



## Trophy Size Measurements, Is It A Useful Index for Determining Population Status of the Endemic Kafue Lechwe (*Kobus Leche Kafuensis*) On the Kafue Flats, Zambia?

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### Abstract

A study to determine body and horn length as an index for Kafue lechwe population status was carried out during the 2011/2012 hunting season shortly before government imposed a non time bound hunting moratorium at the end of 2012. Body and horn measurements were taken based on Safari Clun International, Method I for animals with simple horns. Specimens were obtained from non resident and resident hunters. From a total of 183 specimens, horn length showed decreasing trend from June to September, and the measurement was low until November, and then increased in December. Boss circumference did not show any clear pattern between months. It was concluded that horn length was a useful index for determining population status and availability of trophy animals. Detailed information is required to identify and isolate key factors responsible for the bimodal peak in horn length at the beginning and end of hunting season.

**Keywords:** Trophy Measurement, Hunting, Trophy Quality, Hunting, Boss, Horn Length.

### Introduction

In Zambia there are three subspecies of lechwe; red or Zambezi lechwe (*Kobus leche leche*) found in Busanga Plains of Kafue National Park and Barotse Plains of Western Province, black or bangweulu lechwe (*Kobus leche smithemani*) endemic to the Bangweulu swamps and brown or Kafue lechwe (*Kobus leche kafuensis*) endemic to the Kafue Flats (Ansell, W.F.H. 1964; Skinner, 1990). Of the three subspecies, the Kafue lechwe is the most abundant though the trio have suffered population decline of more than 25% in the last 30 years (Chansa & Kampamba, 2005). On the Kafue flats it has the most biomass of all wild herbivores and is critical in the maintenance of biodiversity and promotion of tourism. This precipitous decline of an endemic and critical species constitutes an area of concern to management and maintenance of the ecological integrity of the Kafue Flats. It is suggested that its decline may offset a domino effect and other species may also decline. For instance, wattled crane (*Grus carunculatus*) seems to follow a similar pattern as was demonstrated by Chansa & Kampamba (2005). While the population has continued to decline, hunting licences for meat and trophies have remained the same and in some instances have exceeded 1,000 animals per year excluding animals being lost through poaching (Wataru, 2010). With budget constraints in the law enforcement agency, Zambia Wildlife Authority (ZAWA) which is expected to be self financing and the rising demand for an increased share of the hunting revenue by the Local Communities, the species has continued to experience tremendous pressure through high off take levels accentuating population decline. All off take quotas for the period 2006-2012 depended on the 2005 survey results, even in instances where poaching levels were high. Repeating aerial surveys annually or biannually is a huge cost to ZAWA which does not have an aircraft of its own and hiring one costs about USD350 *per* hour which is a huge cost as a complete survey of the entire Kafue Flats requires about two days.

In instances where aerial surveys become prohibitive in terms of cost, index methods can be used to assist management in monitoring the performance of the population.

An index method in this circumstance becomes a standard approach to produce an indirect measurement of the status of the population of the area. An index of trophy quality gives an indication of the status of the population, based on the annual average size of a given species in a particular area over several years.

The major objectives of this study therefore were to; i) collect base line data for future monitoring programmes of the trophy size of Kafue lechwe in Kafue Flats, ii) understand population size and trend since 2005 when the last survey was done so as to provide data required for determining sustainable off take levels, iii) to determine the practicality and reliability of trophy size trend in population monitoring, and iv) to understand the basic characteristics of the measurements, including seasonal trend and correlation of the different measurements.

## 2. Methods and Materials

### 2.1 Study Area

The Kafue Flats covers an area of about 6,000 km<sup>2</sup> comprising Lochinvar National Park 410 km<sup>2</sup> in extent, Blue Lagoon National Park 420 km<sup>2</sup> and the Kafue Flats Game Management Area 5, 175km<sup>2</sup> (Figure 1). It is an extensive floodplain of the Kafue River System, situated between the Itezhi-Tezhi and Kafue Gorge dams and is located at coordinates 15° 40'S - 16° 10' S and 27° 10' E-28° 20'E in Southern Province of Zambia. The area was designated as a Wetland of International Importance (Ramsar) in 1991 and is a habitat for Kafue lechwe, an endemic subspecies and semi aquatic antelope. The area also holds a population of global significance of the IUCN endangered bird wattled crane (*Grus carunculatus*).

