



REPUBLIC OF NAMIBIA

MINISTRY OF ENVIRONMENT AND TOURISM

HUMAN-LION CONFLICT MANAGEMENT PLAN FOR NORTH WEST NAMIBIA



July 2017

FOREWORD

Managing Human-Lion Conflict in the arid environment of the Kunene Region is complex. Sporadic and variable rainfall patterns, typical of arid environments, result in large overlapping home ranges amongst the lions that often clash with local farmers in search of suitable grazing for their livestock. Lions are important to the growing tourism industry and there is an urgent need to manage Human-Lion Conflict in the region.

Long-term data collected on the ecology of the lion population provide a sound basis to develop and implement a management strategy to address the conflict. The Human-Lion Conflict Management Plan is subject to the National Policy on Human-Wildlife Conflict Management and relies on full collaboration by the various stakeholders under the guidance of the Ministry of Environment and Tourism.

Malan Lindeque

PERMANENT SECRETARY

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ABBREVIATIONS

CBNRM	Community-based Natural Resource Management
DECP	Desert Elephant Conservation Project
DLCT	Desert Lion Conservation Trust
DWNP	Directorate of Wildlife and National Parks
DSS	Directorate of Scientific Services
GPTF	Game Products Trust Fund
IRDNC	Integrated Rural Development and Nature Conservation
HWC	Human-Wildlife conflict
HLC	Human-Lion conflict
KRCCA	Kunene Region Communal Conservancy Association
MET	Ministry of Environment and Tourism
MLR	Ministry of Land Reform
MOU	Memorandum of Understanding
NGO	Non-governmental Organization
PH	Professional Hunter
UNAM	University of Namibia

GLOSSARY

For the purposes of this management plan, the words or phrases set out below have the following meanings:

Authorized staff member	Regional heads of the Ministry authorized by the Minister to carry such duties, functions and responsibilities.
Capacity building	Transfer of knowledge, information, skills and understanding.
Conservancy	Communal area conservancy Gazetted in terms of the Nature Conservation Amendment Act (No.5 of 1996).
Culling	Lethal removal of wild animals to reduce their numbers.
Director	Director of Wildlife and National Parks
Human-Wildlife Conflict	Any event in which wild animals harm, destroy or damage human life or property (including damage to or destruction of crops), or in which wild animals are injured, captured or destroyed as a result of a perceived threat to humans or their property.
Human-Lion Conflict	Any event in which lions harm or destroy human life or their domestic livestock, or in which wild lions are injured, captured or destroyed as a result of a perceived threat to humans or their property.
Government	Government of the Republic of Namibia.
Ministry	The Ministry of Environment and Tourism.

Problem-causing animal	An identified individual wild animal that at any point in time harms, destroys or damages human life or property.
Professional Hunter	A professional hunter approved by MET.
Protected Area	Formal protected area proclaimed in the Government Gazette according to legislation.
Staff member	Person appointed in terms of the Public Service Act (13 of 1995).
Stakeholder	Any individual, group of individuals, organization or government department or agency that is affected by HWC or is involved in research on HWC or implementation of measures to mitigate HWC.
Wild animal	Any wild animal that is included in Schedules 3, 4 and 5 of the Nature Conservation Ordinance (Ordinance 4 of 1975, as amended) or any similar schedules contained in legislation that replaces the Ordinance.

1. INTRODUCTION

Addressing Human-Wildlife Conflict requires striking a balance between conservation priorities and the needs of people who live with wildlife. Most Namibians depend on the land for their subsistence. But the presence of many species of large mammals, combined with settlement patterns of people, leads to conflict between people and wildlife. It is therefore necessary that mechanisms are created for rural communities and farmers to manage and benefit from wildlife and other natural resources.

A variety of approaches can be implemented in order to manage the conflict efficiently and effectively, and that are in line with the strategies set out in the policy. These include prevention strategies which endeavour to avoid the conflict occurring in the first place and take action towards addressing its root causes, and protection strategies that are implemented when the conflict is certain to happen or has already occurred, as well as mitigation strategies that attempt to reduce the level of impact and lessen the problem.

2. BACKGROUND

Successful conservation efforts and the growth of communal conservancies in the North West of Namibia during the past 20 years have resulted in an increase of wildlife populations.

Along the borders of the Skeleton Coast Park a small population of lions survives in extreme desert conditions. These lions exhibit unique adaptation to their environment and live in a harsh habitat of sand dunes, gravel plains and barren mountains, and occasionally forage along the beaches of the Skeleton Coast. This has resulted in the growth in tourism because nowhere else in the world can free-ranging lions be seen amongst sand dunes or on a beach. These lions should be viewed as a National asset to Namibia that needs to be managed wisely to the optimum benefit of the Namibian people.

However, the increase in wildlife numbers, has led to heightened conflict between lions and the local people. While income-generating enterprises such as tourism, trophy hunting and crafts have thrived at conservancy level; considerably less attention has been

