NON-CONSUMPTIVE UTILISATION OF LEOPARDS: COMMUNITY CONSERVATION AND ECOTOURISM IN PRACTISE

P.E. Stander[1], Kaqece //au[2], Nisa |ui[2], Tsisaba Dabe[2] and Dam Dabe[2]

Abstract: In north-eastern Namibia approximately 856 Ju/Hoan San make a sparse existence from a mixture of hunting, gathering and small scale live-stock farming. The San community share their land with a wide range of wildlife species including leopards. Large carnivores are seen as a nuisance since they kill live-stock. Cattle, especially calves, horses, chickens and domestic dogs fall prey to these carnivores, to give an annual financial loss of N$257 per village. Leopards are responsible for losses amounting to N$55 per village per year. Some leopards (N = 12) were translocated after killing live-stock but they always returned to their home range and did eventually continue killing live-stock. The San community was involved in finding solutions to the human/wildlife conflict by, firstly, quantifying their traditional knowledge and skills, such as tracking, as scientifically measurable criteria. Secondly, these skills were employed in studying the ecology of the leopards and in developing an ecotourism product. This product, tested vigorously for feasibility and reliability, proved highly successful as the community generated funds that exceeded their annual losses to large carnivore predation by several fold. The success of the ecotourism enterprise depended on a collaborative effort between the Ju/Hoan community, the tourism industry and the local conservation authorities.

INTRODUCTION

Conflicts between people and wildlife often result in poor conservation practices and the inevitable decline of wildlife populations[4]. In sub-Saharan Africa large carnivore predation on domestic live-stock invariably form the spearhead of the conflict between human development and their natural environment[13]. Pastoralists and a large proportion of the rural population throughout Africa view large carnivores with antagonism and as a nuisance[3, 4, 8 9, 13]. Most local people in Africa see very little value in carnivores, whether it be aesthetic or financial[3, 4, 14]. This situation has resulted, for example, in the large scale and indiscriminate use of poisons for the control of stock-raiding predators, which has resulted in the extirpation of several carnivore populations[13, 18].

Harmonious relations and co-operation between the local people (especially domestic stock farmers) and conservation authorities is of crucial importance in promoting wildlife conservation in both protected areas and non-proclaimed areas[11 12 16]. Conservation areas can generally not contain carnivores within their boundaries and problems with carnivores on neighbouring farmland are well documented[16, 22, 23]. Only when local communities have an incentive to tolerate carnivores on their land can long-term conservation of carnivores be viable. Efforts to force local people into protecting carnivores only leads to illegal hunting and poor relations with conservation bodies[9,10].

Community-based conservation and ecotourism[5] are buzzwords in modern conservation circles but have unfortunately produced few tangible examples of success. Managing and utilising natural resources sustainably is a complex affair[2,7] since the natural environment is intricate and the science of its' management is far from exact. Successful community conservation over the long term has to depend on a combination of the art and science of traditional knowledge of local communities and the advancing science of wildlife management.

---

[1] Ministry of Environment & Tourism, c/o P.O. Box 6213, Windhoek, Namibia
[2] Tsumkwe Conservation Trust, P.O. Box 5703, Windhoek, Namibia

Over a period of four years a collaborative effort, combining modern wildlife science and traditional knowledge of a local community, was established between the Ju/Hoan community and the Namibian Ministry of Environment and Tourism. This paper describes aspects of this combination which led to the management and sustainable use of a natural resource, by and to the benefit of the local Ju/Hoan community.

STUDY AREA and METHODS

The study was conducted between January 1992 and December 1995 in the Tsumkwe District (former eastern Bushmanland) communal area, north-eastern Namibia (4869 km^2; S19^0 30'; E20^0 30'), which lie within the southern savannah woodland biotic zone[15]. The area is dominated by forest and shrub savannah woodland[6], dominated by *Commiphora africana, Terminalia sericea, Combretum hereroensis* and *Grewia* spp. The region falls within the 400-500 mm rainfall isohyet with annual evapotransporation equalling 2800-3000 mm[22].