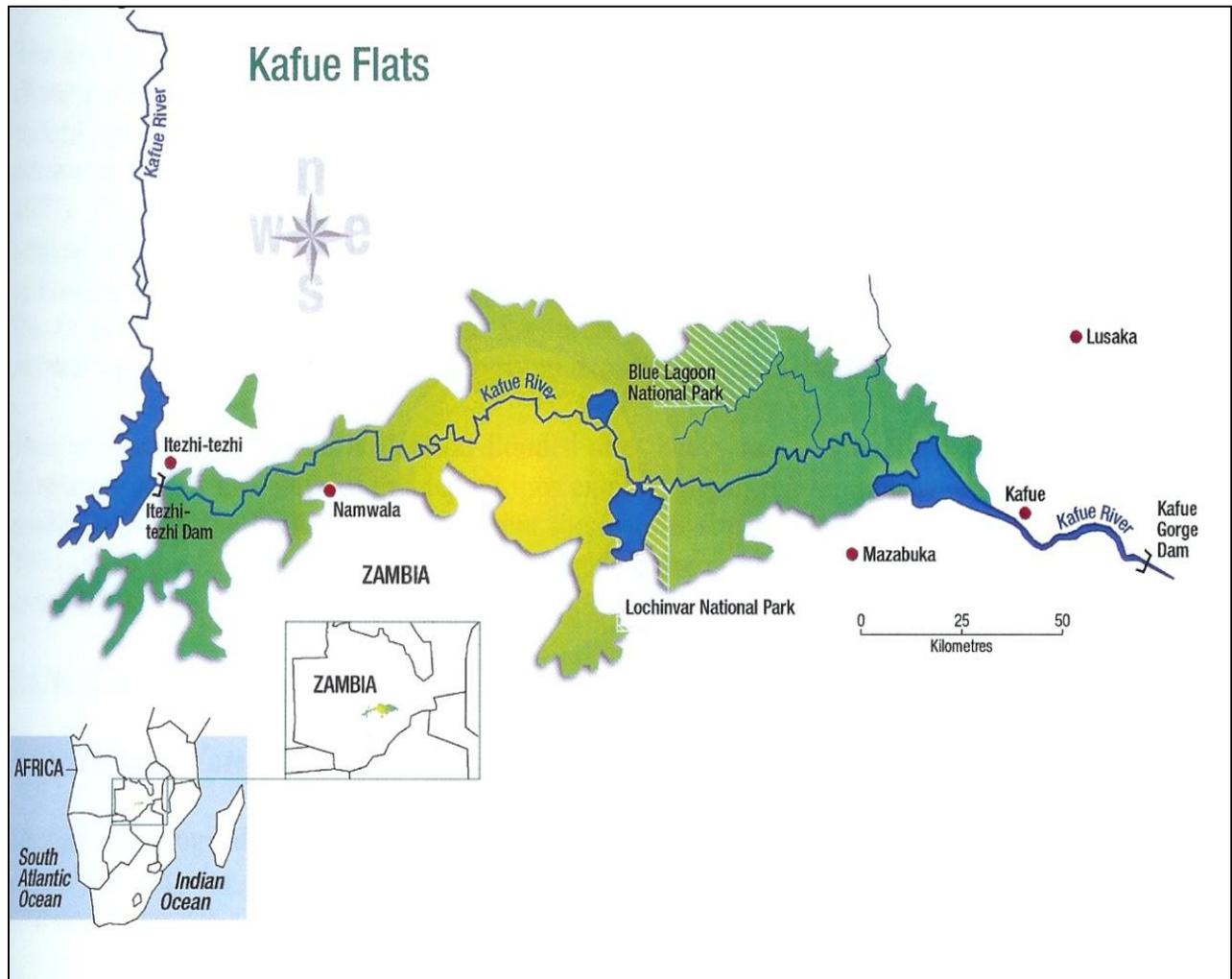


Figure 1 Location of the Kafue Flats an important habitat for the endemic semi aquatic Kafue lechwe antelope, Zambia.

### 2.2 Data collection

#### 2.2.1 Horn Measurements

In this survey, horn and body size of hunted specimens of Kafue lechwe for the 2010/11 season were measured. In measuring horn size, the Safari Club International (SCI) Method I for animals with simple horns (SCI, 2007) was used. Each horn was measured following the centre of front surface from the base of the horn to the tip, keeping parallel to the hair like grain of the horn material. The direction of the grain was followed carefully for the full length of the measurement.

