

Predator Research Programme

October 2000



*Ministry of Environment
And Tourism*

Research Progress Report

***Population ecology and long term monitoring of
free-ranging populations in Namibia's
marginal and arid environments.***



***In support of the Namibia
Carnivore Monitoring
Programme***



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Predator Research Programme

Progress Report – October 2000

[Page 2 of 19]



Ministry of Environment
And Tourism

INTRODUCTION

Although large carnivores in sub-Saharan Africa have showed a marked reduction in numbers and distribution during the past five decades, their numbers appear to be stable in Namibia. The past decline can be attributed to an increased conflict with human development and in many parts of Africa large carnivores only persist in protected areas.

Namibia is one of few African countries that support six species of large carnivore. The distribution of lions, spotted hyaenas and wild dogs is restricted to either protected or areas of low human density with sufficient numbers of suitable prey. Leopards, cheetahs and brown hyaenas are more adaptable and show a much broader distribution, including areas of intensive livestock farming. Although the populations of all six species appear to be stable there is constant conflict between these predators and people, mainly in the form of livestock depredation.

For some species, such as lions and wild dogs, due to their restricted distribution, there is concern over the long-term sustainability of the populations. This is mainly due to a shortage of scientific data on the ecological mechanisms that drive population regulation. Despite the immense size of the areas that large carnivores in Namibia inhabit, they live at very low density. These populations may therefore be susceptible to the threats that face small populations, such as demographic and environmental stochasticity and reduced genetic variability that could lead to social instability or extinction.

Lions are important to the ecology of both Etosha National Park and the Khorixas District. Previous studies have indicated that these lions exhibit unique behaviour, adapted to the harsh environment, 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.

Baseline data on density, demography and ecology are needed for all large carnivore species in Namibia. This is essential to assess the conservation status of the species and to address conservation problems. Our research activities are presently focussing on lions and leopards in three distinctly different habitats in northern Namibia. These research activities forms part of our *Predator Research Programme* that spans over a period of ten years with intensive research projects pending on cheetahs and wild dogs, and monitoring projects on all six species. The *Predator Research Programme* contributes to the Namibia Carnivore Monitoring Programme and has the following main objectives.

OBJECTIVES

1. To determine the population demography and limiting factors of Namibian large carnivores.
 - 1.1. Demography, land use characteristics, genetic and disease status.
 - 1.2. Social structure and population ecology, with particular reference to density dependant population regulation.
2. Design and implement reliable and cost effective techniques for estimating and monitoring population density and demography.
3. Establish training programmes for wildlife managers and conservancies on the monitoring of carnivore density population demography and other wildlife monitoring techniques
4. Investigate and assess the extent of conflict between carnivores and people and develop sustainable utilisation activities to the benefit of local communities.

Present research results are presented under:

Khorixas Study Site – LIONS on page 4

Western Etosha Study Site – LIONS on page 10

Western Etosha Study Site – LEOPARDS on page 13

Otjiwarongo Study Site – LEOPARDS on page 16



Predator Research Programme

Progress Report – October 2000

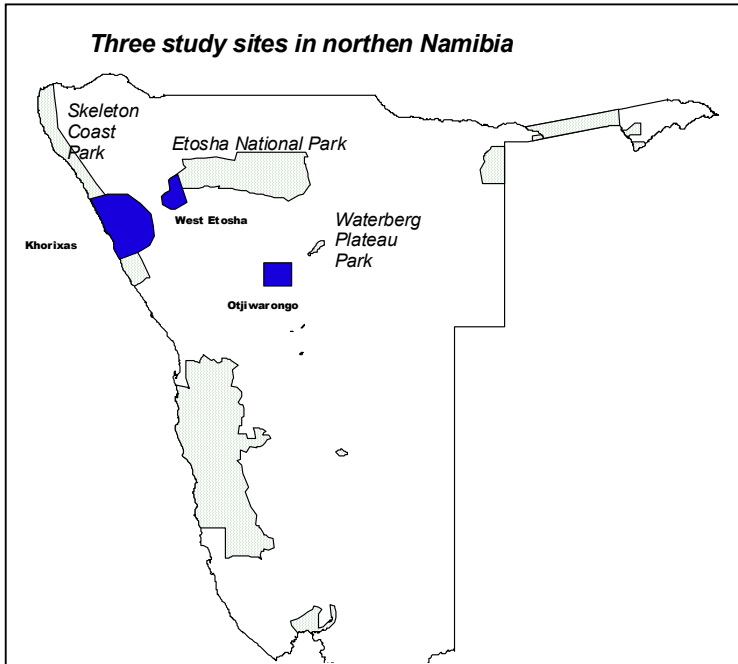
[Page 3 of 19]



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STUDY AREAS

Our present research is focussed on lions and leopards in three study sites. The Khorixas study site (10826 km²) is located in the northern Namib desert, previously known as Damaraland, and consists of an extremely arid habitat (annual rainfall 0-100mm) that stretches into the Skeleton Coast Park. This study is focussing on desert-adapted lions that frequent the Skeleton Coast Park, Torra Conservancy and the Palmwag tourism concession.



The Western Etosha study site (610 km²) is the focus of research on both lions and leopards. The study area is a section west of the Dolomite range and up to the western boundary fence and includes the #Khoadi !Hoas Conservancy, and the Hobatere tourism concession to the west of Etosha. The third study site is located at the Africat Foundation and lies in the heart of the Otjiwarongo commercial farmlands. In both the Khorixas and West Etosha study sites we erected base-camps from where the research activities are co-ordinated. Each base-camp has a short strip where we land with the radio-tracking aircraft. We also keep a field vehicle and essential supplies and equipment at the field camps.



The research base camp in the Khorixas study site



Predator Research Programme

Progress Report – October 2000

[Page 4 of 19]



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METHODS

The study sites are covered systematically, by tracking their spoor and setting out bait, to capture and mark all individual leopards and lions. Study animals are immobilised following standard procedures described by our earlier studies and conform to international veterinary standards. All leopards and 80% of lions are radio collared and lions are marked with permanent hot brands. The age of lions and leopards are determined from tooth wear.

Radio-collared animals are located with the use of a fixed-wing aircraft. Aerial locations are 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. Home range analyses was based on locating the daytime resting spots of lions and leopards by radio telemetry with at least 24 hours between fixes. Home range size is calculated using the Minimum Convex Polygon and Kernel Contour methods. Sufficiency of sample size was tested by determining whether or not an asymptote of home range estimate was reached. Detailed data on population density, demography and spoor frequencies are being collected within the boundaries of each study site.

RESULTS

Khorixas Study Site - LIONS

To date we have marked fifteen lions and have collected a large amount of data on their movements, behaviour ecology and population structure. All the marked lions belong to the Aub Canyon pride but they have moved in three separate sub-groups since March 2000, a period of eight months. Although their ranges are partly overlapping such a long separation is most unusual. This might be a behavioural adaptation to the demanding habitat, but more data need to be collected. The data presented here are preliminary and although there are some interesting results, we are hesitant to make premature conclusions. The results are therefor presented without further discussion.