Leopards (N = 18) were immobilised using a traditional Ju/Hoan bow and arrow[19] and radio-collared. A combination of Zoletil and xylazine hydrocloride was used as immobilising agent and reversed with tolazoline hydrochloride[17]. Marked leopards were located regularly (mean interval = 3.8 days; S.D. = 6.4; N = 1084) with the use of light aircraft and vehicles. Most data collected were derived from tracking, using the skill of the Ju/Hoansi[20], and an extensive description of the ecology of the leopard population is presented elsewhere[21].

Table 1: Demography of the rural Ju/Hoan community and their livestock in the eastern Tsumkwe District, Namibia. Data excludes the "urban" settlements of Tsumkwe and Aasvoelnes

	Total	Per village	Range
People (Total)	856	28.5	8-85
Men	220	7.3	2-24
Women	239	8	1-26
Children	397	13.2	5-45
Cattle	464	15.5	0-55
Horses	41	1.4	0-5
Chickens	455	15.2	0-40
Dogs	139	4.6	0-19

Experiments on the effect of translocation on leopards killing live stock were confined to radio collared individuals where the home range of the animal (prior to the translocation) was known. Leopards to be translocated were immobilised at the site of the live-stock carcass. Immobilised leopards were translocated in a vehicle or light aircraft[17]. At the release site leopards were observed until fully recovered. Thereafter the leopards were radio-tracked frequently (£1 per day) to determine their post release movements and behaviour.

Statistical computations of the relationship between two interdependent variables were fitted by ordinary least squares linear regression[16]. Means are given with standard error (SE) as a measure of the precision. Data were tested for normality using a Komogorov-Smirnov two sample test and were transformed using log (Y + 1) when variances were high. Significance was measured at 5 % and all P values are two-tailed.

RESULTS

Ju/Hoan demography and livestock losses

The rural Ju/Hoan community of eastern Tsumkwe District live in 30 scattered villages, at a density of 17 people 100 km^2 (Table 1). In addition, approximately 2000 San people live in the main towns, Tsumkwe and Aasvoelnes. Livestock were kept by all villages (Table 1) at relatively low densities of 9.5 cattle and 0.8 horses 100 km^{-2}.

Livestock losses due to various causes (Table 2) amounted to an average of N$ 7,716.30 per year. These damages resulted, on average, in a per capita loss of N$ 257.21 per village and N$ 9.01 per adult person. Depredation by lions and leopards caused the largest annual losses followed by disease, poisonous plants and a combination of other causes. Losses due to large carnivores resulted in 78 per cent of the community viewing them with antagonism and as a nuisance.

Table 2: Annual per capita financial losses of livestock belonging to the Ju/Hoan community of the eastern Tsumkwe District, Namibia, due to various causes. (N$1 = R1)

Cause of mortality	Average annual loss N$	
	Per village	Per adult
Lion	83.38	2.92
Leopard	54.92	1.92
Hyaena	2.67	0.1
Disease	28.75	1.01
Poison	27.92	0.98
Age	15.42	0.54
Other	37.5	1.31
Unknown	6.67	0.23
Total	257.21	9.01

Table 3: Total number of livestock killed by leopards and calculated per capita financial losses to the Ju/Hoan community of eastern Tsumkwe District, Namibia

Species	Losses over four years		Average annual loss N$	
	Number killed	Financial loss N$	Per village	Per adult
Cattle	43	5 400	45	1.58
Dogs	32	640	5.33	0.19
Chickens	11	550	4.58	0.16
Total	86	6 590	54.92	1.93

Leopards were responsible for 42% of the number of cattle losses ($c^2 3 = 19.1$; $P < 0.001$) and captured mainly calves younger than three months of age. Almost all the chicken (97%) and domestic dog (100%) losses were attributed to leopard predation. Leopard predation on cattle, however, caused the largest loss to the Ju/Hoan community (Table 3), and when compared to all other causes of live-stock mortality, leopards were responsible for 21 per cent of the annual losses.