#### 2.2.2 Body Measurements

Body measurements were also taken as described in an SCI (2007) manual and Kingdon (2008). Total length, tail length, head and body length, and shoulder height of hunted Kafue lechwe were measured in centimetres using a tape based on Safari Club International (2007) Method I. These were compared with standard measurements for the species in published literature. The volunteer biologist, Wildlife Police Officers (WPOs) or Village Scouts who escorted the hunters took the measurements and recorded on the forms provided for data capture. All escorting officers were given a short training on how to measure and enter data on the forms. The validity of the data and subsequently the reliability of the

results as a true reflection of the population status was based on the following assumptions; i) a safari client will reject inferior trophies and select the biggest trophy available during the period of his hunt, ii) a professional hunter or the client himself is able to estimate trophy quality before the animal is hunted, and iii) that trophy measurements are taken accurately based on the picture provided on the recording sheet where the horn with the measuring line were shown. This eliminated the chance for error in taking measurements.

### 3.0 Results

#### 3.1 Measurements

A total of 183 Kafue lechwe specimens were measured during the survey period, representing a sample of 42% of the total of 435 specimens hunted in the south bank. The details of measurements are shown in Table 1 below.

Table 1 Summary of body and horn measurements of the Kafue lechwe

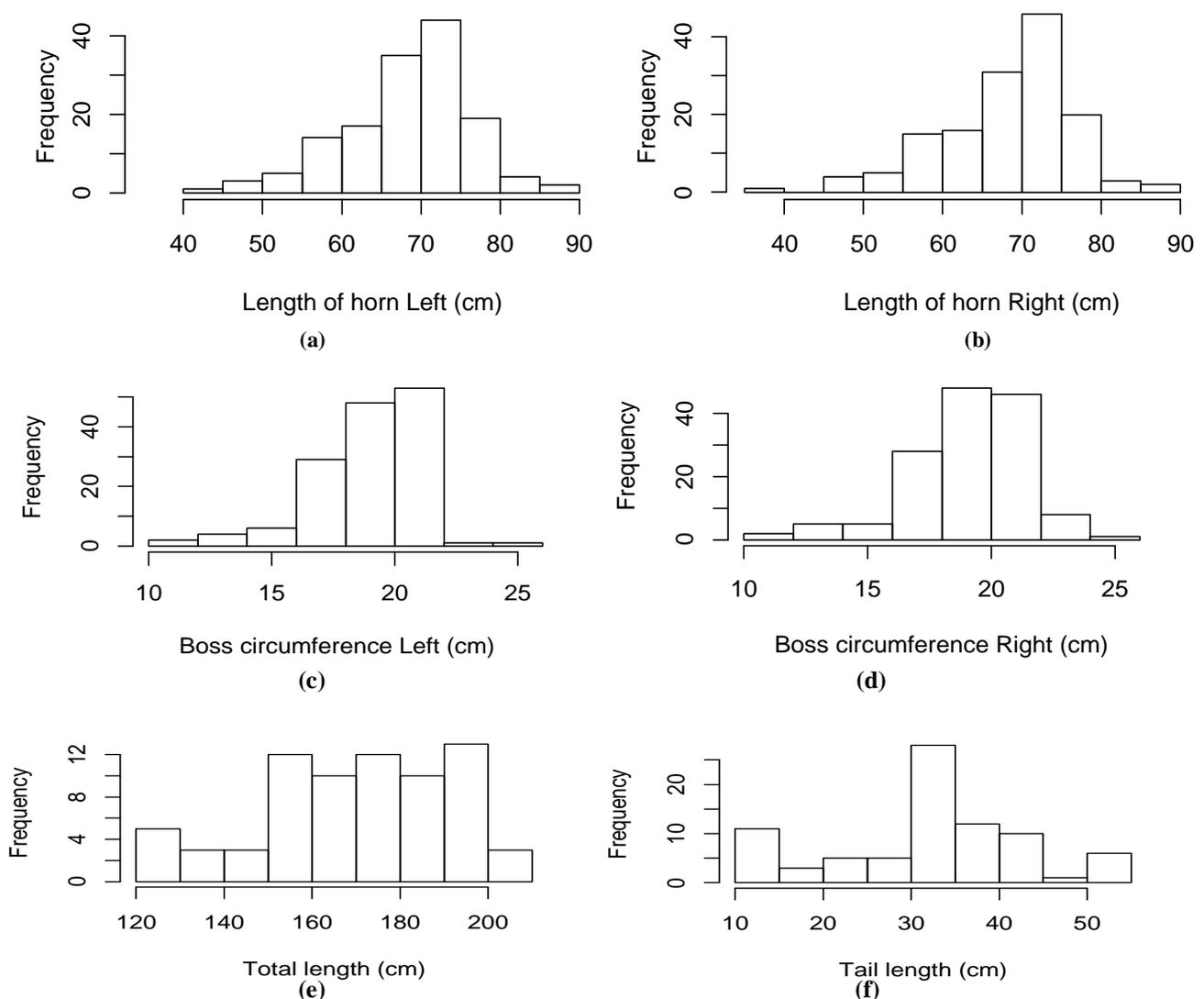
	Length of horn (cm)		Boss circumference (cm)		Body size (cm)			Weight (Kg)	
	Left	Right	Left	Right	Total length	Tail length	Head and body length		Shoulder height
N <sup>1)</sup>	168	167	168	167	96	106	82	87	1
Average	66.8	66.8	18.3	18.4	173.7	33.2	147.6	86.0	60.0
SD $\pm$ <sup>2)</sup>	8.5	8.6	2.1	2.3	21.9	10.6	32.6	13.1	-

