C Zhuwau

Map overlay file : None

Transect summary table :

| T # | EleM | EleF | Buff | Zeb | Imp | Kudu | EIC2 | EIC3 | EIC4 | UnCa | Grf | Whog | Dkr | Ghb | Rhin | Bbk | BRh |
|-----|------|------|------|-----|-----|------|------|------|------|------|-----|------|-----|-----|------|-----|-----|
| 1 | 1 | - | - | 4 | 45 | - | - | - | - | - | 2 | - | - | - | - | - | - |
| 2 | - | 10 | - | - | 2 | 3 | - | - | - | - | - | 1 | - | - | - | - | - |
| 3 | - | - | 3 | 10 | 50 | - | - | - | 1 | - | - | 1 | 1 | - | - | - | - |
| 4 | - | 9 | - | 4 | - | - | 1 | - | 2 | 2 | 1 | - | - | 2 | 2 | - | 1 |
| 5 | 1 | 8 | - | 17 | 17 | 5 | - | - | 5 | 2 | - | 2 | 1 | - | - | - | - |
| 6 | 9 | 60 | - | - | - | 3 | - | 1 | 1 | 1 | 4 | 4 | - | - | 1 | 3 | - |
| 7 | - | 30 | - | - | 11 | - | - | - | 1 | 2 | - | - | - | - | - | - | - |
| 8 | - | 7 | - | - | 1 | 2 | - | - | 2 | 2 | - | - | - | - | - | - | - |
| 9 | 1 | 28 | - | - | 4 | 2 | - | - | 1 | - | 4 | - | - | 3 | - | - | - |
| 10 | 1 | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 11 | 5 | 8 | - | - | - | 5 | - | - | - | 1 | 2 | - | - | - | - | - | - |
| 12 | - | 66 | - | - | - | 3 | - | - | - | 3 | - | - | - | - | - | - | - |
| 13 | 1 | 10 | - | - | - | - | - | - | 2 | 1 | 2 | - | - | - | - | - | - |
| 14 | 4 | - | - | - | - | - | - | - | - | 1 | - | - | 1 | - | - | - | - |
| 15 | 2 | 28 | - | - | 2 | - | - | - | 2 | 1 | - | - | - | - | - | - | - |
| 16 | 4 | 9 | 50 | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - |
| 17 | 1 | 10 | - | - | - | - | - | - | - | - | 1 | - | 1 | - | - | - | - |
| 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 19 | - | - | - | - | - | - | 1 | - | 1 | 1 | - | - | - | - | - | - | - |
| 20 | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - |

Sighting Totals

| | EleM | EleF | Buff | Zeb | Imp | Kudu | EIC2 | EIC3 | EIC4 | UnCa | Grf | Whog | Dkr | Ghb | Rhin | Bbk | BRh |
|--|------|------|------|-----|-----|------|------|------|------|------|-----|------|-----|-----|------|-----|-----|
| | 30 | 287 | 53 | 35 | 132 | 23 | 2 | 2 | 19 | 17 | 16 | 8 | 4 | 5 | 3 | 3 | 1 |

Date of Survey : 09/11/07

Stratum Name : Tsholotsho East

Stratum Locality : NW Matabeleland

Base Line Length : 56.2 km

Stratum Area : 910 km²

Calibrated Strip Width at 300ft : 328 m

N : 169 n : 9

t : 2.306

Pilot : C Mackie

Observer : G Mtare / C Zhuwau

Map overlay file : None

Transect summary table :

| T # | EleF | Kudu | EIC4 | UnCa | Catt | Shoa | Donk |
|-----|------|------|------|------|------|------|------|
| 1 | - | - | - | - | - | - | - |
| 2 | - | - | 1 | 1 | 24 | - | - |
| 3 | - | - | - | - | 7 | - | - |
| 4 | - | - | - | - | 1 | 1 | 2 |
| 5 | - | - | 1 | - | 6 | - | - |
| 6 | 34 | - | - | 1 | 17 | - | - |
| 7 | - | 1 | - | - | - | - | - |
| 8 | - | - | - | - | - | - | - |
| 9 | - | - | - | - | - | - | - |

Sighting Totals

| | EleF | Kudu | EIC4 | UnCa | Catt | Shoa | Donk |
|--|------|------|------|------|------|------|------|
| | 34 | 1 | 2 | 2 | 55 | 1 | 2 |

Aerial Survey of Elephants and other Herbivores in NW Matabeleland, Zimbabwe: 2007

Date of Survey : 09/11/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 474 km²
 N : 218 n : 8
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Tsholotsho FarNorth
 Base Line Length : 73.2 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.365
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EIC4 | Catt | Shoa | Donk |
|-----|------|------|------|------|------|
| 1 | - | - | - | - | - |
| 2 | - | - | 4 | 12 | 3 |
| 3 | - | 1 | - | - | - |
| 4 | - | 1 | 6 | - | - |
| 5 | 5 | 1 | - | - | - |
| 6 | - | - | 17 | - | 5 |
| 7 | - | - | 46 | 13 | 1 |
| 8 | - | - | - | - | - |