Marked and known lions in Khorixas

Aub Canyon pride in three sub-groups								
"XPL-1 group"			"XPL-5 group"			"XPL-3 group"		
ID no.	Age	Sex	ID no.	Age	Sex	ID no.	Age	Sex
XPL-1	Adult	Γ	XPL-5	Adult	E	XPL-3	SA	Γ
XPL-2	Adult	E	XPL-14	Adult	E	XPL-6	SA	Γ
XPL-9	Adult	E	XPL-4	SA	Γ	XPL-10	SA	E
XPL-11	Adult	E	XPL-7	SA	Γ	XPL-15	SA	E
	S cub	E	XPL-8	SA	Γ		Adult	E
	S cub	E	XPL-12	SA	Γ			
	S cub	E	XPL-13	SA	Γ			
	S cub	Γ						
	S cub	Γ						
	S cub	Γ						
	S cub	?						
	S cub	?						
Total = 12			Total = 7			Total = 5		



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Progress Report – October 2000

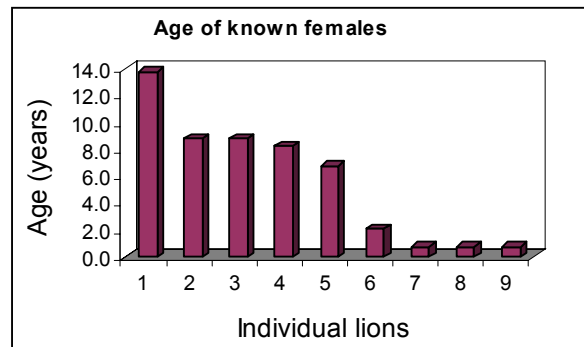
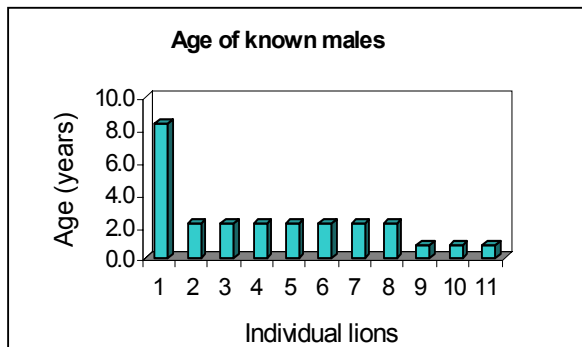
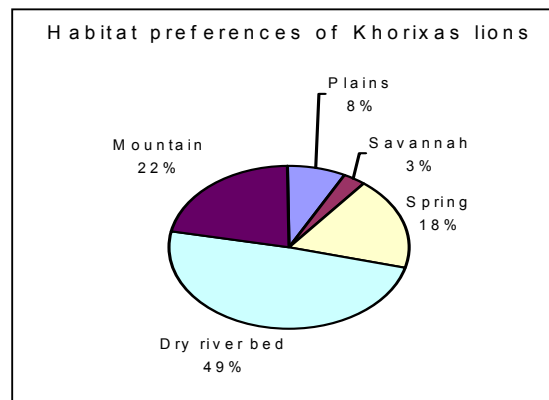
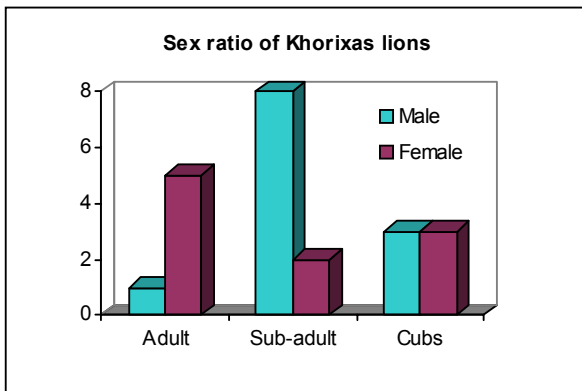
[Page 5 of 19]



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Population demography of lions in the Khorixas District

Khorixas District		
Study area size (km ²)	10825.7	
Density sample size (km ²)	2063	
Number of marked lions	15	
Number of radio-collared lions	14	
<u>Lion population estimate</u>	Known individuals	Possible numbers
Adult male	1	2
Adult female	6	8
Sub-adults	9	13
Large cubs	0	5
Small cubs	8	8
TOTAL	24	36
Population density (lions 100 km ⁻²)	1.18	1.77
Sex ratio (Γ:E)	1.2 : 1	0.93 : 1





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Progress Report – October 2000

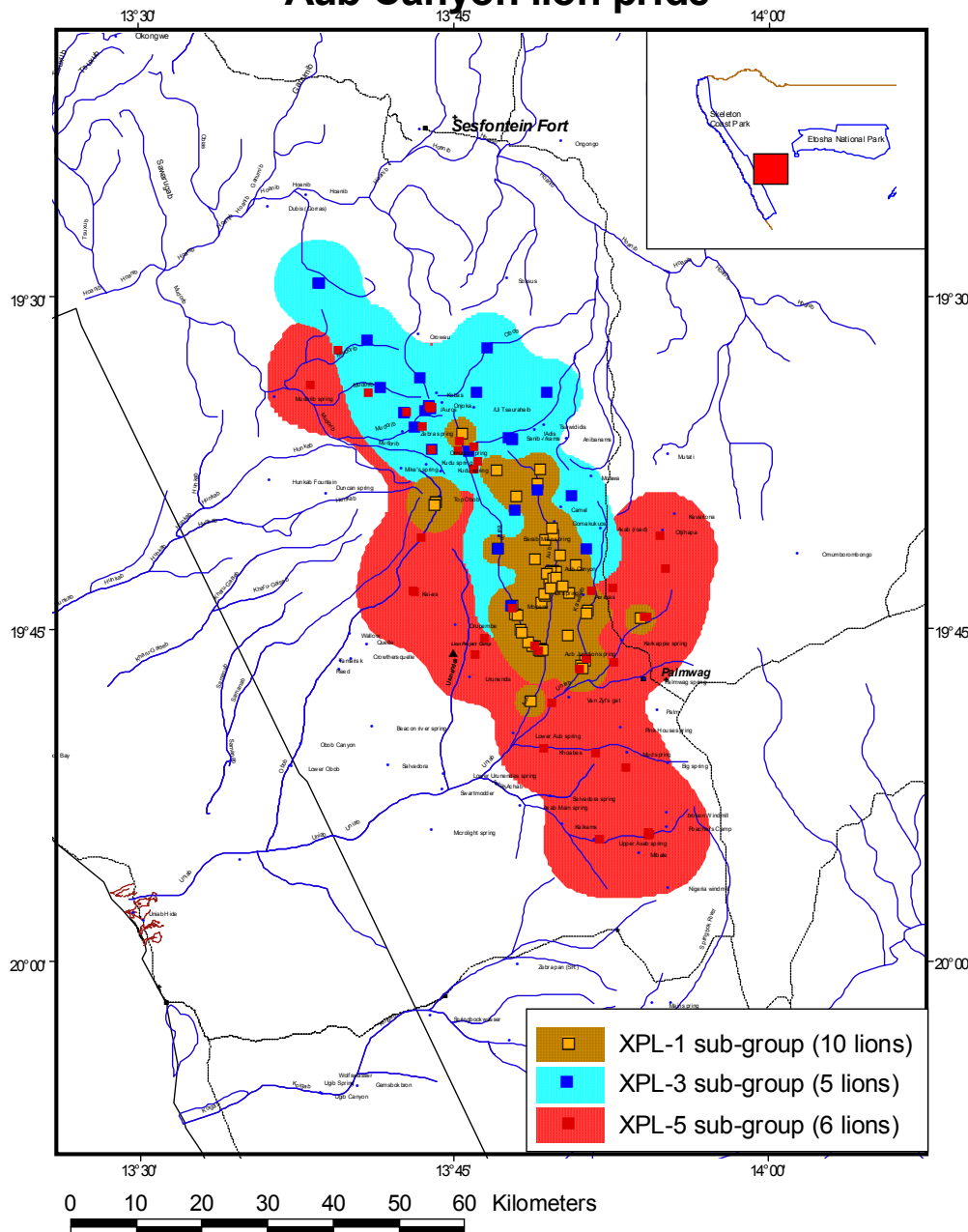
[Page 6 of 19]