1) The number of Kafue lechwe measured.

2) Standard Deviation

#### 3.1.1 Horn Length

Horn length for right and left and boss circumference right and left depicted smooth curve with one peak and unsymmetrical shape (Figure 2,a,b,c,d). Head and body length formed symmetrical distribution (Figure 2 g), while the histogram of other three measurements did not show **any** clear trend (Figure 2e, f, h).



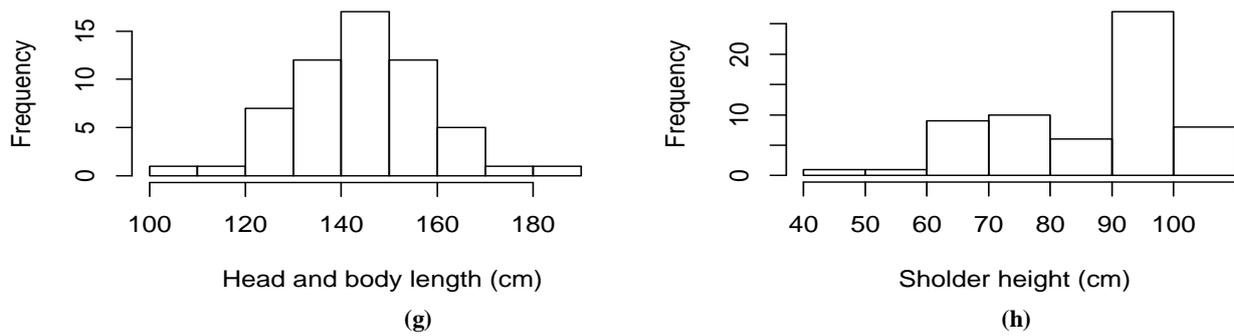


Figure 2 a) The distribution of length of horn (left) measurements, b) The distribution of length of horn (right) measurements, c) The distribution of boss circumference (left) measurements, d) The distribution of boss circumference (right) measurements, e) The distribution of total length measurements, f) The distribution of tail length measurements, g) The distribution of head and body length measurements, h) The distribution of shoulder height measurements.

**3.1.2 Seasonal Changes**

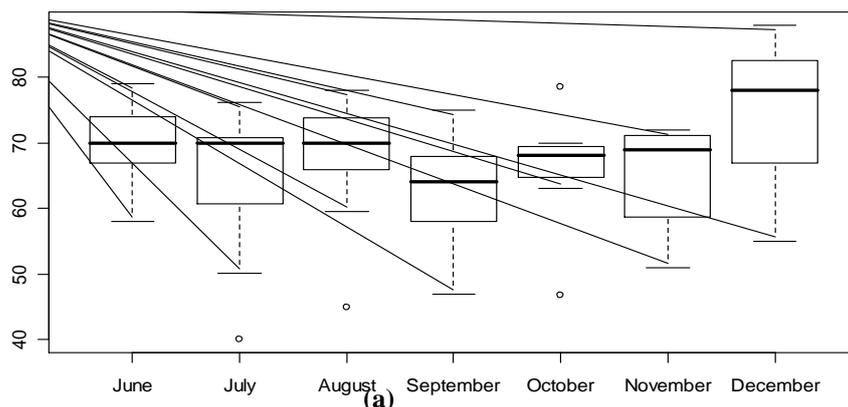
Length of horn (right and left) and boss circumference (right and left) were summarised based on month which showed decreasing trend from June to September and the measurements were low until November, and then the measurements increased in December. The horn length (right and left) are shown in Table 2 and Figure 3, a, b, c, d. Boss circumferences (right and left) fluctuated slightly depending on the month, but did not show clear seasonal trend.