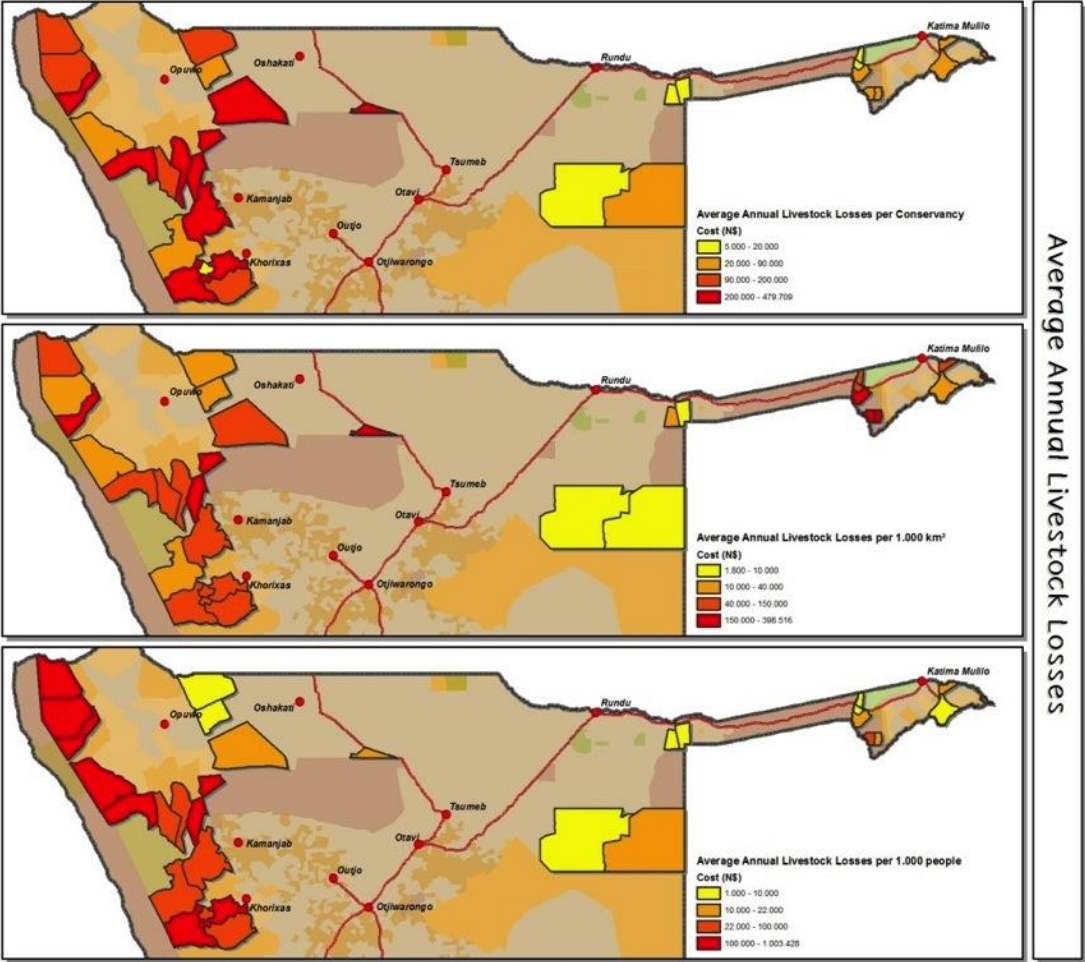
paid to reducing human-wildlife conflict. In most conservancies the costs experienced by conservancy members that suffer livestock losses from lions exceeds the selected income they earned from their respective conservancies. Table 1 shows the annual costs of livestock losses in some of the key conservancies across northern Namibia. Conservancies in the North West (NW) of Namibia suffer significantly higher losses when compared to conservancies across northern Namibia (Table 1).

Conservancies with the highest incidents of human-wildlife conflict are those on or near to national parks and tourism concession areas (Figure 1) with conservancies along the borders of Etosha National Park and Skeleton Coast Park, and around Palmwag concession areas suffering most livestock losses. Lions prey on domestic livestock, and farmers respond by shooting lions to protect their livelihood. Local communities have to bear the costs of living with lions but do not always share equally in the benefits. As a result, members of those conservancies are often least sympathetic to the presence of the park and are less inclined to support conservation practices. These attitudes can be turned around by providing communal farmers with information, support, management skills and infrastructure to protect livestock, as part of the implementation of conservancy and/or regional HWC management plans.

Table 1: The estimated costs of Human-Wildlife Conflict through livestock losses (N\$) per conservancy and per 1,000 people for each conservancy.

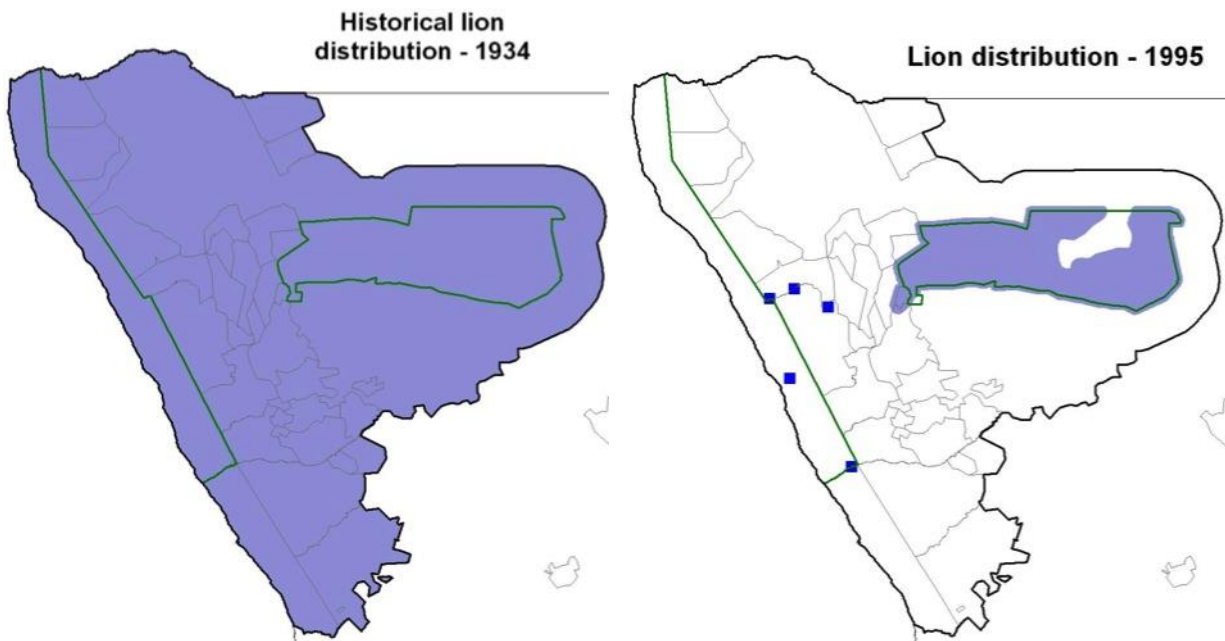
Average annual <u>livestock losses</u> per conservancy		Average annual <u>livestock losses</u> per 1,000 people per conservancy	
Conservancy	Cost (N\$)	Conservancy	Cost (N\$)
Muduva Nyangana	5,868	Uukwaluudhi	1,185
Mayuni	9,976	N=/a Jaqna	2,473
Uibasen Twyfelfontein	16,063	Muduva Nyangana	2,934
N=/a Jaqna	17,311	Uukolonkadhi/Ruacana	3,603
George Mukoya	18,044	Mayuni	4,157
Kwandu	18,484	Kwandu	4,299
Sikunga	22,445	Salambala	4,801
Impalila	27,873	George Mukoya	9,022
Uukwaluudhi	29,633	King Nehale	10,122
Salambala	36,968	Sikunga	11,223
Balyerwa	37,849	Sheya Uushona	13,566
Wuparo	40,196	Impalila	18,582
Nyae Nyae	48,998	Wuparo	19,141
Puros	50,508	Mashi	20,500
Mashi	79,952	Nyae Nyae	21,303
Torra	88,596	Balyerwa	25,232
Uukolonkadhi/Ruacana	90,074	Anabeb	45,126
Anabeb	90,252	Uibasen Twyfelfontein	69,840
Orupembe	100,636	Torra	73,830
Sorris Sorris	123,372	#Khoadi//hoas	74,261
Marienfluss	165,771	Omatendeka	85,673
King Nehale	202,446	Sorris Sorris	94,902
Doro !Nawas	207,000	Sesfontein	106,211
Omatendeka	214,182	Ehrovipuka	131,443
#Khoadi//hoas	237,636	Doro !Nawas	138,000
Sanitatas	250,857	Puros	194,262
Sesfontein	265,527	Orupembe	251,591
Ehrovipuka	328,608	Marienfluss	552,570
Sheya Uushona	479,709	Sanitatas	1,003,428

Figure 1. Livestock losses recorded in conservancies across northern Namibia.