Leopard ecology and behaviour

Detailed data on the ecology and behaviour of the leopard population is presented elsewhere[21] and the following information is relevant to this paper. In an area of low leopard density individuals lived alone

with both males and females occupying large home ranges, (% = 210-1164 km^2; & = 183-194 km^2). Despite resource and reproductive advantages in maintaining exclusive ranges, the degree of range overlap both between and within sex was substantial. Average overlap between males was 46 per cent and between females 35 per cent. Leopards hunted at night and killed mainly steenbok and duikers. Prey were captured every 3.9 - 5.6 days and consumed in an average of 2.5 to 9 days. Daily per capita food intake was different for single females (1.6 kg/day), females with cubs (2.5 kg/day), and males (3.1 kg/day). Leopard kills were visited by other large carnivores (12 %) such as hyaenas, lions and wild dogs, but food loss was minimal (2 %). Leopards successfully avoided conflict with inter-specific competitors by dragging and hiding kills in thick vegetation, but not often in trees.

Translocation of leopards as an option to relieve live-stock killings

On twelve occasions known radio-collared leopards (N = 6) killed domestic live-stock. The leopards were immobilised and translocated between 10 and 135 km from the site of the killing, or the edge of the known home range. All animals returned to their respective home ranges within an average of two days (range 1.5 - 4.2 days). There was a strong linear relationship between the distance moved from the home range and the time it took the leopards to return (Fig. 1). These leopards returned to their home ranges and only resumed killing live-stock 8.2 months (range 1 - 20) later. This delay in killing live-stock, following a translocation, was not correlated with the distance moved (r^2 = 0.06; t = 0.85; P = 0.41) nor with the time it took the leopards to return to their respective home ranges (r^2 = 0.16; t = 1.4; P = 0.19).

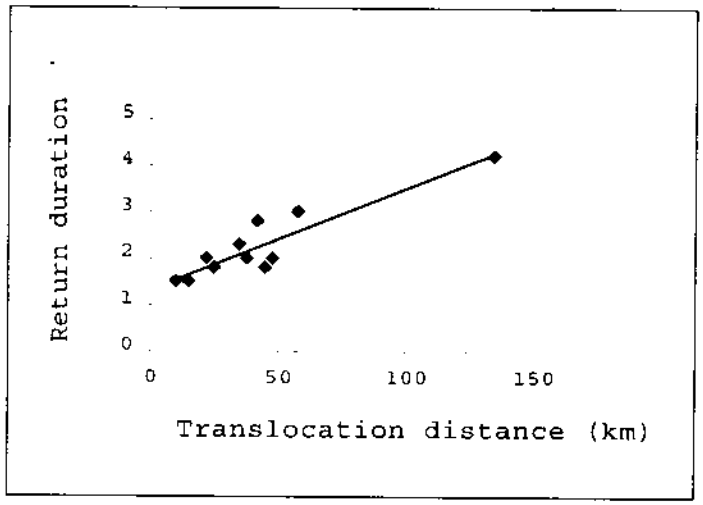

Fig. 1. The duration it took translocated leopards to return to their home ranges correlated with the distance that they were moved (b = 39.1ñ5.14; r^2 = 0.85; t = 7.6; P < 0.001)

Non-consumptive use of leopards

In developing a non-consumptive utilisation programme of leopards through ecotourism, the first step was the assessment of the ecology of the resource. Secondly, a partnership between the local community, the travel industry and the conservation authorities was established[5]. A tourism package was developed where the members of two Ju/Hoan villages agreed to collaborated with a tour operator in guiding tourist following the spoor of leopards and viewing the leopards at night. The package, named the "**Ju/Hoan Leopard Tour**", had the following properties:

a) a respectable and reliable tour operator was approached to sign a joint venture with the two Ju/Hoan villages;

b) the operator agreed to market and promote the "Ju/Hoan Leopard Tour", and to ensure low impact, high cost tourism (one group of 1-6 people once per month for four days);

c) the operator was responsible for all managerial aspects related to the tourists, marketing and transport;

d) the "Ju/Hoan Leopard Tour" was restricted to the traditional hunting grounds (n!ore) of the Ju/Hoansi involved;

e) Ju/Hoan village members lead tourists as they track the spoor of a leopard, reconstructing behaviour, and demonstrating how their skill is used to study and monitor the leopard population.;

f) Tourists were given the unique opportunity to view a leopard from a mobile hide, carefully placed near a fresh kill located by the Ju/Hoansi;

g) The Ju/Hoan community expose tourists to some aspects of their tradition, such as collecting veldt food, the making of poison arrows and traditional dances.