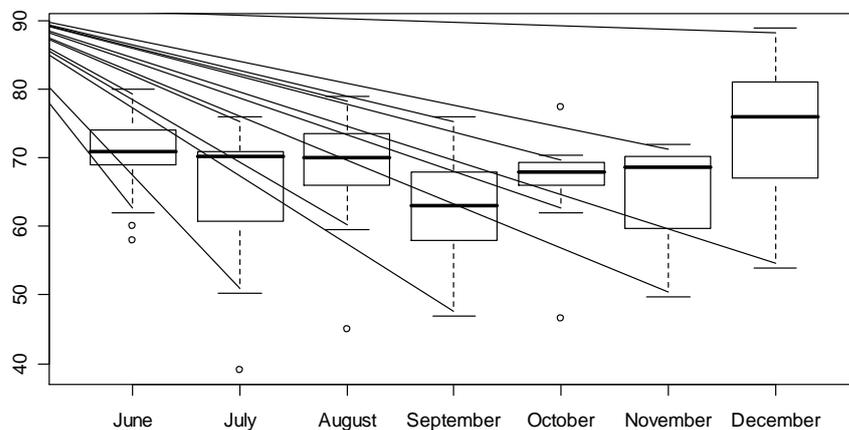
**Table 2** Monthly summary of the trophy size

Month		Length of horn		Boss circumference	
		Left	Right	Left	Right
June	N <sup>1)</sup>	26	25	23	22
	Avarage (cm)	70.0	70.6	17.8	17.8
	SD <sup>2)</sup>	5.2	5.2	2.1	2.2
July	N	28	28	28	28
	Avarage (cm)	65.5	65.7	19.4	19.7
	SD	8.9	9.1	1.6	2.0
August	N	29	29	29	29
	Avarage (cm)	68.7	68.6	17.2	17.3
	SD	6.8	7.0	3.0	3.1
September	N	25	25	27	27
	Avarage (cm)	63.2	63.2	18.3	18.3
	SD	7.0	7.1	1.2	1.2
October	N	13	13	14	14
	Avarage (cm)	66.7	66.5	19.1	19.4
	SD	7.1	7.1	2.1	1.7
November	N	7	7	7	7
	Avarage (cm)	64.6	64.3	17.2	17.1
	SD	9.3	9.5	1.5	1.4
December	N	16	16	16	16
	Avarage (cm)	74.8	73.9	20.1	20.5
	SD	10.4	10.7	1.6	1.8

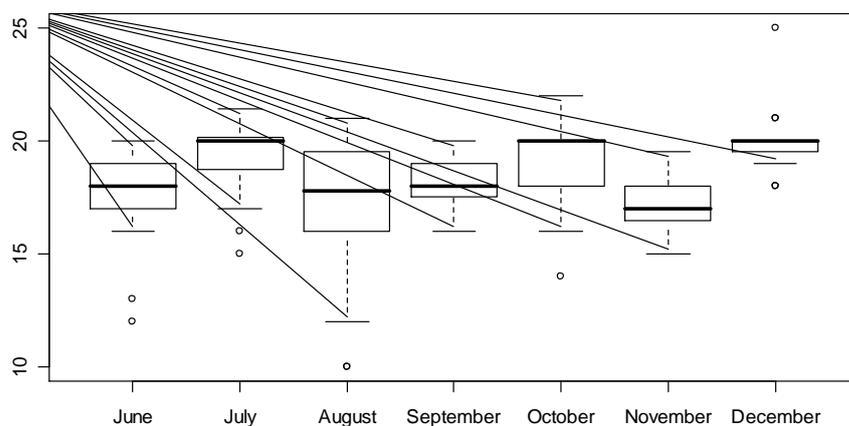
1)N: the number of Kafue lechwe measured

