Hunting in Tanzania: Has Science Played Its Role?

A. N. Songorwa[1]* and Michelle du Toit[2]

[1] Department of Wildlife Management, Sokoine University of Agriculture, P.O.Box 3073, Morogoro, Tanzania, Songorwa@suanet.ac.tz.

[2]Mammal Research Institute, Department of Zoology and Entomology, University of Pretoria, Pretoria, 0002, SOUTH AFRICA. E-mail: dutoit.michelle@gmail.com, mdutoit@zoology.up.ac.za

Abstract

Tanzania is a favoured destination for trophy hunting and this industry contributes greatly to the country's economy and wildlife conservation. By far the greatest number of animals shot by tourists annually is from Selous Game Reserve. Problems associated with the hunting industry include high demand for trophies, short-term profit making, and various unscrupulous practices on the ground, which together undermine the sustainability of the industry. Tanzanian wildlife authorities require scientific information on wildlife populations so that they can make informed decisions especially in setting hunting quotas. This paper aims at providing some insights into the matter.Trophy measurement records or quality from the North-western Sector of Selous for the period 1999-2004 were analyzed using SPSS 11.5 for Windows. Based on that analysis this paper assesses the quality of trophies from the Sector and finds that there was a decline from 1999 to 2004. In the study area, hunters increased gradually from 1998 to 2004. There were definite declines in trophy quality in all five species although in hippos the trend was not as clear as in the rest. The implication is that populations of these big five may be declining in the study area. It is recommended that more research on trends in trophy quality be conducted and a mechanism to make this information available to all stakeholders be developed.

Keywords: Hunting, Selous Game Reserve, Tanzania, trophy quality, science

Introduction

Trophy hunting is the primary form of consumptive wildlife utilization in Tanzania, taking place in Game Reserves, Game Controlled Areas and Open Areas. The hunting is conducted from 1 July to 31 December each year. This is justified by the fact that in that period hunting areas are dry and there is limited grass due to burning. It also serves to restrict hunting to outside of the main calving season, which is January to May to minimize disturbances to lactating animals.

Nationally there has been an increase in outfitters (hunting companies) from 34 in 1998 to 44 in 2005 – a 29.4% increase in eight years. The Wildlife Division sets annual hunting quotas (numbers of animals per species per hunting block) (MNRT, 2002), which are reportedly well under or at sustainable off-take levels (MNRT, 2002; Baldus *et al.*, 2003). Therefore, trophy hunting is believed to have the least negative impact of any activity in the wildlife tourism industry (Jackson III, 1996; Severre, 1996; Buetzler, 1990).

Trophy hunting can contribute positively to both conservation and country's economy but, as a result of lack of necessary information, the activity has been reported to contribute to local wildlife population declines and even complete destruction of certain populations (Buetzler, 1990). Growing demand combined with the increase of outfitters creates pressure to increase the quotas, which in turn threatens to compromise ecologically justified principles (Stephenson, 1987; Baldus, 1990; MNRT, 2002; Baldus *et al.*, 2003). Furthermore, the social structure and reproductive rates of hunted species may be affected by the continual removal of the fittest males (Whitman *et al.*, 2004).

***Corresponding author**

Tanzania J. Agric.Sc. (2007) Vol. 8 No. 1, 31 – 38

Accepted March, 2008

Due to the problems outlined above, there is a need to constantly monitor the quality of trophies Tanzania produces (Stephenson, 1987; MNRT, 2002). With an area of 46,970 km^2 the Selous Game Reserve (Figure 1) is the prime trophy hunting area in Tanzania (Caro *et al.*, 1998). There is still some poaching in the reserve, but the current level does not negatively affect the game population status (Baldus *et al.*, 2003). It is believed that trophy hunting is the main factor, which will affect the game populations and hence the aim of the present study.

Materials and methods

Study area

The North-western Sector (NWS; Msolwa) (4,633 km^2) is among eight administrative sectors of the Selous Game Reserve (Figure 1). For trophy hunting the NWS is responsible for eleven blocks, i.e. K4, K5, M1, M2, R1, R2, R4, U1, U2, and also K1 and K2, which belong to the Western Sector (Ilonga; Figure 1). The NWS of Selous was chosen for this study because of its geography. Big rivers surround it on three sides (Kilombero River to the west and south, and Ruaha River to the east) and on the north and northwest there are settlements and a sugarcane plantation, making NWS effectively an 'island'. There is little inward or outward migration of animals and, therefore, most of the hunted game populations are resident. Many small hunting blocks are squeezed into this space and the pressure from trophy hunting is most felt in this area (Cauldwell, 2004).