Historically lions occurred throughout the Kunene Region, but with autocratic political structures, land reform (such as the Odendaal Commission in 1970) and the growth of agriculture post 1970, the population declined dramatically (Figure 2). Lions that inhabited the Skeleton Coast Park and the bordering arid habitat of the northern Namib Desert were all but wiped out leaving only the Etosha population.

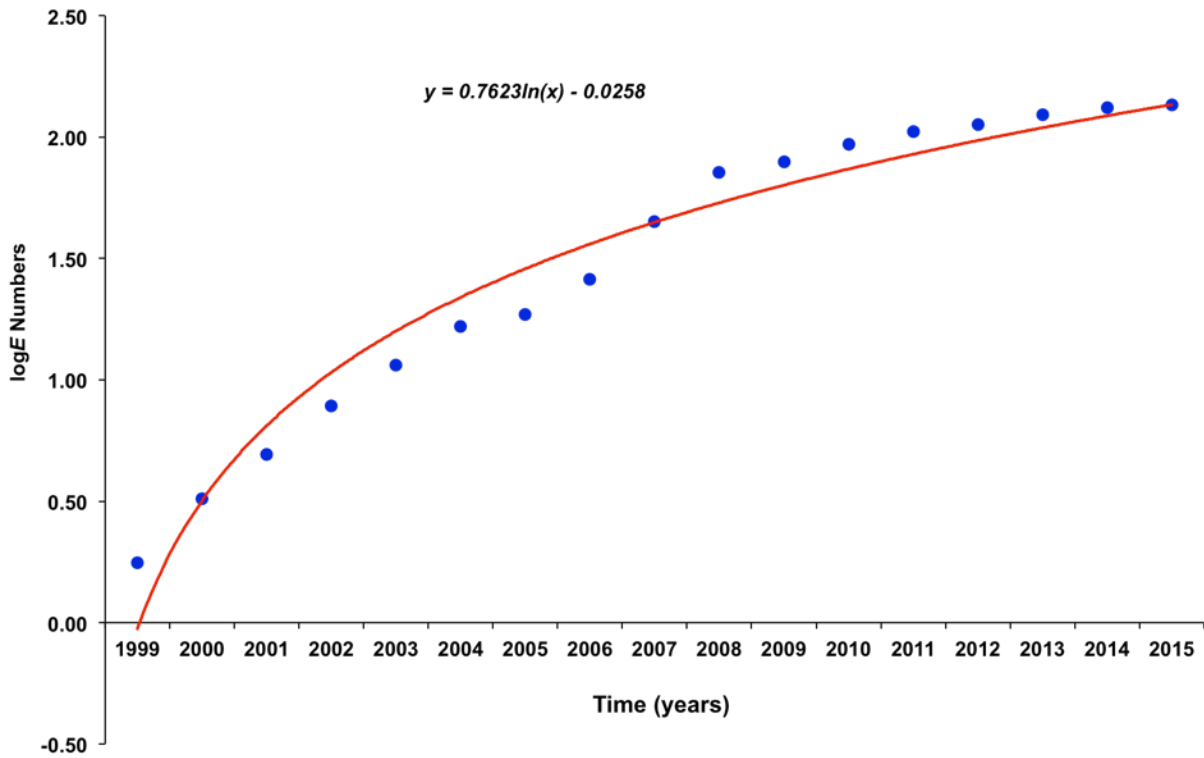
Figure 2. Historical distribution of lions in the North West of Namibia (1934 – 1995).



Following the independence of Namibia in 1990 that led to the establishment of communal conservancies, the development of CBNRM programmes, and the rapid growth of tourism, as well as above average rainfall in the region the few surviving desert-adapted lions increased and expanded to parts of its former range (Figure 4).

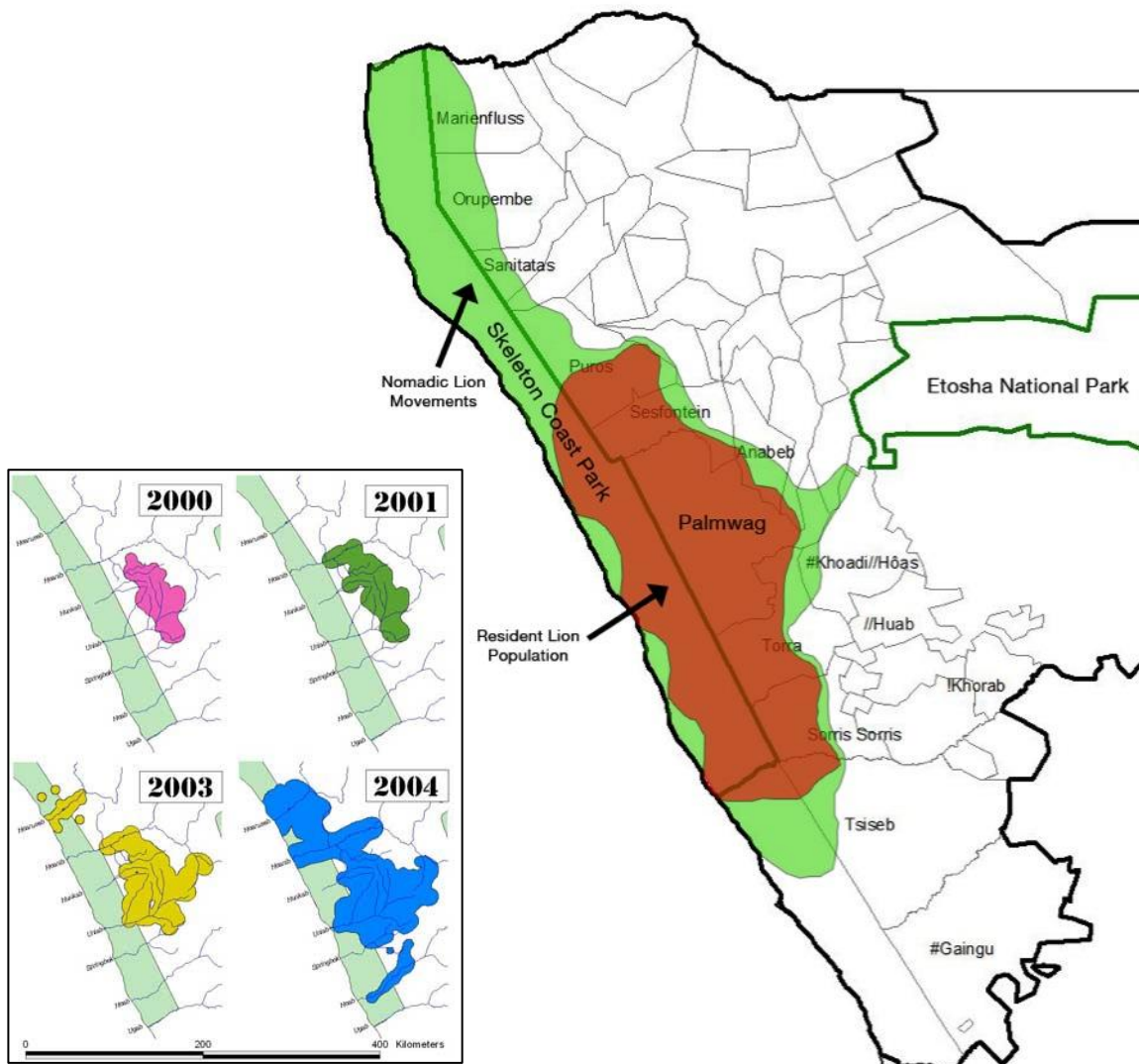
The lions have been the subject of intensive long-term research and monitoring since 1998. During this period the population displayed a positive growth rate (Figure 3) and the number of lions increased from approximately 20 individuals in 2000 to an estimated 180 in 2015.