2)SD: standard deviation

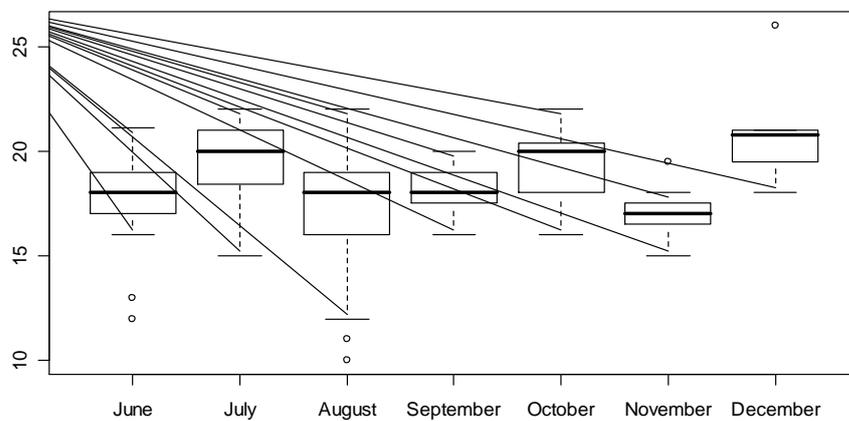




(b)



(c)



(d)

Figure 3 a) Seasonal change of the length of the left horn measurements, b) seasonal change of the length of the right horn measurements, c) seasonal change of the left boss circumference measurements, d) seasonal change of the right boss circumference measurements, Kafue Flats, Zambia.

**3.1.3 Correlation among Measurements**

Correlation of the measurements calculated by Spearman's rank-correlation method which determined; (i) horn length of left and right sides, (ii) boss circumference of left and right sides, (iii) total length and shoulder height, and (iv) tail length and shoulder height, showed no significant correlations between horns (length of horn, boss circumference) and body sizes (total, tail, head and body length, and shoulder height) ( $p < 0.05$ ) (Table 3).

Table 3 Coefficient of correlation of body, boss and horn measurements for Kafue lechwe

Measurement	Length of horn		Boss circumference		Total length	Tail length	Head and body length	Shoulder height	
	Left	Right	Left	Right					
Length of horn	Left	-	0.976**	0.422**	-	0.203	0.085	0.155	0.098
	Right	-	-	-	0.451**	0.206	0.093	0.165	0.106
Boss circumference	Left	-	-	-	0.955**	-0.094	-0.048	-0.175	-0.284
	Right	-	-	-	-	-0.118	-0.152	-0.140	-0.269
Total length	-	-	-	-	-	-	-	-	0.539**
Tail length	-	-	-	-	-	-	-	0.081	0.407**
Head and body length	-	-	-	-	-	-	-	-	0.293
Shoulder height	-	-	-	-	-	-	-	-	-

Note: - : Not analysed  
 \*\*: p<0.01

## 4. Discussion

### 4.1 Body and Horn Measurements

Results of this survey suggest that the methodology of horn sizes (the length of horn and boss circumference) was generally appropriate and is a useful indicator of trophy quality. The method is simple and easy to use which gives accurate readings (SCI, 2007). The weakness however, is when hunters, particularly resident hunters cut the heat apart in order to get tongue and other organs for food abandoning the horns in the field. Such specimens are then lost. It also requires that the researcher uses the same officers in order to maintain consistency, accuracy and precision. Since this study was taken in one hunting season only, it would not be possible to compare with other figures and this may have accounted for the assumed accuracy of figures obtained. Time series data may be required to ascertain the accuracy of this method on Kafue lechwe in future.

#### 4.1.1 Seasonal Changes

Horn length showed decreasing trend from June to September, and the measurement was low until November, and then the measurement increased in December. This trend could be explained by the hunting pressure and Kafue lechwe's migration as follows; (i) Kafue lechwe with bigger horns were hunted at the beginning of hunting season. During this season, hunting was undertaken at a specific area on the western side of GMA near the National Park boundary which was accessible at the time, (ii) by end of August hunters started to hunt not only big Kafue lechwe but also Kafue lechwe with medium sized trophy, a trend which continued until November. During this season, the hunting was undertaken mainly in the western GMA and sometimes in the eastern GMA in areas where poaching is also high. Such poaching competes with trophy hunting and takes away trophy animals, (iii) in December Kafue lechwe starts to migrate from further west of the GMA including Nakasale area towards areas near the National Park boundary, this massive movement provides a large pool of trophy animals. Most of the animals migrating to this area may have not been exposed to hunting pressure, and bigger Kafue lechwe was available in those herds which explains why trophy quality increased in December.