The reliability of offering the described "Ju/Hoan Leopard Tour" was tested vigorously before the first tour was initiated. Data showed that with their remarkable tracking and ecological skill[20] the Ju/Hoansi were able to consistently find and track leopards.

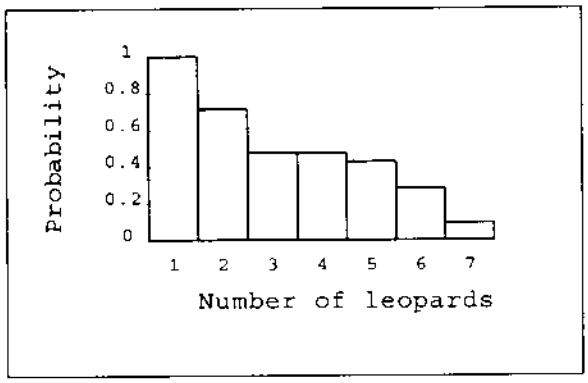

Fig. 2: The probability of finding leopard spoor, on any one day, when searching a 245 km² area in eastern Tsumkwe District, Namibia

Leopard spoor were located frequently along roads since it was distributed, on average, at 1 spoor every 36.1 km of road (SE = 3.832; %CV = 10.6; *N* = 3089 km). Within a 245 km² area utilised by the two Ju/Hoan villages the probability of finding the spoor of up to four leopards on any one day was 50 per cent, and finding at least one leopard spoor was per cent (Fig. 2). Once a spoor had been located the Ju/Hoansi were always able to follow the spoor and reconstruct the behaviour of the leopard. Observations on radio-collared leopards showed that between four and 12 leopards utilised the 245 km² area at any one time (*N* = 1084 radio tracking observations).

Within the same 245 km² area, measured over a four day period, there was a very high probability (Fig. 3) of the Ju/Hoansi following the spoor and finding at least one leopard with a fresh kill (*N* =

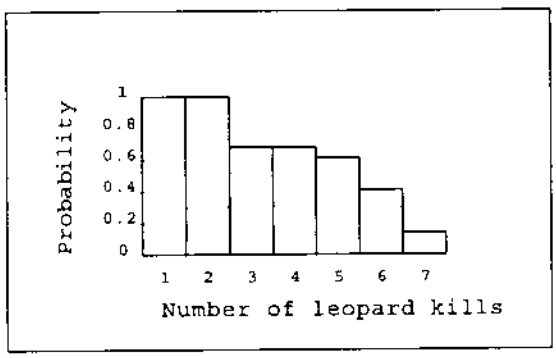

Fig. 3: The probability of finding a leopard with a fresh kill, over any four consecutive days, when searching a 245 km² area in eastern Tsumkwe District, Namibia

Based on the calculated frequency that leopards kill a steenbok or duiker every 3.9 - 5.6 days and feed for 2.5 ñ 0.9 days, there is a 70 per cent probability of finding four leopard kills over the six day period that tourists visit the area. Upon finding a fresh kill the Ju/Hoansi secured the carcass and carefully placed a mobile hide approximately 20 metres from the kill. The hide was camouflaged and occupied two hours before sunset. Leopards were viewed on most nights (92.9%; N = 42) that the mobile hide was positioned at a fresh kill.

Financial benefits to the Ju/Hoansi from leopard ecotourism.