Figure 3. Growth rate of the desert-adapted lion population between 1999 and 2015.



Lions may occasionally still move between Etosha and the arid areas bordering the Skeleton Coast Park, but the increase in livestock farming east of the Grootberg escarpment has essentially created an effective barrier. The lions inhabiting the Skeleton Coast Park and bordering areas exhibit unique adaptation to the arid environment and are treated as a separate sub-population, referred to as the “Desert” population. Between 1999 and 2015 the “Desert” lion population expanded from the core area northwest of Palmwag to occupy ephemeral river systems and suitable habitats between the Hoaruseb and Ugab Rivers (Figure 4).

Figure 4. The distribution of desert-adapted lions in the North West of Namibia in 2015 with indications of the recorded expansion between 2000 and 2004.



The “Desert” lion sub-population is important to the conservation of the species in Namibia. Their range (Figure 4) contributes to 51% of the total area inhabited by lions in Namibia, but only 16% of this range falls inside a protected area. Nevertheless, the conservation prospects are favourable, since the area has a rapid-growing tourism industry and forms the hub of CBNRM and Communal Conservancy programmes.

3. RATIONALE

In 2009, Cabinet approved the National Policy on Human Wildlife Conflict Management. The Policy provided a framework for addressing human-wildlife conflict efficiently and effectively in order to promote both biodiversity conservation as well as human development.

Due to human population growth, wildlife population growth, unplanned agricultural activities, and the expansion of agricultural and industrial activities, which together have led to increased human encroachment on previously wild and uninhabited areas the incidents of human-wildlife conflict have increased. With the current challenges and new innovative ideas on how to address the conflict, the National Policy on Human Wildlife Conflict Policy has been reviewed. The new policy is more focused and specific on affected areas and the specific conflict that should be addressed. The policy also contains an implementation plan that outlines the required human and financial resources requirements to deal with the problem. This human-lion conflict management plan contributes to the revised National Policy on Human Wildlife Conflict Management.

4. ALIGNMENT

The Human-Lion Conflict Management Plan is aligned with both the National Policy on Human Wildlife Conflict Management and the Lion Conservation Strategy (Draft). The legislative basis for control of problem causing animals, hunting and the rights on the utilisation of wildlife is currently covered by the Nature Conservation Ordinance 4 of 1975 as amended by the Nature Conservation Amendment Act (Act 5 of 1996).

5. PRINCIPLES

The Human-Lion Conflict Management Plan is based on a number of fundamental principles outlined in the National Policy on Human Wildlife Conflict Management.

6. POLICY DIRECTION

6.1 Vision

To manage human wildlife conflict in a way that recognizes the rights and development needs of local communities, recognizes the need to promote biodiversity conservation, promotes self-reliance and ensures that decision-making is quick, efficient and based on the best available information.

In order to achieve this, the Government will devolve decision-making to the lowest appropriate institutional levels, develop appropriate mitigation and monitoring methods and develop the capacity of all stakeholders to manage human wildlife conflict.

6.2 Mission

To provide a framework for addressing Human-Lion conflict efficiently and effectively in NW Namibia following the guidelines of the revised National Policy on Human Wildlife Conflict Management.

6.3 Goal

To provide measures and approaches to manage and reduce human lion conflict in NW Namibia according to the revised National Policy on Human Wildlife Conflict Management.

6.4 Objectives

The objectives of the Management Plan are:

- 6.4.2 To contribute to a standardised monitoring system for human-lion conflict Management.
- 6.4.3 To establish best practice mitigation measures for human-lion conflict management.
- 6.4.4 To develop innovative mechanisms to reduce the level of human-lion conflict.
- 6.4.5 To provide clarity on the question of compensation with regard to damages caused by wildlife, especially the lion.

6.5 Strategies

Human-Lion Conflict (HLC) is a multi-faceted problem. In order to address its impacts, a number of different strategies are required to address the following key issues:

- The economic impacts of HLC on local communities.
- The appropriate level of decision-making power for managing HLC, particularly in a case where an animal that persistently causes problems needs to be destroyed.
- Accurate information on the scale, the costs and impacts of conflict, and the success of mitigation methods and approaches.
- The skills of all stakeholders to manage HLC efficiently and effectively.

In order to address these key issues the Government has developed the following strategies:

6.5.1 Land use planning and livestock management structures

Understanding the patterns and extent of human-lion conflict experienced by communities farming with livestock in NW Namibia is important to the development of effective management options. Data collected by conservancies through the Event Book procedures and other monitoring systems provide valuable information. Between 2003 and 2015 the five conservancies that share their land with the Desert lion population recorded 5,863 incidents of livestock attacks caused by lions and other carnivores. On average 451 incidents were recorded per year (range: 205 in 2003 to 713 in 2013) with Sesfontein Conservancy recording the highest number of attacks (N = 2293) followed by Anabeb (N = 1393), Torra (N = 1303) and Purros Conservancies (N = 873). The pattern and frequency of livestock attacks varied between years and between conservancies (Figure 5).

Between 2005 and 2015 a total of 343 incidents of human-lion conflict were recorded by the five conservancies at an average of 32 incidents per year (range: 15 in 2011 to 54 in 2015). Torra Conservancy recorded the highest number of incidents (N = 121) followed by Purros (N = 85), Sesfontein (N = 77) and Anabeb Conservancies (N = 60). Although Torra Conservancy recorded a dramatic increase between 2011 and 2015, the pattern and frequency of human-lion conflict incidents between years and between conservancies appears to be random (Figure 6).