Sighting Totals

| | EleM | EIC4 | Catt | Shoa | Donk |
|--|------|------|------|------|------|
| | 5 | 3 | 73 | 25 | 9 |

Date of Survey : 27/10/07
 Stratum Locality : NW Matabeleland
 Stratum Area : 543 km²
 N : 95 n : 7
 Pilot : C Mackie
 Map overlay file : None

Stratum Name : Zambezi NP
 Base Line Length : 32 km
 Calibrated Strip Width at 300ft : 328 m
 t : 2.447
 Observer : G Mtare / C Zhuwau

Transect summary table :

| T # | EleM | EleF | Buff | Sab | Zeb | Imp | Kudu | Hipo | EIC4 | UnCa | Grf |
|-----|------|------|------|-----|-----|-----|------|------|------|------|-----|
| 1 | - | - | - | - | - | - | - | 1 | - | - | - |
| 2 | 6 | - | 50 | 1 | - | - | - | - | 3 | - | - |
| 3 | 1 | 17 | 16 | 12 | - | - | - | 9 | 2 | 1 | - |
| 4 | - | - | - | 1 | 15 | - | - | - | 2 | 1 | - |
| 5 | - | - | 4 | 1 | - | - | 1 | - | 1 | - | 5 |
| 6 | 2 | - | 12 | 6 | - | 9 | - | - | 3 | 1 | 4 |
| 7 | 1 | - | - | - | - | - | - | 1 | - | 1 | - |

Sighting Totals

| | EleM | EleF | Buff | Sab | Zeb | Imp | Kudu | Hipo | EIC4 | UnCa | Grf |
|--|------|------|------|-----|-----|-----|------|------|------|------|-----|
| | 10 | 17 | 82 | 21 | 15 | 9 | 1 | 11 | 11 | 4 | 9 |

Appendix 5. Comparison of observers

Introduction

One of the observers in this survey (the left one) had no previous experience of observing during transect surveys. Hence, the numbers of groups and animals counted by the two observers were compared to determine if the observers appeared to be similarly efficient.

Methods

For each species, the total numbers of groups and of individual animals counted by each observer in all transects were determined. For each observer and each species, the numbers of groups and individual animals that the observer was expected to see (if the observers were equally efficient and the animals similarly distributed on the two sides of the aircraft) were calculated as follows.

$$\text{Expected Number} = \frac{\text{Total Number} \times \text{Observer's Strip Width}}{\text{Total Strip Width for both Observers}}$$

where:

Expected Number = the number of groups/animals of a given species that an observer was expected to count if the two observers saw similar numbers;

Total Number = the total number of groups/animals of a given species actually counted by both observers;

Observer's Strip Width = the width (in metres) of the search strip of one observer when the aircraft was flying at 300 feet above ground level; and

Total Strip Width for both Observers = the calibrated combined strip width (in metres) for both observers when the aircraft was flying at 300 feet above ground level (Appendix 1).

For each species, the observed and expected numbers of groups/animals were compared using a chi-square one-sample statistical test with 1 degree of freedom (Siegel 1956). No test was conducted for a species if either expected number was < 5.

Results

The right observer (who had previous survey experience) saw more groups of giraffe, steinbuck and waterbuck than the novice left observer (Table A5.1). However, when individual animals – as opposed to groups - were considered, the difference for giraffe was reduced, suggesting that for this species the group difference was at least partly due to differences between the two observers in their definition of a group.

This survey was designed to count elephants and so particular attention was paid to the observers' observations of these. The numbers of cow herds and cows counted by the two observers were very similar to those expected if the observers were equally efficient (once allowance was made – as it was in Table A5.1 - for the differing widths of the left and right strips). However, the novice left observer saw more elephant bull groups and more elephant bulls than expected and while the results are not of great statistical significance, it is surprising that a novice observer should see more than an observer with some experience.

Table A5.1. Comparison of numbers of groups and numbers of individual animals seen by the left and right observers

The left observer had no prior experience as a transect survey observer. The strip width when flying at 300 feet above ground level was 174 m for the left observer and 153 m for the right observer. No chi-square test was conducted if any expected number was < 5. *P* indicates the probability of the observed numbers if there was no difference in the efficiency of the two observers. ns = not significant.