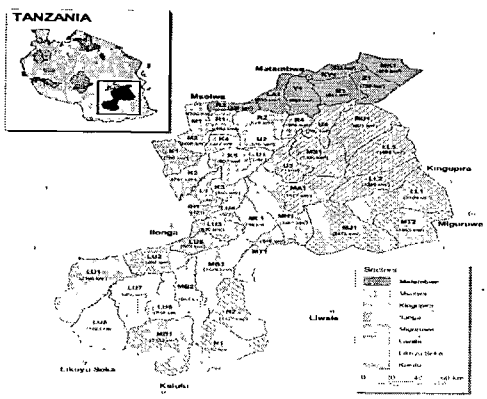

Figure 1: Map of Selous Game Reserve showing administrative sectors and hunting blocks (*Source*: Adopted from Cauldwell, 2004)

Data sources, collection and analysis

This article is based on secondary data. Professional Hunters in collaboration with Game Scouts who oversee trophy hunting activities record on special forms measurements of trophies of the animals killed. The measurements are in inches as per Safari Club International (SCI) standards (MNRT, 2002). The authors analyzed those hunting data for the purpose of getting a clear picture of the trend in quality of trophies. Because of the limited space, focus is on five species most preferred by trophy hunters, i.e. buffalo, lion, leopard, elephant and hippo, commonly known to trophy hunters in Tanzania as the Big Five. This source of data is supplemented by data collected from other sources especially the various reports on trophy hunting in Tanzania and Selous Game Reserve in particular.

The statistical software used for the analysis was Statistical Package for Social Sciences (SPSS) 11.5 for Windows. A Pearson Correlation was used to assess the relationship of various measurements within species and, where significantly correlated, only one measurement was used as an indicator of trophy quality. However, we report the results of both horn and boss measurements in the case of buffalo despite their strong correlation, as the trends of annual means differ. A One-Way ANOVA test was used to analyze the measurements of trophies – to test the hypothesis that the annual means were not significantly different and to identify those that differed, in case of differences. Lavene's homogeneity-of-variance test was run first to test for the equality of annual (or group) variances. Results showed that for most of the species, variances of the annual means were not equal. Since sample sizes (Table 1) were also not equal, Welch test (a robust test of equality of means) was run. The Welch statistic is more powerful than the standard F when sample sizes and variances are unequal. Post-Hoc pair-wise tests were then used to assess each pair of means.

Results and Discussion

Trends in numbers of hunters and nimals hunted

Trend in numbers of hunters in Selous Game Reserve between 1988 and 2003 is shown in Figure 2. Except for a few years generally the number increased gradually. The numbers of trophy hunters and animals hunted in NWS also steadily increased since 1990 (Figure 2).

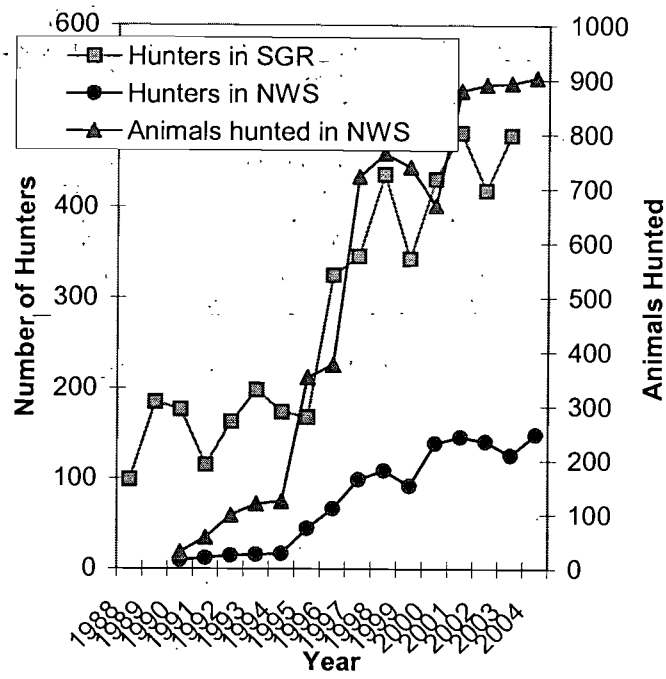

Figure 2: Number of hunters in Selous Game Reserve (1988-2003) and in NWS and animals hunted in NWS (1990-2004) (*Source*: Some of the data are adopted from MNRT (2002:38))