A total of 37 lions were destroyed between 2005 and 2015 (Figure 7). Torra Conservancy reported the highest number of lions destroyed during human-lion conflict (N = 18) followed by Sesfontein (N = 9), Anabeb (N = 7) and Purros Conservancies (N = 3). There was no statistical relationship between the recorded incidents of human-lion conflict and the number of lions destroyed. However, the number of lions destroyed increased dramatically between 2013 and 2015 when 27 of the 37 lions (73 %) were killed. During the same period the five conservancies only recorded 36 % of the total recorded human-lion incidents and 26 % of the recorded attacks on livestock.

Figure 5. Number of livestock damage incidents caused by lions and other carnivores per year between 2003 and 2015 as recorded by five conservancies.

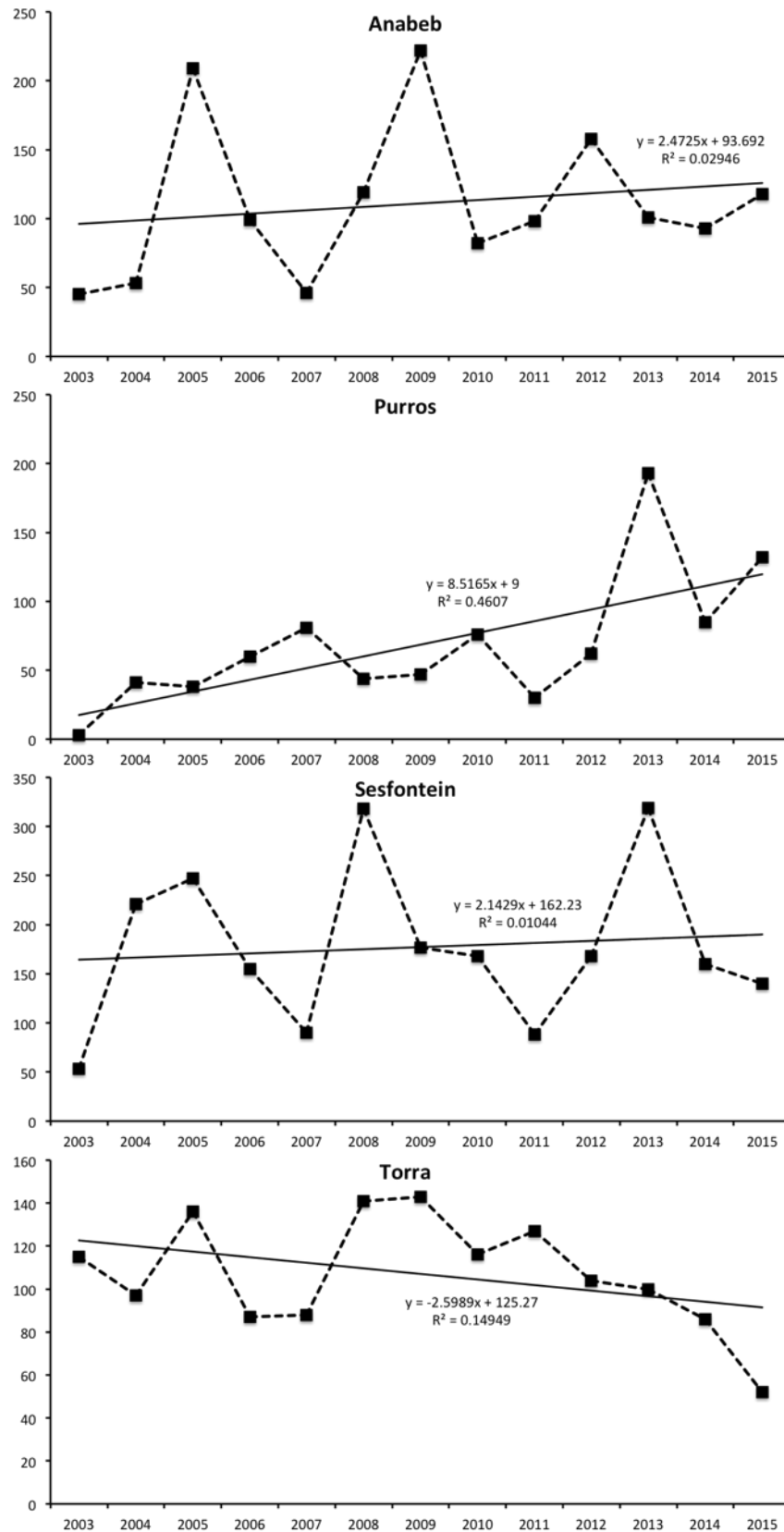
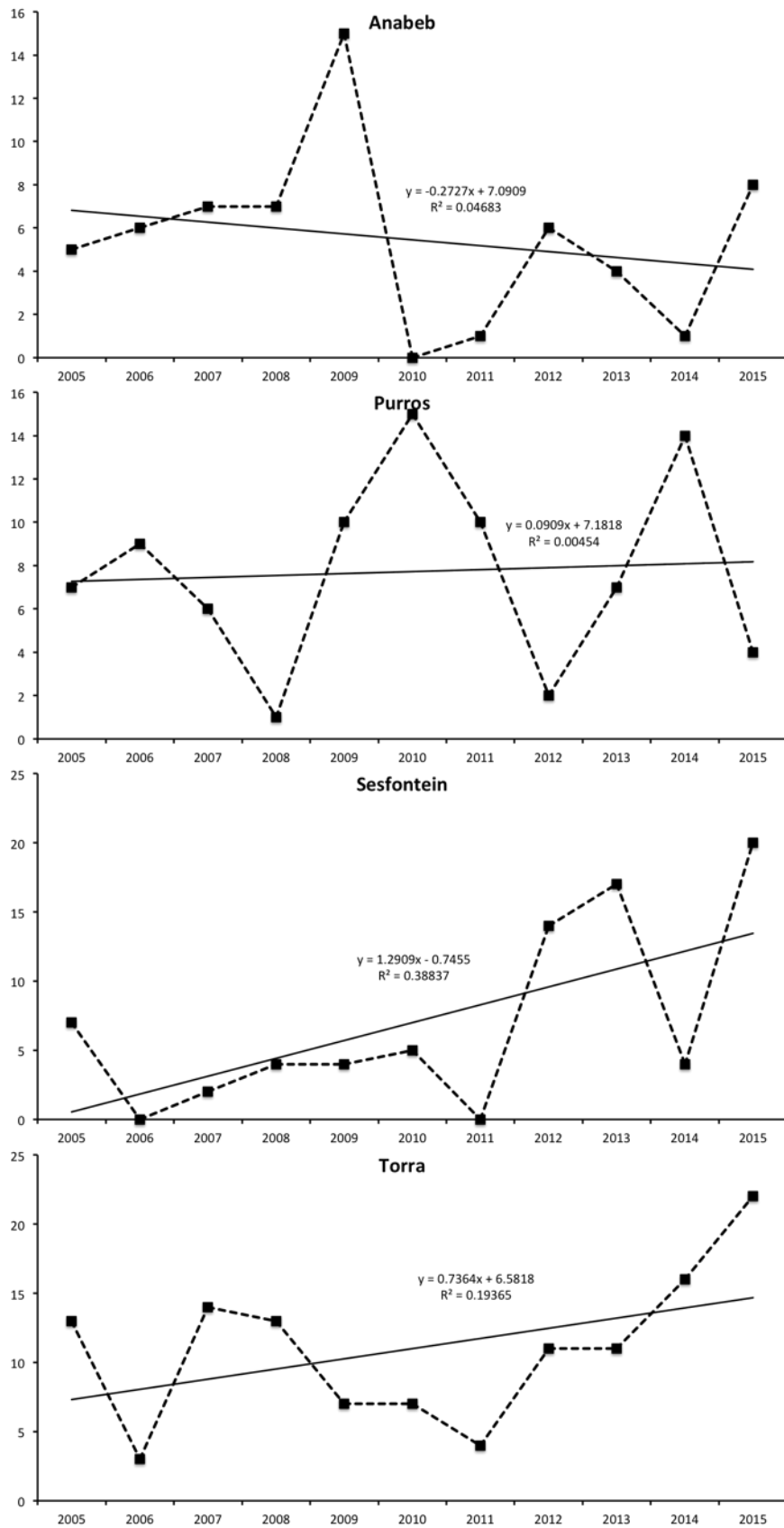


