



QUARTERLY REPORT January 2000

**Conservation of lions and other large carnivores
in the Kunene Region, Namibia**

*Population ecology and long term monitoring of
free-ranging populations in a marginal and arid environment.*



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INTRODUCTION

Lions and other large carnivores in sub-Saharan Africa have showed a marked reduction in numbers and distribution during the past five decades. This decline can be attributed to an increased conflict with human development (Nowell & Jackson 1996). Namibia supports a small lion population and there is concern over the long-term viability of Namibian lions. Most lions live in Etosha National Park (ENP) and the bordering Khorixas District (KD). Lions also occur in three other locations (Kaudom Game Reserve / Nyae Nyae Conservancy; western and eastern Caprivi) but numbers in those locations appear to be low. A conservation area, such as ENP does not offer full protection to lions because of intensive live stock farming along the borders. Lions often cause live stock losses along the borders and are persecuted (Van der Meulen 1977; Mills et. al 1978; Anderson 1981; Stander 1990). During the past 15 years 427 lions were destroyed on the borders of ENP. The long-term sustainability of this population is uncertain. This is mainly due to a shortage of scientific data on the ecological mechanisms that drive population regulation.

Despite the immense size of the area lions live at very low density and may therefore be susceptible to the threats that face small populations such as demographic and environmental stochasticity and reduced genetic variation which could lead to social instability or extinction (Caughley & Gunn 1996).

Lions are important to the ecology of Etosha National Park and the Khorixas District. Previous studies have indicated that Etosha lions exhibit unique behaviour, adapted to the harsh environment (Bridgeford 1985; Stander 1992), but data are generally not available on their population dynamics and conservation status. Lions are of great aesthetic appeal and financial value. Tourism is a growing industry in southern Africa and predators are arguably a great attraction to national parks in Namibia. It is therefore important to provide baseline data on ecological and population characteristics to guide long term conservation of the species.

OBJECTIVES

1. To determine the population demography and limiting factors of the lion and other large carnivore population.
 - 1.1. Determine the demography, land use characteristics and genetic status of the lion population.



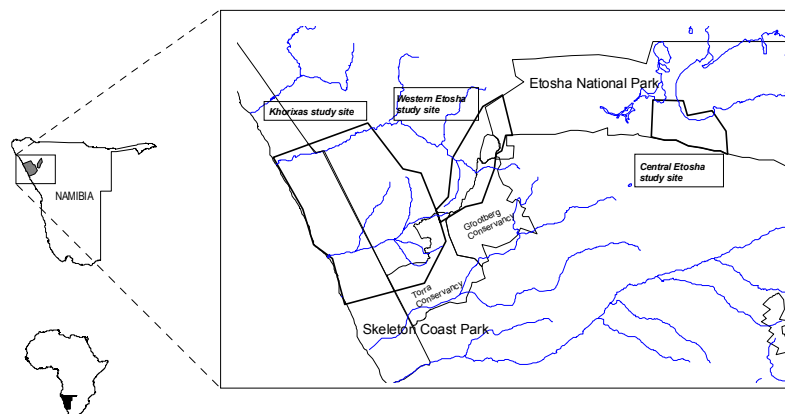
National Carnivore Monitoring Programme

- 1.2. Design and implement a reliable, repeatable, and cost effective technique for estimating and monitoring population size and basic demography of the large carnivore species.
 - 1.3. Study the social structure and population ecology of lions, with particular reference to stability and population regulation.
 - 1.4. Monitor the health status and diseases in the large carnivore populations.
2. To establish a training programme where employees of Etosha National Park, and relevant communal conservancies participate and receive training on the monitoring predator population demography and other wildlife monitoring techniques. Investigate the potential of using the traditional skill to the benefit of integrated community development and wildlife conservation.
 3. To investigate and assess the extent of conflict between lions and bordering pastoralists and propose a management strategy.

STUDY AREA

The study is being conducted in three study sites (Figure 1). The Central Etosha study site is an area of 1500 km² where lions have been studied for over 18 years. The Western Etosha study site (578 km²) is a section west of the Dolomite range and up to the boundary fence, both to the west, south and north. The Khorixas District study site (10826 km²) borders the ENP and includes the Grootberg and Torra Conservancies, and the Palmwag and Hobatere concessions. Detailed data on population density, demography and spoor frequencies are being collected within the boundaries of these study sites.

METHODS





Population estimates and demography

The two study sites were covered systematically in an attempt capture and mark all individuals. All lions were immobilised following standard procedures described by Stander & Morkel 1991. All lions marked with permanent hot brands and some were radio collared. The age of lions were determined from tooth wear.

Radio-collared animals were located with the use of a fixed-wing



aircraft. Aerial locations were then followed-up by ground observations to record group composition in relation to individuals and age/sex structure, and the ratio of marked to unmarked individuals.