In 2003, the whole of Selous Game Reserve received 479 hunters of which 126 (26.3%) went to NWS alone. In the same year, a total of 2,969 animals were hunted in the reserve 894 (30.11%) of which came from NWS, which, at 6,206 km^2 (including blocks K1 and K2), only comprises 13.21% of the area of the reserve.

Numbers of animals of the Big Five hunted in NWS between 1999 and 2004 for which some trophy measurements were taken are shown in Table 1.

Table 1: Numbers of the Big Five hunted in NWS (1999-2004)

		Buffalo	*Lion*	*Leopard*	*Elephant*	*Hippo*
Year	1999	58	13	12	-	27
	2000	122	10	16	4	21
	2001	153	10	9	5	38
	2002	196	22	8	5	35
	2003	192	11	20	8	32
	2004	223	10	19	9	43
	Total	944	76	84	31	196

Table 2: Correlations between various measurements of trophies

Species	*Comparison/correlation*		*Pearson Correlation*	*Significance (2-tailed)*
Buffalo	Horn (tip-to-tip)	Boss width	0.163	P < 0.001
Lion	Skull length	Skull width	0.948	P < 0.001
	Pad length	Pad width	0.633	P < 0.001
Leopard	Skull length	Skull width	0.752	P < 0.001
	Pad length	Pad width	0.837	P < 0.001
Elephant	Tusk weight	Tusk circumf.	0.462	P = 0.035
	Tusk length	Tusk weight	0.506	P = 0.019
	Tusk length	Tusk circumf.	0.504	P = 0.006
Hippo	Tooth length	Tooth circumf.	0.634	P < 0.001

Table 3: Annual means of trophy measurements for the big five (1999 –2004)

Species: Measurement in inches	Year					
	1999	*2000*	*2001*	*2002*	*2003*	*2004*
Buffalo: Mean horn length (tip-to-tip)	71.4	72.2	71.1	69.9	69.2	70.3
Buffalo: Mean boss width	12.034	12.133	11.930	11.365	11.533	11.336
Lion: Mean skull width	10.429	9.929	9.191	8.725	9.405	9.191
Leopard: Mean skull width	6.800	6.429	6.471	5.843	6.071	5.900
Elephant: Mean tusk weight	-	33.810	15.714	20.000	20.003	14.762
Elephant: Mean tusk length	-	78.679	56.038	68.302	57.547	64.151
Hippo: Mean tooth length	22.719	23.109	20.844	21.969	21.031	21.578

Trends in trophy quality

Results from the statistical analysis of trophy measurements are presented here separately. For some species certain measurements were found to correlate (Table 2). Using correlations at 0.01 levels, the following measurements were selected per species to represent trophy quality: horn length (tip-to-tip) and boss width for buffalo; skull width for lion and leopard; average tusk weight and average tusk length for elephant; and average tooth length for hippo. The reason they are presented here is twofold: they reflect the age or size of the animal hunted; and to abide by the measurements recommended by SCI. Sample sizes are given in Table 1.

In the case of horn tip-to-tip measurements for buffalo, the annual means were generally decreasing (Table 3). The Welch test showed a difference (P=0.004). A Post Hoc pair-wise test showed differences between the years 2000 and 2003 (P=0.001).

Means of average boss width showed an overall decline between the years 2000 and 2004 (Table 3) and were different (P<0.001). A Post Hoc pair-wise test showed differences between the following pairs: 2000 and 2002 (P<0.001); and 2000 and 2004 (P<0.001).

Lions' mean skull width declined continuously between 1999 and 2002, rose somewhat in 2003 and declined again in 2004 (Table 3). The differences were not significant with the Welch test (P=0.298). The Post Hoc pair-wise test also showed no significant difference between the pairs of annual means.