Figure 6. Number of human-lion conflict incidents per year between 2003 and 2015 as recorded by five conservancies.



6.5.2 Aspects of lion demography & behaviour ecology relevant to HLC

A sound understanding of the population dynamics, demography and behaviour ecology of the Desert lion population is essential to the process of conserving the species and managing human-lion conflict. This can only be achieved through the systematic collection of long-term data on the key aspects of their ecology. These include habitat utilisation, home ranges, movement patterns, hunting behaviour, activity patterns, group/pride structures and limiting factors.

6.5.2.1 *Movements and habitat use*

Over the past seven years (2008 – 2015) satellite and GPS radio-collars were fitted to 19 different lions that represent all the current prides in the population. In total 196,849 data points were recorded that contain accurate movement patterns and habitat utilisation of all the major prides/groups of lions that represent data over 43.5 lion-years (Table 2 & Figure 7).

Table 2. Sample sizes and status of 19 lions (7 males and 12 females) fitted with satellite radio collars in the northern Namib.

Pride / Area	Lion ID	Sex	N ¹ (points)	N ² (nights)	Duration	Status
Hoanib Floodplain	Xpl-10,	♀	38,438	2,365	16.5 yrs	Dead***
	Xpl-55	♀				On-going**
Hoanib River	Xpl-47	♀	29,017	2,741	7.6 yrs	Dead
	Xpl-59	♀				On-going
Okongwe	Xpl-70	♀	11,298	1,142	2.8 yrs	Malfunction*
Orowau / Hunkap	Xpl-81	♂	9,226	1,169	3.4 yrs	On-going
	Xpl-53	♀	10,051	794	2.2 yrs	Malfunction
	Xpl-100	♀	861	164	8 mo	On-going
Uniab Delta	Xpl-45	♀	32,277	2,033	5.8 yrs	On-going
Barab / Obab	Xpl-54	♂	5,868	533	1.5 yrs	Malfunction
	Xpl-49	♀	30,253	1,447	4 yrs	Malfunction
Aub - Etendeka	Xpl-79	♂	420	210	7 mo	Dead
	Xpl-65	♀	3,281	402	1.1 yrs	Malfunction
	Xpl-94	♂	811	139	6 mo	On-going
Agab River	Xpl-50	♂	6,892	329	1 yr	Dead
	Xpl-36	♀	4,567	515	3.2 yrs	Dead

Huab River	Xpl-75	♀	8,998	1,338	3.9 yrs	On-going
Ugab River	Xpl-77	♂	2,799	247	9 mo	Dead
	Xpl-98	♂	1,792	305	11 mo	On-going
Totals			196,849	15,873	or 43.5 Lion years	

Key:

Dead*** = Lion was shot, trophy hunted or died of natural causes during the past year.

On-going** = Lion is alive and collecting of movement data continues.

Malfunction* = Satellite radio collar failed.

The distance that a lion moves per night is a function of home range size and habitat use. Accurate information on this is important to the conservation process and essential for the management of Human-Lion-Conflict. The home ranges of male lions are larger than those of females and on average the 19 lions moved 8.2 km per night (Table 6). Male lions, however, moved further per night (9.3 ± 1.2 km) than did lionesses (7.3 ± 0.9 , $t = 3.963$, $P < 0.01$).