Home range calculations of lions - Khorixas District

Sub group	N	Home range calculation (km ²)		Accuracy of fixes*
		MCP	Kernel (95%)	
XPL-1	86	647.8	581.7	Negative
XPL-5	43	1867.1	2818.6	Negative
XPL-3	26	817.3	1352.9	Negative

- The number of fixes where the home range estimate reached an asymptote of at least 95% of the home range estimate.

Home ranges of 3 sub-groups of the Aub Canyon lion pride





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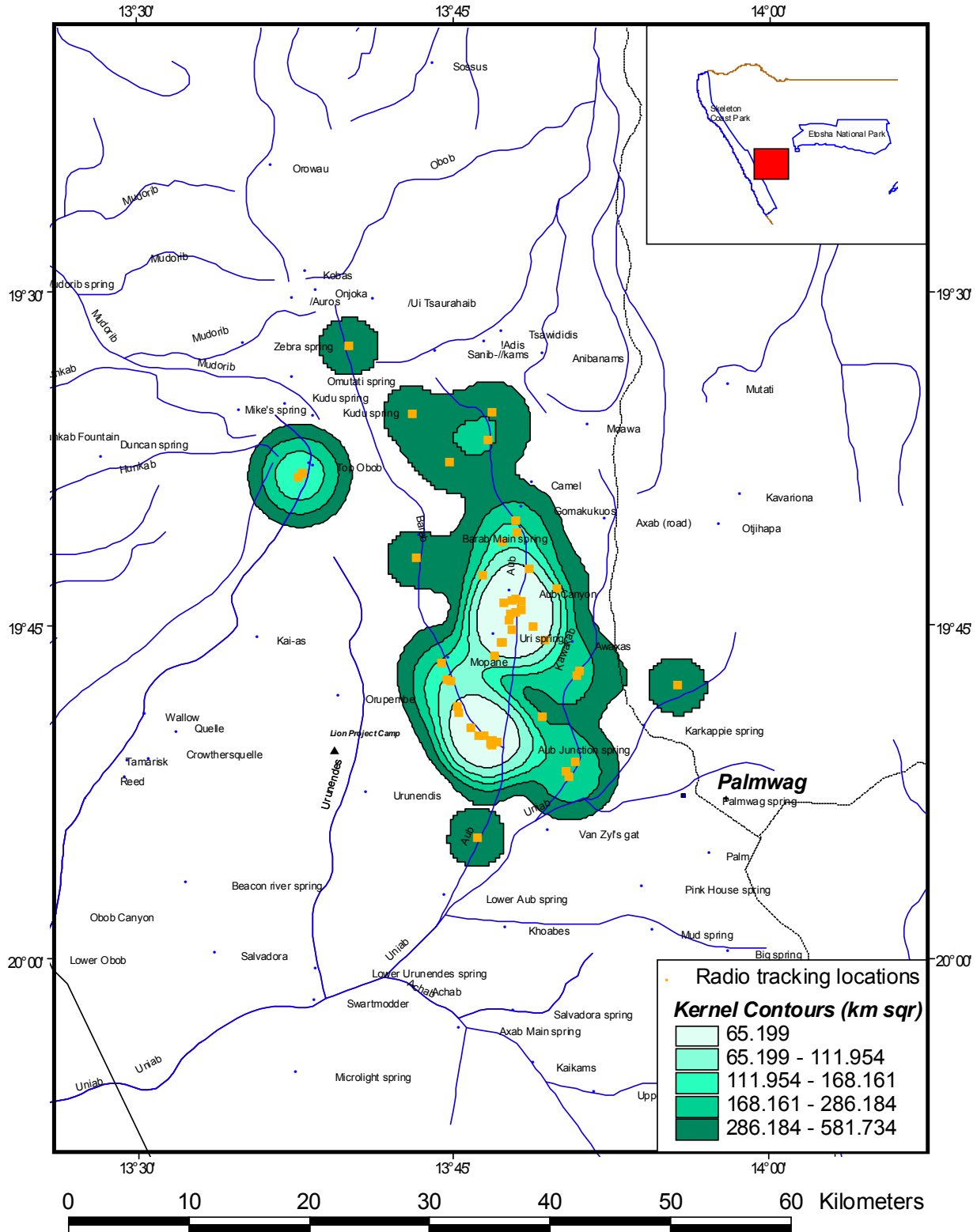


Progress Report – October 2000

[Page 7 of 19]