Over an initial trial period of 17 months, 35 tourists visited the "Ju/Hoan Leopard Tour" during 12 tours. A total of N$ 39,350 was generated and paid out to the two villages via the "Tsumkwe Conservation Trust". When calculated on a annual basis the impact of the tourism activities was low since 25 tourists were with the Ju/Hoansi for a total of 25 days (7% of the year). The tourist groups ranged between one and six people (average = 3). The two target villages and their respective adult members gained substantial amounts of money from the leopard ecotourism activities (Table 4). If the funds earned by the two villages were to be divided equally among the entire Ju/Hoan population of eastern Tsumkwe District, the average income per village, and per adult, would exceed the annual livestock losses by a large margin. On a village per capita basis the leopard ecotourism income would exceed losses due to leopards by 12 fold and all live-stock losses combined by 2.6 fold.

Table 4: Annual financial benefits derived from leopard ecotourism activities in the eastern Tsumkwe District, Namibia between 1994 and 1996

	Annual benefits (N$)	
	Per village	Per adult
Target villages (N=2)	10 005.88	653.97
All villages combined	667.06	43.59

DISCUSSION

The rural Ju/Hoan community live at a very low density and conflicts between large carnivores and their limited live-stock result in annual losses of approximately N$ 260. These losses were significant for a low cash flow society resulting in negative attitudes towards large carnivores. Leopards were a significant factor in the conflict as they were responsible for almost half the cattle losses and most of the chicken and domestic dog losses. Attempts to solve live-stock predation problems by leopards failed as all translocated leopards returned to their respective home ranges. There was a strong linear relation between the distance translocated and the time it took them to return. Translocation did seem to deter live-stock killing temporarily although leopards did eventually resume killing live-stock.

A small proportion of the Ju/Hoan community was involved directly in a detailed study of the ecology of the leopard population. By utilising and quantifying their tradition skills the Ju/Hoansi gained valuable experience by implementing their skills in a modern wildlife management programme. This study provided baseline data on the ecology and behaviour of leopards as a natural resource, which enabled the design and implementation of a leopard ecotourism product. The product was tested vigorously and found to be reliable and marketable ecotourism package.

In a joint venture between the Ju/Hoansi and a tour operator in the private sector the "Ju/Hoan Leopard Tour" was initiated with clear reciprocal division of labour between the two parties. The Tour Operator providing logistical and marketing support while the Ju/Hoansi utilise their traditional skills and knowledge of the leopard population to provide the tourism attraction. During a 17 month test period the "Ju/Hoan Leopard Tour" produced favourable results in terms of consistency, low impact and financial benefits to the Ju/Hoan community. Financial benefits were surprisingly high and significantly exceeded live-stock losses due to large carnivore predation.

We suggest that this project successfully addressed the main biological and logistical constraints, and the expectations of the immediate local community, in solving the conflict between the people and large carnivores. This was achieved through a strongly collaborative effort, combining traditional skill and scientific data. Substantial and reliable funds were generated from leopards, as a natural resource, therefore promoting the long term conservation of the species. The ecotourism product is based on strong scientific data on the ecology of the leopard population and the Ju/Hoan community's ability to utilise this information.

This project has, however, also been met with extensive criticism which has constrained its' progress. Aid and development organisation operating in the region, including the Nyae Nyae Farmers Co-operative (a Ju/Hoan leadership group, imposed by the former Busman Development Foundation) have condemned the programme for being paternalistic and too localised. We feel that the criticisms are inappropriate in the face of the progress made. The bottom line is that, in a collaborative effort with the private sector and a scientific study, two Ju/Hoan villages have earned a worthy income, exceeding any other enterprise in the region. By utilising and promoting their traditional skills the Ju/Hoan people of the two villages are implementing the sustainable utilisation of a resource that have previously caused them extensive losses.

ACKNOWLEDGEMENTS

We are greatful to the Ju/Hoansi of Kaptein's Pos and N!hai !Uh, especially Kxao GØkao (Kaptein), Di//xao, Ghau //au, Xuaq//an |Kunta, Øoma //au, |Am //au, |Ui |okxa, |Ui N//aqu, Seg//e Xumi for their eager participation throughout the project. Allan Cilliers of !ah N!ore Safaris was invaluable as the link between the private sector and the community. We thank Dirk Heinrich, Nigel Berriman, Keith Wright and Allan Cilliers for assistance and support at various occasions. Funding was partly provided by WWF (US), Grand Canyon Spur Steak Ranch, Heinrich Fotolibrary, Caltex: Namibia, Total: Namibia, Air Namibia, Rio Tinto Namibia, MG Refrigeration and Wright Motors.