Leopards' mean skull width declined between 1999 and 2004 (Table 3), but with no significant differences (P=0.605; Welch test). The Post Hoc pair-wise test did not show significant difference between the pairs of annual means.

For elephants, with the exception of a small rise in 2002 and 2003, mean tusk weight generally declined (Table 3). The differences between annual means were not found to be significant (P=0.441), however. The Post Hoc pair-wise test also showed no significant difference between all pairs of annual means.

Mean tusk length did not show a clear trend (Table 3), and were not found to be statistically significant (P=0.592). The Post Hoc pair-wise test showed no significant difference between all pairs of annual means.

For hippos the mean tooth length did not show a clear trend but declined overall (Table 3). The differences between annual means were not found to be statistically significant (P=0.591). The Post Hoc pair-wise test showed

no significant difference between all pairs of annual means.

The decline in trophy quality

Of the seven annual means for the various measurements analyzed, six (85.7%) were declining, although only buffalo showed a significant decline (statistically) in trophy quality. Only elephant tusk length was relatively constant, but it may be an indicator of lack of positive correlation between tusk length and age of the animal. It is important to note, however, that statistically 'not significant' does not necessarily imply not interesting or not important (Rowntree, 1981). Therefore, the declining measurements indicate that younger animals are hunted and that the current levels of utilization are unsustainable, causing population sizes to decline.

The significant declines in both tip-to-tip and boss width measurements of buffalo trophies echo the sentiments of many in the hunting industry: that buffalos are being overexploited. However, these measurements are not necessarily an accurate reflection of the quality of trophy that clients want, which is solid-bossed bulls (Professional Hunter in NWS, personal communication in 2005). Rather, a measurement indicating the distance from horn base to horn base between the bosses would be a more accurate reflection on the trophy quality on buffalo, with a smaller gap indicating a more mature animal.

The decline in skull width of both lion and leopard in this study indicates that younger animals are shot, though the declines were not statistically significant. There have been many complaints that trophy quality for these species has declined. Research findings in Katavi ecosystem also show that trophy hunting in Lwafi Game Reserve, Mlele Game Controlled Area and Rukwa Game Reserve have had negative impacts on the lion population there (Caro, T.M., personal communication on 2 December 2005; Kniffer, C., personal communication on 2 December 2005). Currently, male lions must be a minimum of six years of age before they can be hunted in Tanzania (Funston, 2005); this has been shown through population simulation to have the least impact to the lion population (Packer, 2005). Using the extent of black on the tip of the nose to estimate age in lions, as proposed by Whitman *et al.* (2004), is not adequate for hunting purposes, as it is very easy to artificially modify the colour of the nose-tip before the trophy is processed. However, clients judge trophy quality by the size of the mane. Using colour of the nose as an indicator of trophy quality is, therefore, not a true reflection of quality from the client's perspective.

In lions, trophy hunting results in the repetitive off-take of individual animals with the largest manes. At four years, the males' manes are fully-grown, though reproductive success only peaks later. Two or three adult males form a coalition and sire all the cubs of an average of six females in the pride (Whitman *et al.*, 2004). When these males are removed through trophy hunting (or ousted by competitors), incoming males kill all cubs less than nine months old in order to induce oestrus in the females. Older cubs are evicted, and may not survive. Even when only one resident male of a coalition is removed, the coalition is more likely to be ousted (Whitman *et al.*, 2004). Excessive hunting may, therefore, result in a loss of recruitment through preventing cubs from attaining maturity. This might be a contributing factor to the small number of lions in NWS.

In the case of leopard, the solitary nature of the animal may mean that a client is happy to shoot whatever leopard they come across, regardless of the trophy size, as another leopard may be hard to find.

In the 2004 season some elephant tusks were far below the minimum size. Elephants may now be legally hunted if their tusks are 1.7 m (5.58 ft) or greater and at least 20 kg each. In 1999 the minimum allowed length was 2.21 m (7.25 ft) and weight was 25 kg. This minimum should not be lowered any further in response to declining trophy quality.