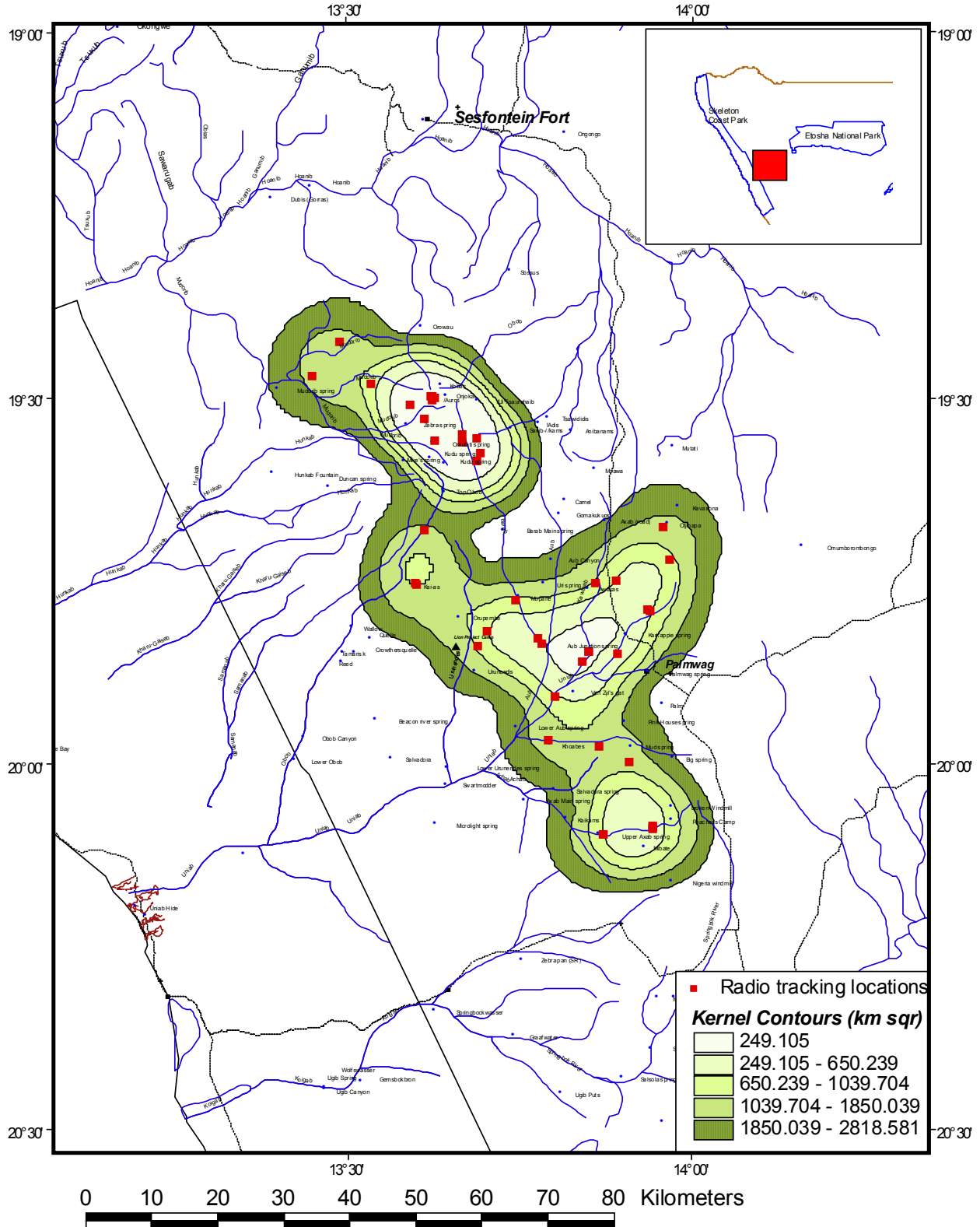
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Concentration areas of XPL-1 sub-group



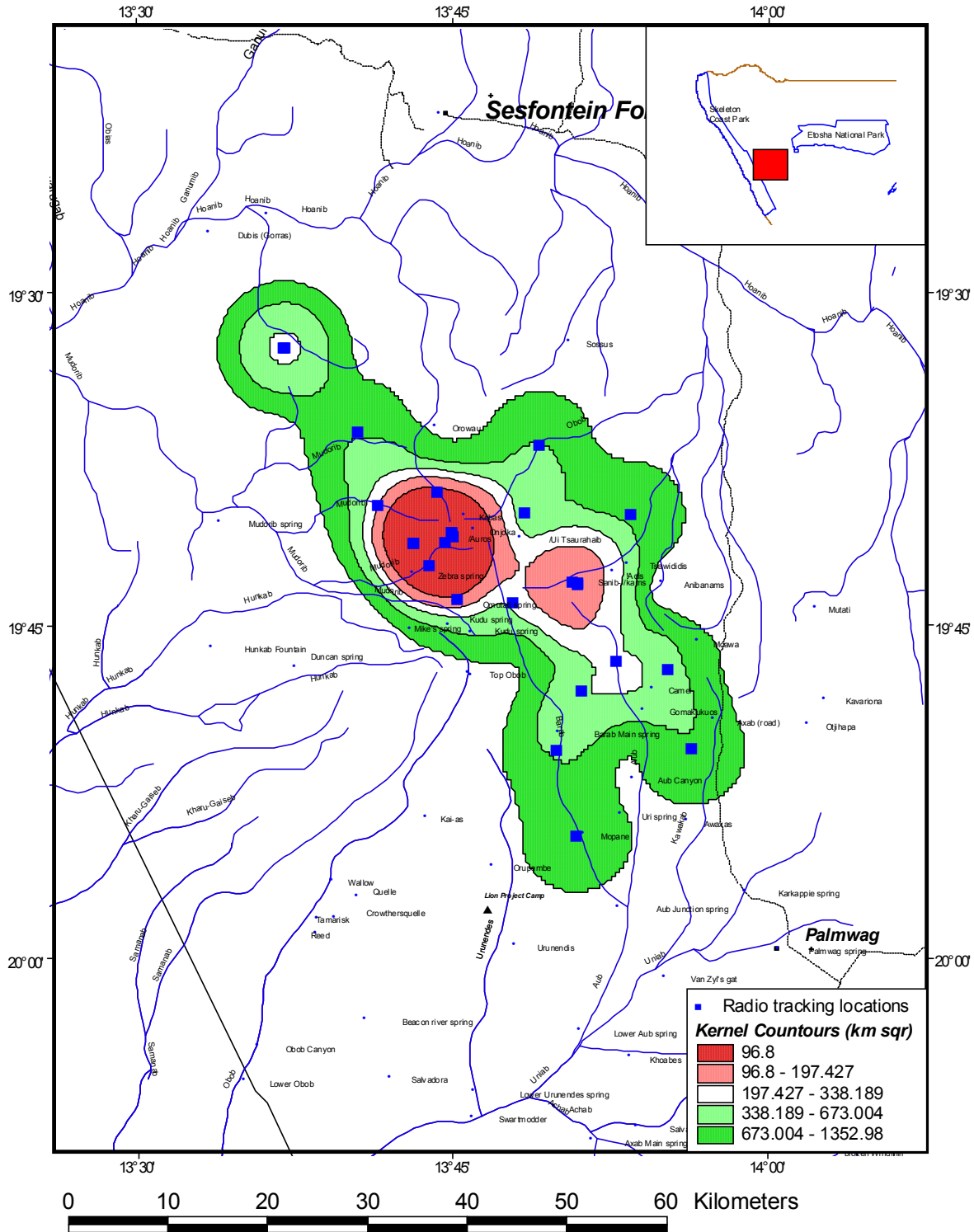


Concentration areas of XPL-5 sub-group





Concentration areas of XPL-3 sub-group





Predator Research Programme

Progress Report – October 2000

[Page 10 of 19]



Ministry of Environment
And Tourism

Western Etosha Study Site - LIONS

To date we have marked 12 lions. Most are members of the Rateldraf pride that live in the northern section of the study area. Two other prides, Renostervlei and Duineveld have been identified but more work is necessary to capture and mark those individuals. Preliminary data indicate that the population is healthy with good age/sex ratios. Breeding is prolific and most of the adult females have attending cubs. Population density estimates, although still preliminary, indicate higher densities than expected. The next phase of the project will focus in the southern section of the study area where information is lacking. Our preliminary data on population structure, densities and home ranges are presented below.