REFERENCES

1. **Anderson J.L.** 1981. The re-establishment and management of a lion Panthera leo population in Zululand, South Africa. *Biological Consonservation* 19: 107-117
2. **Caughley G. & Sinclair A.R.E.** 1994. *Wildlife ecology and management.* Blackwell Scientific Publications, Oxford
3. **Cobb S.** 1981. The leopard - problems of an overabundant, threatened, terrestrial carnivore. In: P.A. Jewell, S. Holt & D. Hart (Eds.) *Problems in management of locally abundant wild animals.* Academic Press, New York. pp. 181-191
4. **Eltringham S.K.** 1984. *Wildlife resources and economic development.* Chichester: Wiley
5. **Giannecchini J.** 1993. Ecotourism: new partners, new relationships. *Conservation Biolology* 7: 429-432
6. **Giess W.** 1971. A preliminary Vegetation Map of South West Africa. *Dinteria* 4: 1-114
7. **Giles R.H.** 1978. *Wildlife Management.* Freeman and Co. San Francisco
8. **Lensing, J.E. & Joubert E.** 1976. Intensity distribution patterns for five species of problem animals in South West Africa. *Madoqua* 10: 131-141
9. **Martin R.B. & de Meulenaer T.** 1988. *Survey of the status of the leopard (Panthera pardus) in sub-Saharan Africa.* CITES, Switzerland
10. **Martin R.B.** 1984 Wildlife human interaction. In: **R.H.V. Bell & E. McShane-Caluzi** (Eds.) *Conservation and wildlife management in Africa.* (U.S.) Peace Corps, Washington, D.C. pp. 209-218
11. **Martin R.B.** 1984. Communal area management plan for indegenous resources (Project CAMPFIRE). In: **R.H.V. Bell & E. McShane-Caluzi** (Eds.) *Conservation and wildlife management in Africa.* (U.S.) Peace Corps, Washington, D.C. pp. 279-296
12. **Mills M.G.L.** 1991. Conservation management of large carnivores in Africa. *Koedoe* 34: 81-90
13. **Myers N.** 1982. Conservation of Africa's cats: problems and opportunities. In: **S.D. Miller & D.D. Everett** (Eds.) *Cats of the world: biology conservation and management.* National Wildlife Federation, Washington, D.C. pp. 437-446

14. **Pennington H.** 1983. *A living trust: Tanzanian attitudes towards wildlife and conservation.* M.Sc. thesis, Yale Univerity, New Haven
15. **Skinner J.D. & Smithers R.H.N.** 1990. *The mammals of the southern African subregion.* Pretoria: University of Pretoria
16. **Sokal R.R. & Rohlf F.J.** 1995. *Biometry.* (3rd edn.) New York: WH Freeman and Company
17. **Stander P.E. & Morkel P.vdB.** 1991. Field immobilization of lions using disassociative anaesthetics in combination with sedatives. *African Journal of Ecology* 29: 138-148
18. **Stander P.E.** 1990. A suggested management strategy for stock-raiding lions in Namibia. *South African Journal of Wildlife Research* 20: 53-60
19. **Stander P.E., Ghau X., Tsisaba D. & Txoma X.** 1996. A new method of darting: stepping back in time. *African Journal Ecology* 34: 48-53
20. **Stander P.E., Ghau //, Tsisaba D., Øoma // & |ui |.** 1997. Tracking and the interpretation of spoor: a scientifically sound method in ecology. *Journal of Zoology, London* 242: July
21. **Stander P.E., Haden P., Kaqece // & Ghau //.** 1997. The ecology of asociality in Namibian leopards. *Journal of Zoology, London* 242: July
22. **Van Der Merwe J.H.** 1983. *National Atlas of South West Africa.* Cape Town: National Book Printers
23. **Van Der Meulen J.H.** 1977. Notes on the capture and translocation of stock raiding lions in north eastern and north western Rhodesia. *South African Journal of Wildlife Research* 7: 15-17