RESULTS

Population density and demography

Western Etosha study site

Up to the 31st of January 2000 a total of 7 lions were individually marked and 4 lions (1 adult Γ and 3 adult E) were radio collared (Table 1). A total of 13



lions were individually identifiable to give a population density of 2.25 lions per 100 km² (Table 1). This figure is similar to calculations from 1989 (2.5 – 2.9 lion 100 km⁻², Stander 1991). It is probable that the population density is higher than the present estimates since more work is necessary before all the lions that inhabit the area have been identified. The sex ratios indicate a preponderance of males when all age classes are combined (Table 1), but there are more adult females than adult males (Table 2). This discrepancy could be the result of insufficient sample sizes and will receive attention during the next phase of the project.

Khorixas District study site

Compared to the Western Etosha study site a total of 11 lions were individually marked and 10 lions (1 adult ♂, 4 adult ♀, 4 large cub ♂ and 1 large cub ♀) were radio collared at the end of January 2000 (Table 1). A total of 19 lions were individually identifiable to give a population density of 0.92 lions per 100 km² (Table 1). It is possible that the population density is higher than the present estimates since more work is necessary before all the lions that inhabit the area has been identified. The sex ratios indicate a high ratio of males when all age classes are combined (Table 1), but there are more adult females than adult males (Table 2). This discrepancy could, similar to the Western Etosha site, be the result of insufficient sample size and will receive attention during the next phase of the project.

Between the two study sites overall sex ratios are similar (Fisher's exact test; $P = 0.59$). Among adults, both study sites show a preponderance of females ($P = 0.42$). The distribution of age classes, based on the ratio of adult females to sub-adults, large and small cubs, on the other hand, is significantly different between the two study sites (G -test; $G = 18.09$; d.f. = 3; $P < 0.001$). The Khorixas study site support a higher number of large cubs (1 – 2 years) and Western Etosha more sub-adults (2 – 4 years). Both study sites, however, signify the characteristics of healthy and growing populations.



Table 1. Records of marked large carnivores in the two study sites

Western Etosha Study						
Lions - Rateldraf pride						
Seq No.	Age	Sex	Brand mark	Radio collar	Date last seen	Current age (years)
WPL-9	Adult	♂	BF TT	Yes	05-Jan-00	5.6
	Adult	♂	none		21-Nov-99	5.6
WPL-4	Adult	E	BB ≡	Yes	21-Nov-99	6.1
WPL-5	Adult	E	BF	Yes	05-Jan-00	5.1
WPL-6	SA	E	BF TT		21-Nov-99	3.6
WPL-7	SA	E	BB TT		21-Nov-99	3.6
WPL-8	Adult	E	BF ⊥┊	Yes	05-Jan-00	9.6
Khorixas Study Site						
Lions - Aub Canyon pride						
XPL-1	Adult	♂	BF X BB 20	Yes	11-Feb-00	7.6
XPL-2	Adult	E	BF XT	Yes	11-Feb-00	7.6
XPL-3	L cub	♂	BF XT	Yes	11-Feb-00	1.5
XPL-4	L cub	♂	BF ×┊	Yes	11-Feb-00	1.5
XPL-5	Adult	E	BF ×┊	Yes	11-Feb-00	8.1
XPL-6	L cub	♂	BF X	Yes	11-Feb-00	1.5
XPL-7	L cub	♂	BF X		11-Feb-00	1.5
XPL-8	L cub	♂	BF XV	Yes	11-Feb-00	1.5
XPL-9	Adult	E	BF X LB 36	Yes	11-Feb-00	8.1
XPL-10	L cub	E	BF X	Yes	11-Feb-00	1.5
XPL-11	Adult	E	BF XV	Yes	11-Feb-00	6.1
Spotted hyaenas						
XCC-1		♂	Vis. collar No.79			
XCC-2	Adult	♂	Vis. collar No.79		15-Jan-00	4.5
XCC-3	Adult	?	Photo patterns		20-Apr-99	
XCC-4	Adult	E		Yes	11-Feb-00	4.1

Key: BF = both front; BB = both buttocks; LB = left buttock; L cub = large cub.



Table 2. Population demography of lions in Western Etosha and bordering Khorixas District on 31 July 1999.

	Western Etosha	Khorixas District
Study area size (100 km ²)	577.8	10825.7
Density sample size (100 km ²)		2063
Number of marked lions	8	11
Number of radio-collared lions	4	10
Lion population estimate		
Adult male	2	1
Adult female	3	5
Sub-adults	4	0
Large cubs	0	9
Small cubs	4	4
TOTAL	13	19
Population density (lions 100 km ⁻²)	2.25	0.92
Sex ratio (Γ:E)	1.6:1	1.43:1

Table 3. Age and sex composition of lions in Western Etosha and Khorixas District on 31 January 2000, based on known animals, visual and spoor observations.