Marked and known lions in West Etosha								
Rateldraf pride			Renostervlei pride			Duineveld pride		
ID no.	Age	Sex	ID no.	Age	Sex	ID no.	Age	Sex
WPL-9	Adult	♂	WPL-14	Adult	♂		Adult	E
	Adult	♂		Adult	E		Adult	E
WPL-4	Adult	E		SA	E			
WPL-5	Adult	E						
WPL-6	Adult	E						
WPL-7	Adult	E						
WPL-8	Adult	E						
WPL-10	L cub	♂						
WPL-11	L cub	♂						
WPL-12	L cub	♂						
WPL-13	L cub	♂						
	S cub	?						
	S cub	?						
	S cub	?						
	S cub	?						
Total = 15			Total = 3			Total = 2		

Population demography of lions in West Etosha

	West Etosha	
	Known individuals	Possible numbers
Study area size (km ²)	577.8	
Density sample size (km ²)	577.8	
Number of marked lions	12	
Number of radio-collared lions	8	
Lion population estimate	Known individuals	Possible numbers
Adult male	3	4
Adult female	8	10
Sub-adults	1	5
Large cubs	4	4
Small cubs	4	4
TOTAL	20	25
Population density (lions 100 km ⁻²)	3.46	4.33
Sex ratio (♂:E)	0.77 : 1	1.09 : 1



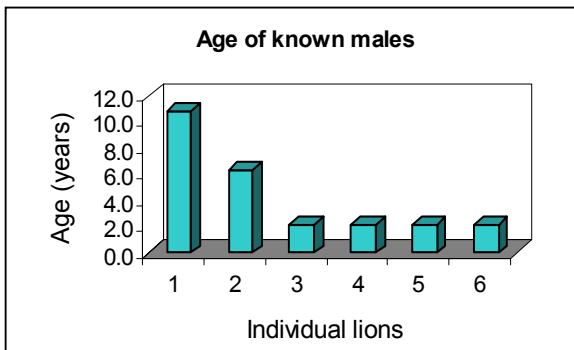
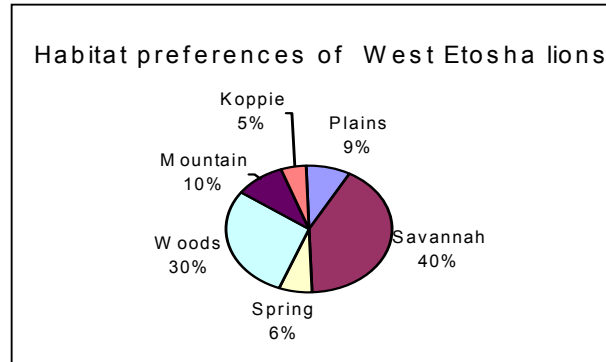
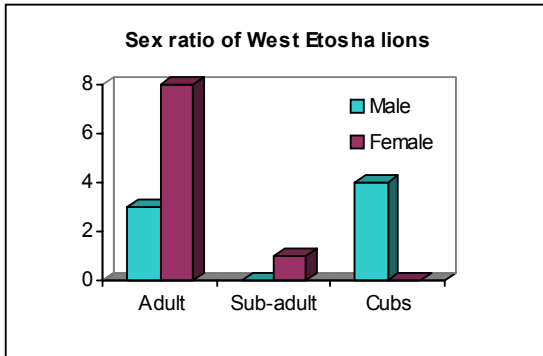
Predator Research Programme



Ministry of Environment
And Tourism

Progress Report – October 2000

[Page 11 of 19]



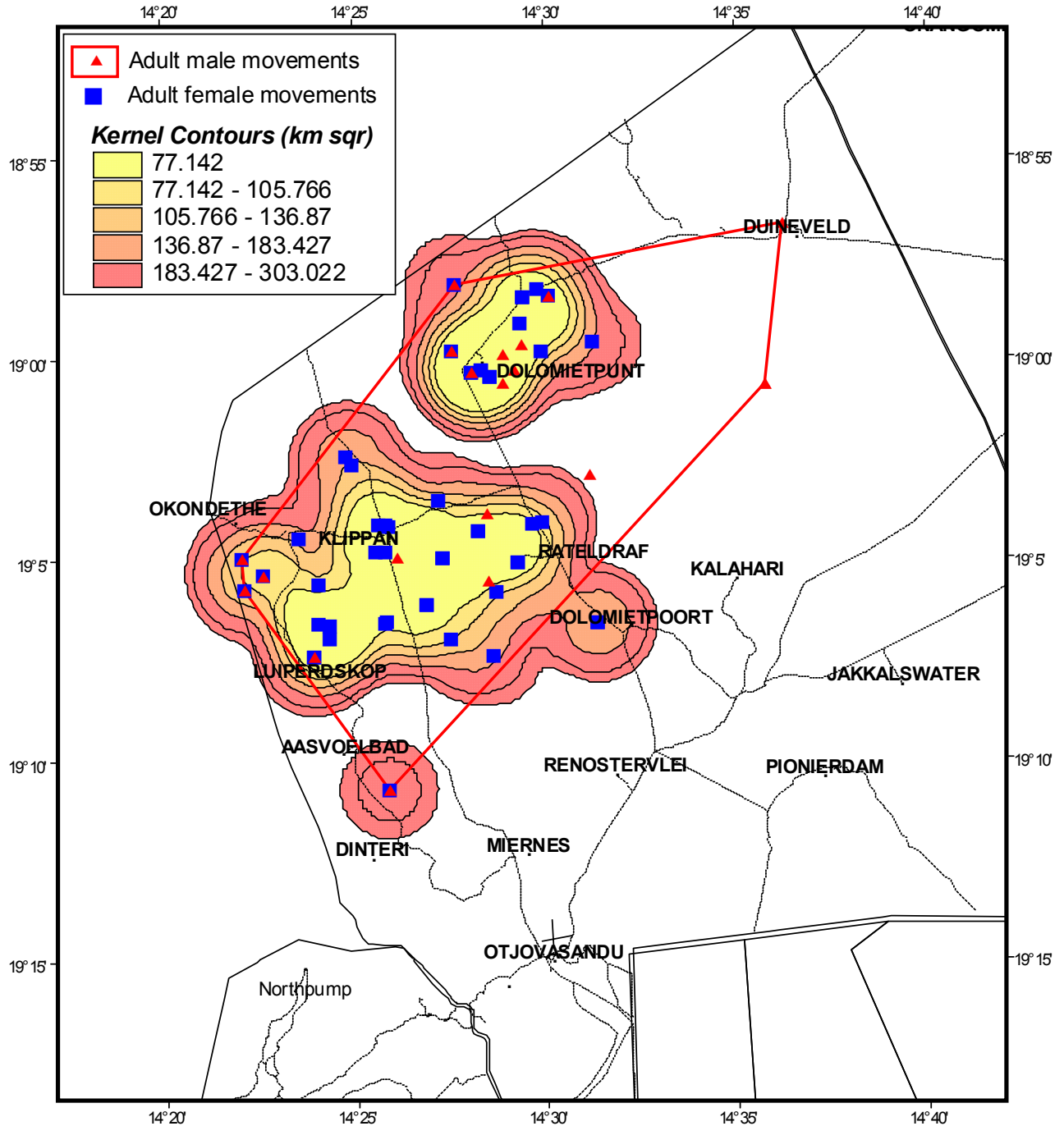
Home range calculations of lions – West Etosha

Sub group	N	Home range calculation (km ²)		Accuracy of fixes*
		MCP	Kernel (95%)	
Rateldraf pride	51	327.1	303.7	Negative

* The number of fixes where the home range estimate reached an asymptote of at least 95% of the home range estimate.