| Species | Observed Number of Groups | | Expected Number of Groups | | Observed Number of individuals | | Expected Number of individuals | | Chi-square (groups) | <i>P</i> | Chi-square (individuals) | <i>P</i> |
|-----------------|---------------------------|-------|---------------------------|-------|--------------------------------|-------|--------------------------------|-------|---------------------|----------|--------------------------|----------|
| | Left | Right | Left | Right | Left | Right | Left | Right | | | | |
| Buffalo | 19 | 20 | 21 | 18 | 643 | 818 | 777 | 684 | 0.4 | 0.521 | 49.4 | 0.000 |
| Carcass 1 or 2 | 7 | 12 | 10 | 9 | 7 | 12 | 10 | 9 | 1.9 | 0.168 | 1.9 | 0.168 |
| Carcass 3 | 3 | 9 | 6 | 6 | 3 | 10 | 7 | 6 | 3.0 | 0.083 | 5.0 | 0.026 |
| Carcass 4 | 120 | 88 | 111 | 97 | 123 | 88 | 112 | 99 | 1.6 | 0.211 | 2.3 | 0.129 |
| Cattle | 18 | 21 | 21 | 18 | 118 | 142 | 138 | 122 | 0.9 | 0.335 | 6.2 | 0.013 |
| Donkey | 4 | 2 | 3 | 3 | 8 | 4 | 6 | 6 | | | 1.3 | 0.248 |
| Duiker | 12 | 7 | 10 | 9 | 14 | 7 | 11 | 10 | 0.8 | 0.358 | 1.7 | 0.190 |
| Eland | 2 | 5 | 4 | 3 | 2 | 8 | 5 | 5 | | | 3.6 | 0.058 |
| Elephant bull | 269 | 203 | 251 | 221 | 465 | 352 | 435 | 382 | 2.8 | 0.097 | 4.4 | 0.035 |
| Elephant cow | 190 | 173 | 193 | 170 | 1484 | 1284 | 1473 | 1295 | 0.1 | 0.752 | 0.2 | 0.675 |
| Giraffe | 23 | 45 | 36 | 32 | 59 | 71 | 69 | 61 | 10.0 | 0.002 | 3.1 | 0.079 |
| Ground hornbill | 6 | 4 | 5 | 5 | 14 | 12 | 14 | 12 | 0.4 | 0.527 | 0.0 | 1.000 |
| Hippo | 4 | 1 | 3 | 2 | 1 | 12 | 7 | 6 | | | 11.1 | 0.001 |
| Impala | 29 | 26 | 29 | 26 | 245 | 227 | 251 | 221 | 0.0 | 1.000 | 0.3 | 0.580 |
| Kudu | 14 | 21 | 19 | 16 | 40 | 65 | 56 | 49 | 2.9 | 0.090 | 9.8 | 0.002 |
| Ostrich | 7 | 2 | 5 | 4 | 12 | 4 | 9 | 7 | | | 2.3 | 0.131 |
| Roan | 3 | 6 | 5 | 4 | 5 | 16 | 11 | 10 | | | 6.9 | 0.009 |
| Sable | 25 | 30 | 29 | 26 | 110 | 202 | 166 | 146 | 1.2 | 0.280 | 40.4 | 0.000 |
| Steinbuck | 1 | 10 | 6 | 5 | 1 | 11 | 6 | 6 | 9.2 | 0.002 | 8.3 | 0.004 |
| Unknown Carcass | 62 | 67 | 69 | 60 | 65 | 68 | 71 | 62 | 1.5 | 0.217 | 1.1 | 0.297 |
| Warthog | 9 | 14 | 12 | 11 | 18 | 24 | 22 | 20 | 1.6 | 0.210 | 1.5 | 0.217 |
| Waterbuck | 3 | 10 | 7 | 6 | 38 | 69 | 57 | 50 | 5.0 | 0.026 | 13.6 | 0.000 |
| Wildebeest | 9 | 2 | 6 | 5 | 140 | 10 | 80 | 70 | 3.3 | 0.069 | 96.4 | 0.000 |
| Zebra | 29 | 32 | 32 | 29 | 160 | 189 | 186 | 163 | 0.6 | 0.442 | 7.8 | 0.005 |

During this survey, there were two calibration exercises (Appendix 1). On both occasions, the actual strip width of the novice left observer was positively correlated with flying height (as it should have been). For the left observer, the calibrated strip width at 300 feet agl was 176 m during the first exercise and 174 m during the second. For any observer, such results would be considered very encouraging. They suggest that the left observer was using the rods and decision and window marks correctly during the calibration exercises.

Conclusion

The differences between the two observers in the numbers of bull groups and bulls seen may be due to chance (after all, the animals being counted during a survey are seldom equally distributed on the two sides of the plane). Or the left observer may have been less effective at using the rods and decision and window marks during the actual survey than during the calibrations, with the result that some bull groups near the edge of the search strip were considered to be inside the strip when in fact they were outside.

The need for extensive and rigorous training of observers prior to their involvement in major (and therefore expensive) surveys cannot be emphasised too strongly.

Reference

Siegel, S. 1956. *Nonparametric Statistics for the Behavioral Sciences*. McGraw-Hill Kogakusha Ltd, Tokyo. 312 pp.