The size of the teeth of a hippopotamus is not the only thing that should be kept in mind when hunting these animals. The availability of males is a limiting factor, and the presence of hippos in a block does not justify them being on a quota unless the number of males is known. It is possible for a client to legally hunt hippo

based on his/her license, but inadvertently removes the last male from a particular pool.
A Professional Hunter mentioned the need to reduce lion and buffalo quotas, as young specimens were being shot due to a shortage of mature males. However, Cauldwell (2005) and Milledge (2005) caution that reducing quotas will not necessarily solve the problem. According to them, what is urgently needed is a reform of the entire hunting industry.

Conclusion

Trophy quality for all five species under the present study has declined. This decline in population is mainly caused by trophy hunting as the current poaching rate is relatively small and unlikely to affect the populations. It is recommended to conduct more research on trends in trophy quality, including more species and more hunting areas and develop a mechanism to make this information available to all stakeholders in order to have a sustainable policy on trophy hunting and consumptive wildlife utilization in general.

Acknowledgements

The authors would like to thank Mr. Mmari, then Sector Warden for NWS, who provided the data used in this article and all those who in one way or another contributed to the success of all the stages of this work. Special thanks should also go to the anonymous reviewers of the manuscript for their constructive comments.

References

Baldus, R. (1990). The Economics of Safari Hunting. In SADCC/GTZ, *Wildlife Based Tourism in the SADCC Region.* Workshop Proceedings, Kafue National Park, Zambia, 17-24 August 1990. SADCC/GTZ. Pages 198-207.

Baldus, R., Kibonde, B. and Siege, L. (2003). Seeking conservation partnerships in the Selous Game Reserve, Tanzania. *PARKS* 13, 50-61.

Buetzler, W. (1990). Safari Hunting Tourism. In SADCC/GTZ, *Wildlife Based Tourism in the SADCC Region.* Workshop Proceedings, Kafue National Park, Zambia, 17-24 August 1990. Pages 186-189.

Caro, T.M., Pelkey, N., Borner, M., Severre E.L.M., Campbell, K.L.I., Huish, S.A., Ole Kuwai, J., Farm, B.P. and Woodworth, B.L. (1998). The impact of tourist hunting on large mammals in Tanzania: an initial assessment. *African Journal of Ecology* 36, 321-346.

Cauldwell, A.E. (2004) *Analysis of hunting data of the Selous Game Reserve.* Unpublished report.

Cauldwell, A.E. (2005). Tanzania: Reduce the Quotas, or Reform? *African Indaba e-Newsletter* 3(4), 10.

Funston, P. (2005). Botswana Holds First National Lion Workshop. *African Indaba e-Newsletter* 3(3), 3-4.

Jackson III, J.J. (1996). An International perspective on Trophy hunting. In Leader-Williams, N., Kayera, J. A. and Overton, G. L. (eds.), *Tourist Hunting in Tanzania. Occasional Paper of the IUCN Species Survival Commission* 14, 7-11. IUCN.

Milledge, S. (2005). Tourist Hunting: How Tanzania Can Benefit From SADC Best Practices. *African Indaba e-Newsletter* 3(3), 5-7.

MNRT (Ministry of Natural Resources and Tourism). (2002). *Selous Game Reserve Management Plan, First Revision: 2003-2008.* Dar-es-Salaam.

Packer, C. (2005). Savannas Forever: A Certification Program for Lion Trophy Hunting. *African Indaba e-Newsletter* 3(3), 7-8.

Rowntree, D. (1981). *Statistics Without Tears: A Primer for Non-mathematicians*, St Ives plc, England: Clays Ltd.

Severre, E.L.M. (1996). Administration of hunting in Tanzania. In Leader-Williams, N., Kayera, J.A. and Overton, G.L.

(eds.), *Tourist Hunting in Tanzania. Occasional Paper of the IUCN Species Survival Commission* 14, 34-37. IUCN.

Stephenson, J.G. (1987) *Rehabilitation of the Selous Game Reserve, Final Report* (Unpublished report)

Whitman, K., Starfield, A.M., Quadling, H.S. and Packer, C. (2004). Sustainable trophy hunting of African lions. *Nature* 428, 175-178.[online]URL: http://www.fw.umn.edu/fw8576/WhitmanLionHunt.pdf. Visited on 6 May 2005