Home range and concentration areas of the Rateldraf pride - October 2000





Predator Research Programme

Progress Report – October 2000

[Page 13 of 19]



Ministry of Environment
And Tourism

Western Etosha Study Site - LEOPARDS & Hobatere Concession

To date eight leopards that occupy a 102 km² intensive study site in the Hobatere Concession have been captured and radio-collared. The sex ratio of marked leopards is strongly in favour of females. There are several more leopards that inhabit the area, and tracks of male leopards have often been observed. Similar to the previous sections, the data are preliminary, however, several interesting conclusions can be drawn. The density of leopards is surprisingly high at 3.85 leopards per 100 km², especially considering that several more leopards frequent the study site and need to be marked during the next phase. Home range sizes are variable, although this is probably due to low sample sizes, with a large overlap of 20.8% between females. The data collected so far are presented below.

Marked leopards at Hobatere & West Etosha			
ID no.	Age	Sex	Notes.
WPP-1	Adult	E	
WPP-2	Adult	E	
WPP-3	Adult	E	
WPP-4	Adult	Γ	
WPP-5	L cub	E	Cub of WPP-1
WPP-6	Adult	E	
WPP-7	L cub	Γ	Cub of WPP-1
WPP-8	Adult	E	

Population demography of leopards at Hobatere & West Etosha

	Hobatere & West Etosha
Study area size (km ²)	310
Density sample size (km ²)	101.37
Number of marked leopards	8
Number of radio-collared leopards	8
Leopard population estimate	Known individuals
Adult male	1
Adult female	5
Sub-adults	0
Large cubs	2
Small cubs	0
TOTAL	8
Calculated population density (leopards 100 km ⁻²)	3.85
Sex ratio (Γ:E)	0.33 : 1



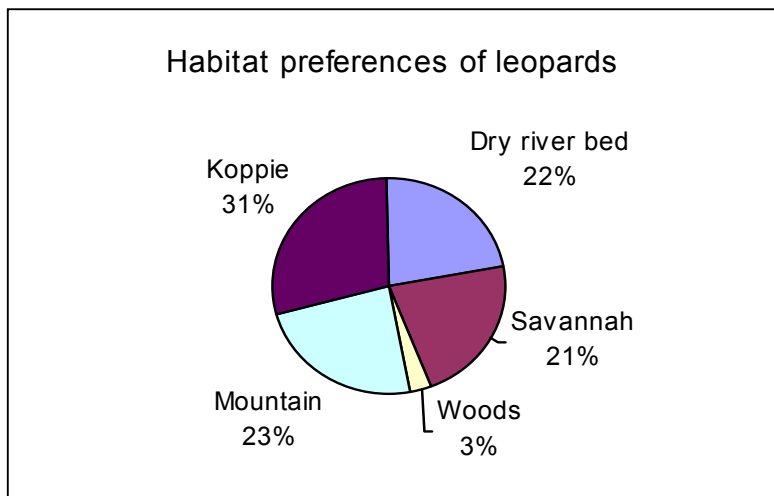
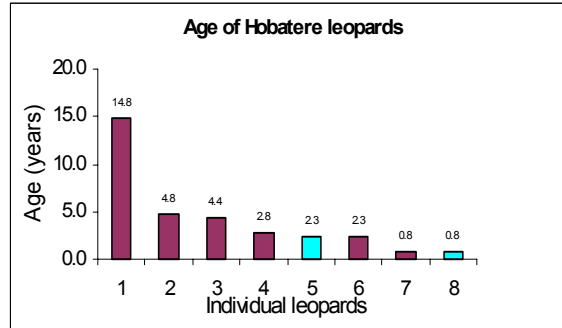
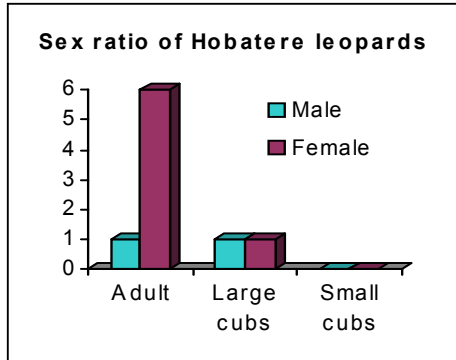
Predator Research Programme

Progress Report – October 2000

[Page 14 of 19]



Ministry of Environment
And Tourism



Home range calculations of leopards – Hobatere & West Etosha

Sub group	Fixes (n)	Home range calculation (km ²)		Accuracy of fixes*
		MCP	Kernel (95%)	
WPP-1	25	44.25	57.09	Negative
WPP-2	23	87.73	154.65	Negative
WPP-3	13	130.62	172.85	Negative
WPP-4	13	32.78	45.11	Negative
WPP-6	6	30.78	-	Negative
WPP-8	5	4.86	-	Negative

* The number of fixes where the home range estimate reached an asymptote of at least 95% of the home range estimate.