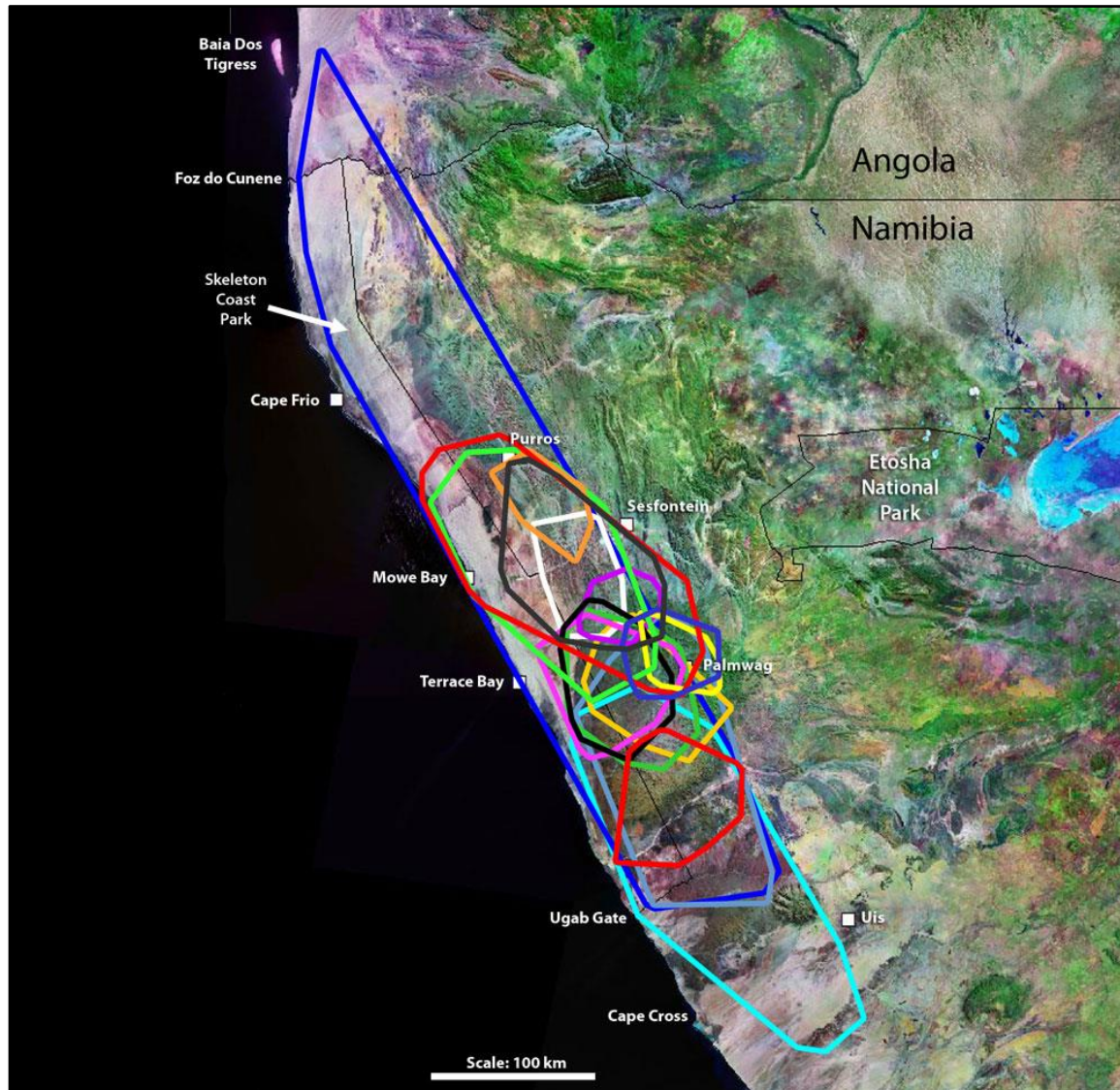
Table 6. Home range estimates (km²), using the Minimum Convex Polygon (MCP) technique, and distances moved by 19 lions (7 males and 12 females) fitted with satellite radio collars in the northern Namib.

Pride / Area	Lion ID	Sex	Home Range MCP* (km ²)	Total distance moved (km)	Average distance moved per	Range of distance per night (km)
Floodplain	Xpl-10	♀	12,642	17,334	9.8	0 – 62.1
	Xpl-55	♀	2,550	11,410	9.5	0 – 36.4
Hoanib	Xpl-47	♀	2,471	14,136	7.9	0 – 36.3
	Xpl-59	♀				
Okongwe	Xpl-70	♀	1,668	4,922	6.1	0 – 37.7
Orowau / Hunkap	Xpl-81	♂	6,405	11,437	11.4	0 – 52.0
	Xpl-53	♀	1,236	4,328	5.5	0 – 22.8
	Xpl-100	♀	618	1,032	6.3	0 – 26.3
Uniab Delta	Xpl-45	♀	3,997	2,135	6.9	0 – 38.9
Barab / Obab	Xpl-54	♂	3,978	4,911	9.5	0 – 63.2
	Xpl-49	♀	4,161	13,219	7.9	0 – 40.1
Aub / Etendeka	Xpl-79	♂	1,923	1,115	7.7	0 – 27.7
	Xpl-65	♀	1,258	984	7.1	0 – 21.5
	Xpl-94	♂	915	1,329	9.6	0 – 24.8
Agab River	Xpl-50	♂	4,881	1,108	8.1	0 – 31.9
	Xpl-36	♀	3,882	3,454	6.9	0 – 32.0
Huab River	Xpl-75	♀	4,865	8,137	7.1	0 – 46.5

Ugab River	Xpl-77	♂	16,872	2,544	10.3	0 – 54.1
	Xpl-98	♂	3,878	2,517	8.3	0 – 30.8

The spatial and temporal patterns of movements and how lions utilise their home ranges are important parameters for all aspects of conservation, mitigation of human/lion conflict and tourism development. There are many different statistical methods to calculate home range sizes. Depending on the movement patterns of animals and the habitat, some methods are more suitable than others. In this analysis the home range size of lions marked with satellite radio collars were calculated using the universal Minimum Convex Polygon (MCP) method. In some cases Spider Distance techniques were used as an additional assessment of habitat use. The movement data from the 19 collared lions provide an essential base-line understanding of the demography of the population.

Figure 7. Layout of the areas utilised by 19 lions fitted with satellite radio collars in the northern Namib between 2008 and 2015.



Conflict between lions and people occur essentially all along the eastern edge of the distribution of the lion population. However, the long-term data collected on lion movements indicate that there are particular “hotspots” where incidents of Human-Lion-Conflict occur repeatedly over the years regardless of the individual lions. These “hotspots” coincide with reports of Human-Lion-Conflict recorded by the communities. Data are presented on lion movements in relation to these “hotspots” with a focus on the past three years due to heightened levels of Human-Lion-Conflict.

🐾 Torra Conservancy

Human-lion conflict has been particularly problematic in parts of the Torra Conservancy due to an abundance of sub-adult lions that have dispersed from their natal prides. Data collected on the demography and movements of the established lion prides since 2008 provide a base-line understanding of habitat utilisation by these lions (see Figs. 6 – 10).

🐾 Aub / Etendeka Pride

During the past three years the original Aub Pride have expanded extensively into the Etendeka and Klip River area. The adult male Xpl-79 that was fitted with a satellite collar was unfortunately shot and the collar destroyed (Figure 8). A young adult male (Xpl-94) from the Hunkap Pride moved into the area and was fitted with a new satellite collar (Figure 9). Unfortunately this lion was also shot a few months later and the collar was destroyed.

Figure 8. The home range area of Xpl-79 (male).