The other reason for the decline of trophy quality at the mid of the hunting season could be attributed to the skewed hunting pressure towards the most accessible areas. This could easily eliminate trophy animals until a new group moves into the area which only takes place towards the end of the year in December.

The undefined pattern of boss measurements cannot be explained by these results. More information, for example Kafue lechwe's migration pattern, the number of Kafue lechwe hunted in each area, and detailed statistical analysis would be required to conclude the hypothesis.

### 4.2 Future Monitoring Programmes

The following have been recommended for implementation;

- (1) Monitoring of hunting pressure based on locality and time of the year will be required to ensure equitable distribution of impact.
- (2) It is suggested that the hunting pressure should be lower than the assumed sustainable level (see Figure 4). For the statistical analysis, Wilcoxon rank-sum test can be adopted, and sample size should be more than 30 in order to apply a parametric statistical test.
- (3) Comparison must be done between the same periods of the year, considering the possible seasonal change and

amount of rainfall received.

- (4) A cross check by the Principal Researcher is encouraged in order to ascertain accuracy of measurements.
- (5) Further studies on the possible correlation between body size and horn length may be required as at times small bodied animals may carry large horns and vice versa. If there is no correlation the two must be handled separately.

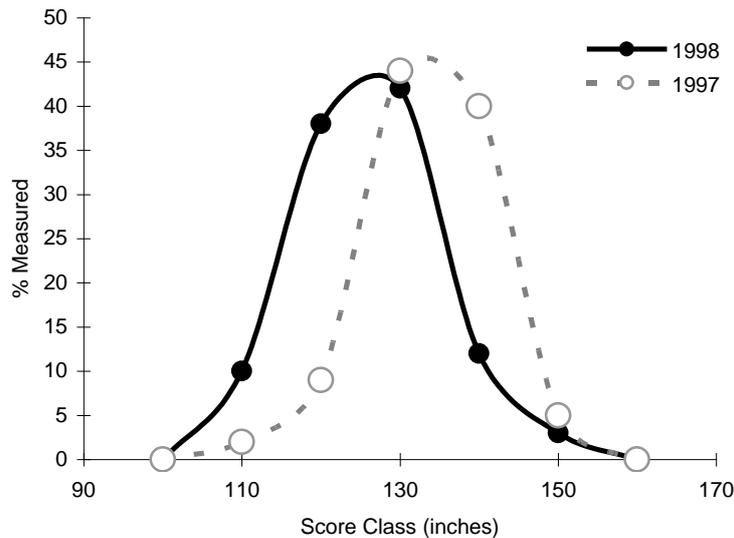


Figure 4 An example of the distribution of trophy quality measurement for kudu in Botswana (Source: Jachmann, 2001). This graph shows distribution of the measurement became smaller in 1998, thus it was recommend adjusting hunting quota down wards (WWF 2000 ).

### Acknowledgement

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### References

- Ansell, W.F.H. (1964). The Kafue Flats lechwe. *Puku*, 2, pp 10 - 13.
- Chansa, W. & Kampamba, G. (2005). The population status of the Kafue lechwe in the Kafue Flats, Zambia. *African Journal of Ecology*, 48, pp 837 – 840.
- Jachmann, H. (2001). Estimating abundance of African wildlife: An aid to adaptive management. Kluwer Academic Publishers, Boston.
- Kingdon, J. (2008). The Kingdon field guide to African mammals. A&C Black Publishers Ltd., London.
- SCI. (2007). Safari Club International: Official Measurer's Manual. Gates Pass, Tuckson.
- Skinner, J.D. & Smithers, R.H.N. (1990). The mammals of the southern African sub region. University of Pretoria, Pretoria.
- Wataru, T. (2010). Volunteer biologist's report to Zambia Wildlife Authority, Chilanga.
- WWF. (2000). Quota Setting Manual. Wildlife Management Series No.5. WWF-World Wide Fund for Nature Southern African Regional Programme Office, Harare.