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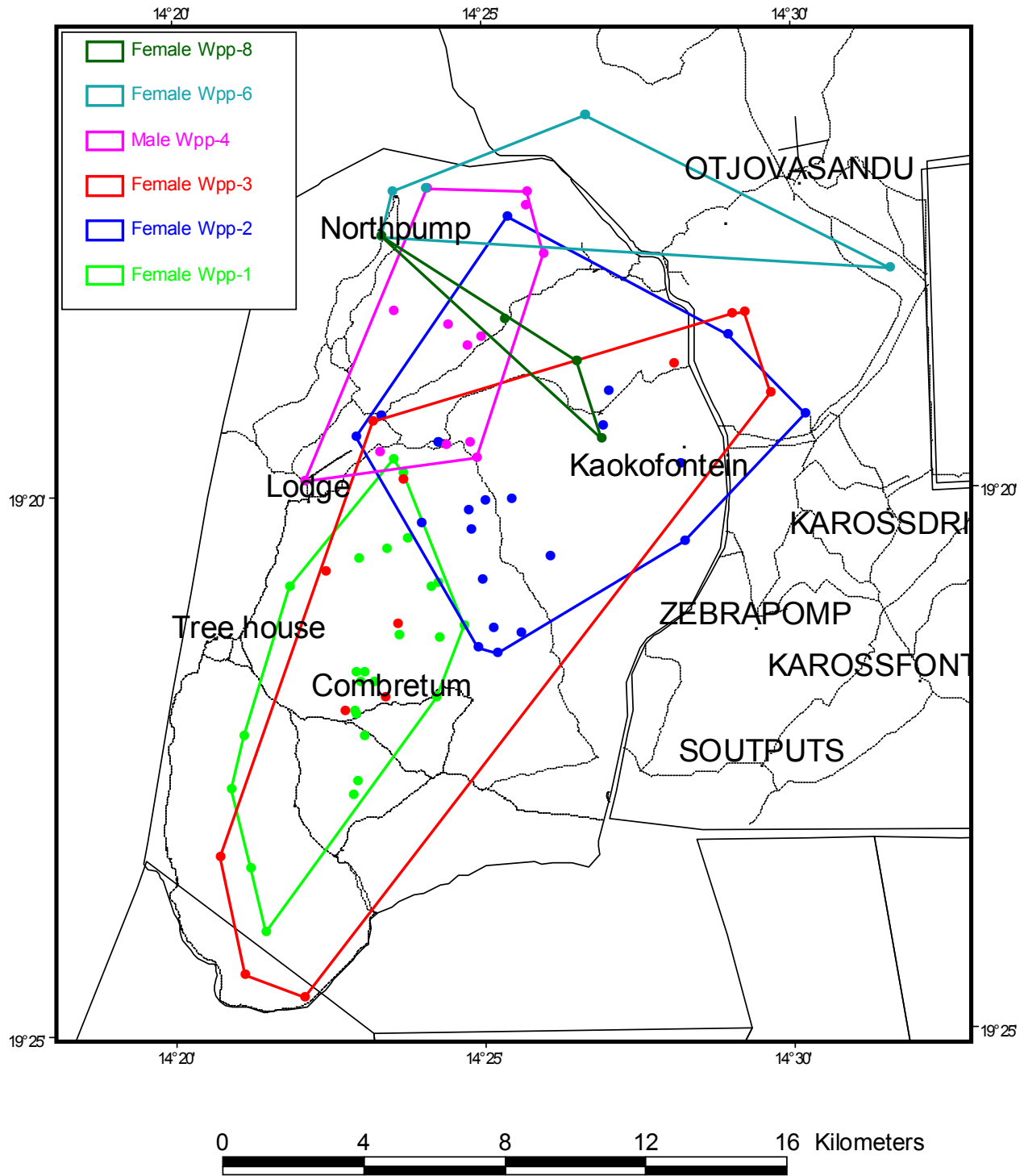
Progress Report – October 2000

[Page 15 of 19]



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And Tourism

Home ranges of leopards at Hobatere and West Etosha





Otjiwarongo Study Site - LEOPARDS

This study was conducted between July 1998 and July 2000. A total of eight leopards were captured and radio-collared in the 55.2 km² study site located on the farm Okonjima, at the Africat Foundation base. Collared leopards were radio-tracked on 501 occasions. One male leopard (App-4) died of unknown causes 4 months after he was radio-collared. Some months later a new male (App-7) moved into the vacant area (see map) and remained there until the end of the study. Hunters shot an adult male App-5 on a nearby game farm towards the end of the study. One adult leopard died during each year of the study, which gives an annual adult mortality of 14%. The sex ratio of leopards was in favour of males and is similar to previous studies in Namibia. The average age of leopards, at the end of the study, was 5.7 years (range 3.8 – 8.3), which suggested a healthy and stable population. The home ranges of males were approximately 25 % larger than females and there was extensive overlap between ranges. Male home ranges overlapped by 26 % and females by 4 %. Overlap between the sexes was 31 % of male ranges and 38 % of female ranges. Detailed results of the study are presented below.

Marked leopards at Otjiwarongo

ID no.	Age	Sex	Notes.
APP-1	Adult	Γ	
APP-2	Adult	Γ	
APP-3	Adult	E	
APP-4	Adult	Γ	Died in Nov 1998
APP-5	Adult	Γ	Shot on 9 March 200
APP-6	Adult	Γ	
APP-7	Adult	Γ	
APP-12	Adult	E	

Population demography of leopards at Otjiwarongo

	Otjiwarongo
Study area size (km ²)	55.2
Density sample size (km ²)	55.2
Number of marked leopards	8
Number of radio-collared leopards	8
<u>Leopard population estimate</u>	Known individuals
Adult male	6
Adult female	2
Sub-adults	0
Large cubs	0
Small cubs	0
TOTAL	8
Calculated population density (leopards 100 km ⁻²)	5.56
Sex ratio (Γ:E)	1 : 0.4



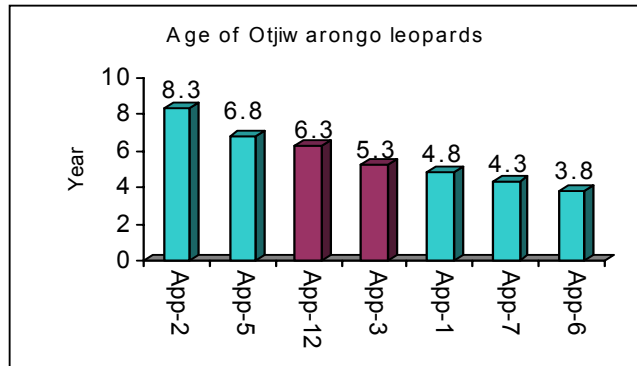
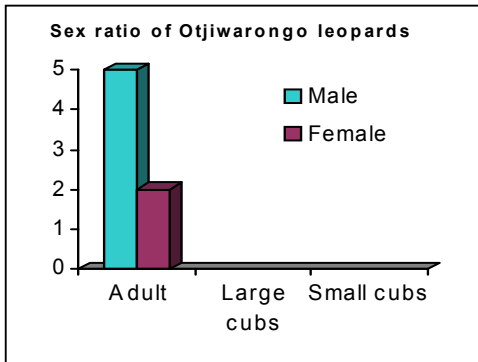
Predator Research Programme

Progress Report – October 2000

[Page 17 of 19]



Ministry of Environment
And Tourism



Home range calculations of leopards – Otjiwarongo study site

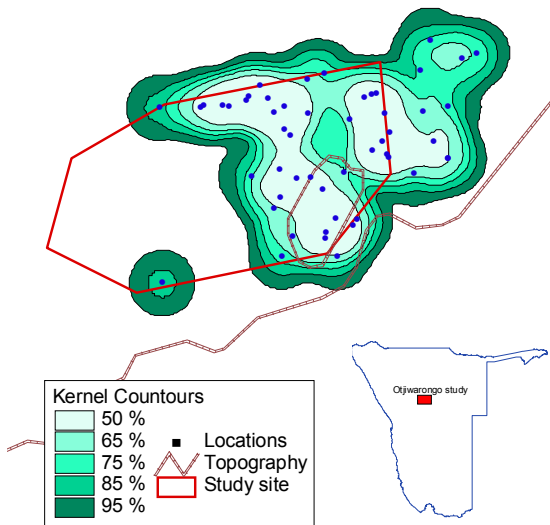
Sub group	Age/ sex	Fixes (n)	Home range calculations (km ²)		Accuracy of fixes*
			MCP	Kernel (95%)	
APP-1	Γ	53	53.2	71.4	66
APP-2	Γ	55	66.9	72.2	57
APP-4	Γ	21	22.9	34.8	Negative
APP-5	Γ	9	98.4	221.5	Negative
APP-6	Γ	33	106.4	164.8	61
APP-7	Γ	25	48.6	92.3	84
Average for males			68.8	100.2	67
APP-3	E	65	51.7	73.2	73
APP-12	E	13	29.6	70.8	74
Average for females			40.7	72.0	73.5

* The number of fixes where the home range estimate reached an asymptote of at least 95% of the home range estimate. Averages are based on estimates where an asymptote was reached.