Western Etosha

Method	A ?	A Γ	A E	Sub-adult	Large cub	Small cub	Young	Total
Known lions		2	3	4	0	4		13
Ratios		0.7	1	1.3		1.3		
Spoor obs.								
Visual obs. *	1(1)	1(3)	1(4)	2(2)			2(2)	

Khorixas District

Method	A ?	A Γ	A E	Sub-adult	Large cub	Small cub	Young	Total
Known lions		1	5	0	9	4		19
Ratios		0.2	1		1.8	0.8		
Spoor obs. *	2.4 (39)	1(9)	1.3 (15)	2.7(20)	2(2)		1.5(6)	
Visual obs. *	5.3 (21)	1(4)	2.3 (9)	2(2)			1.5(6)	

Key: * average group size in each category and sample size in parenthesis



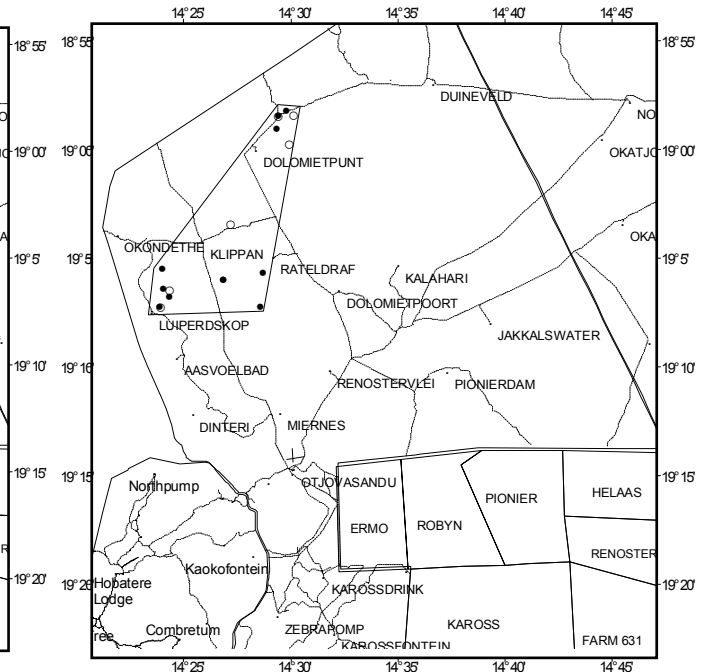
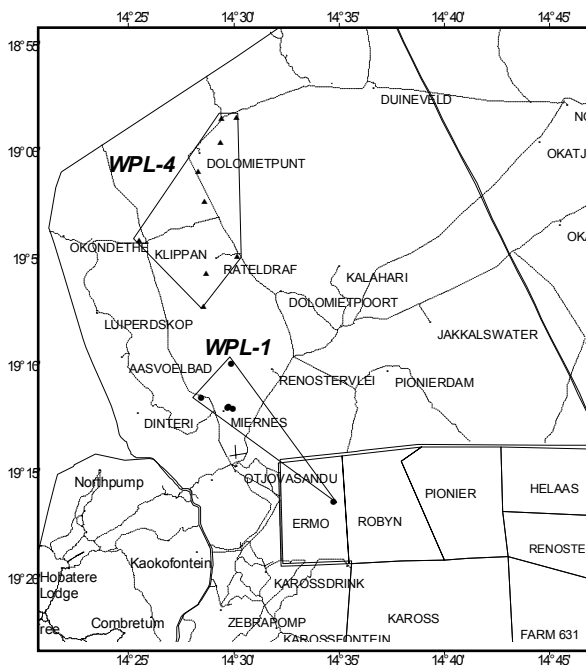
Movements and home ranges

Western Etosha study site

Preliminary radio tracking data on four lions fitted with radio-collars indicate that movements are generally restricted to the selected study site in western Etosha.

Movements of WPL-1 (A ♂) and WPL-4 (A ♀) up to January 2000. WPL-1 was shot on the farm Ermo after killing an eland and WPL-4 is part of the Renostervlei pride.

Movements of A ♀ WPL-5 (closed circles) and A ♀ WPL-8 (open circles) up to January 2000. Both WPL-5 and WPL-8 belong to the Renostervlei pride.





Namibia Large Carnivore ATLAS

An initiative to involve local Ministry of Environment staff, conservancy game guards and the tourism industry in the project, by distributing observation forms (examples attached), has produced wonderful results. Valuable data on distribution, group structure and habitat use has been returned by a wide range of people. Results for the Kunene region have been analysed and are included. The remarkable response from such a wide range of people has spurred an expansion to a national level. The Namibia Large Carnivore ATLAS will now attempt to collect crucial baseline data on all large carnivores throughout Namibia. Within each of the intensive study sites, such as Western Etosha and Khorixas District, ATLAS data will be compared with the data derived from our intensive research, and the ATLAS approach will be assessed as a monitoring technique that may act as an index of density and demography.



Radio tracking from Otjovasandu, Western Etosha (photo: Claudia du Plessis)



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