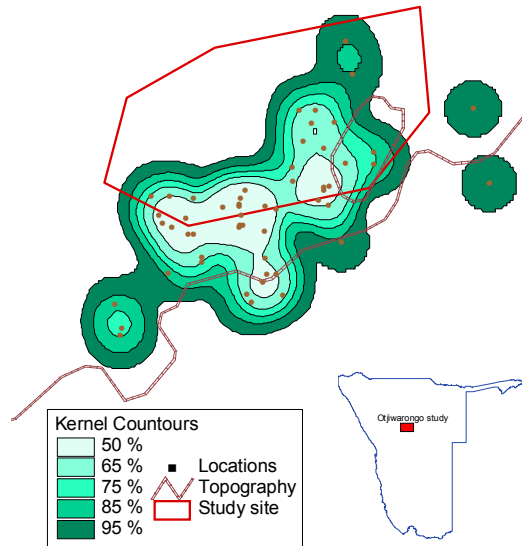


Home ranges of leopards at the Otjiwarongo Study Site

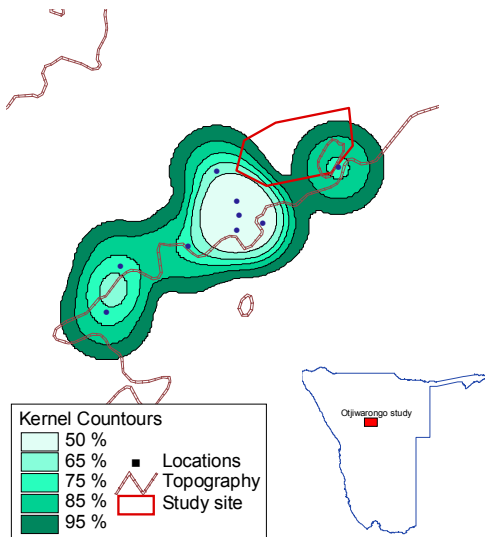
Home range of leopard App-1 (male)



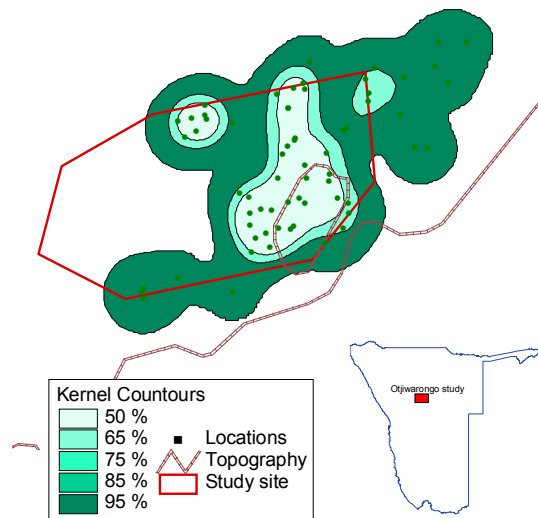
Home range of leopard App-2 (male)



Home range of leopard App-5 (male)



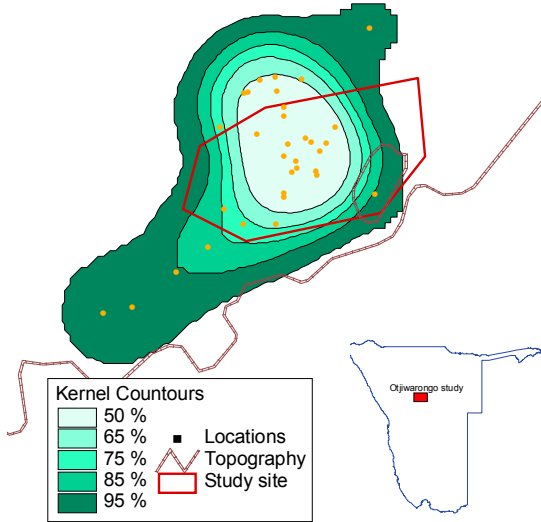
Home range of leopard App-3 (female)



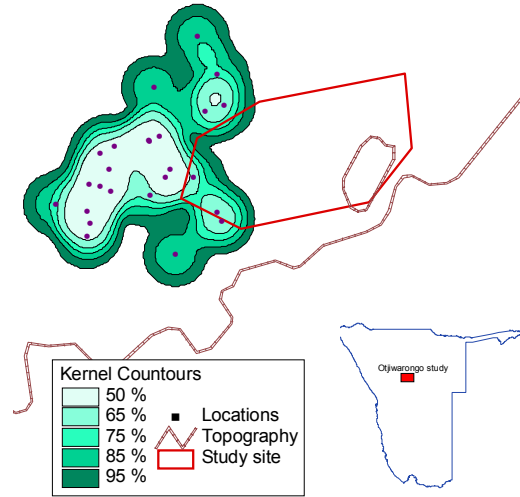


Home ranges of leopards at the Otjiwarongo Study Site (continued)

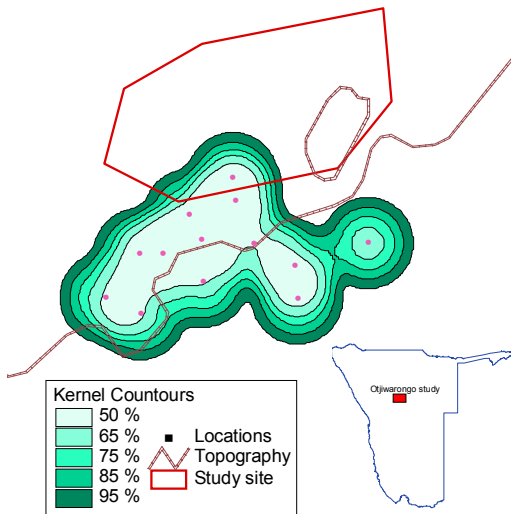
Home range of leopard App-6 (male)



Home range of leopard App-7 (male)



Home range of leopard App-12 (female)



Home range of leopard App-4 (male)