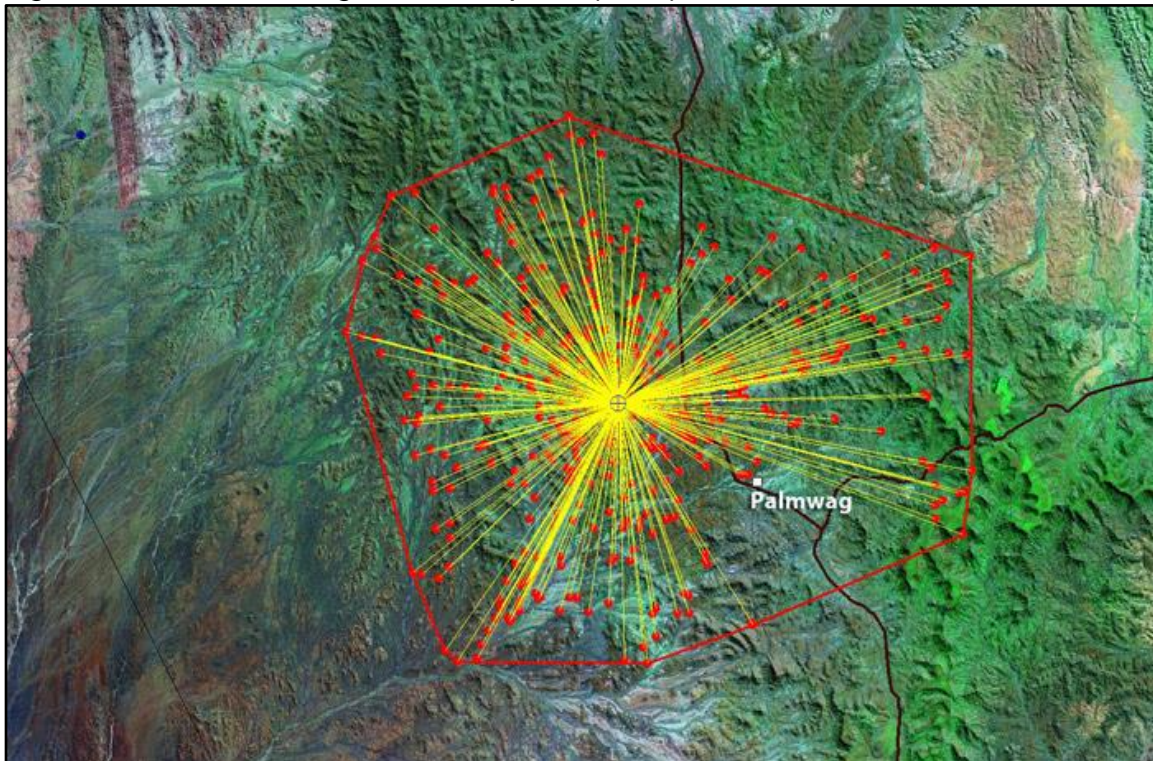
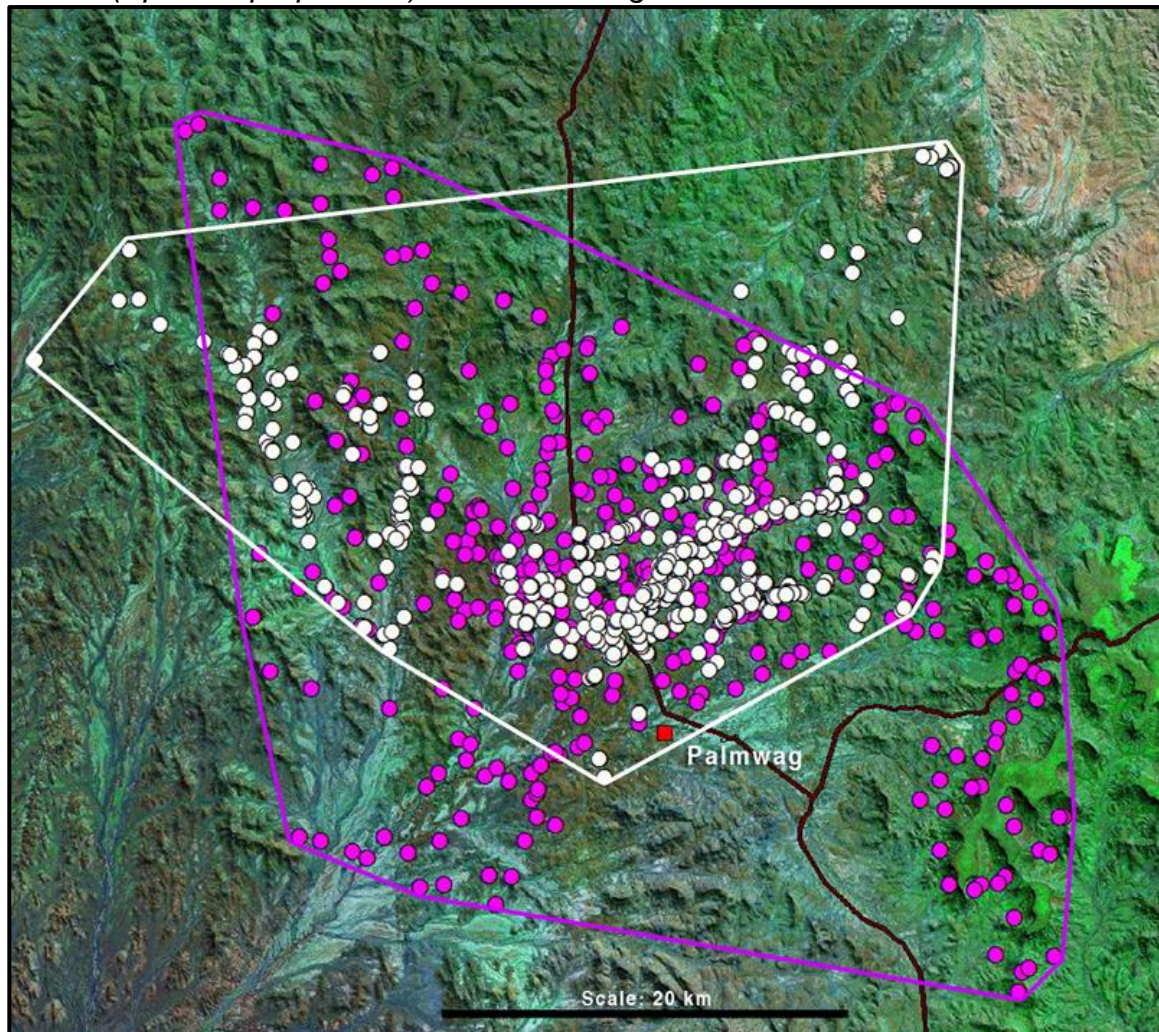


Figure 9. The home range area of an adult male (Xpl-94 – white dots) and an adult female (Xpl-65 – purple dots) in the Palmwag / Etendeka area.



🐾 Agab / Springbok River Pride

The numbers of the Agab Pride increased substantially during the past two years and many of the sub-adult lions expanded to the Springbok River and into the Bergsig area. As a result the incidents of conflict with the local communities increased. After the pride male (Figure 10) and the Ugab male (Xpl-77) was shot whilst mating with Xpl-36 (Figure 11) the Pride spent more time between the Agab and Springbok Rivers. An adult male from the Obab Pride (Xpl-74) joined the lionesses.

Figure 10. The home range area of Xpl-50 (male).

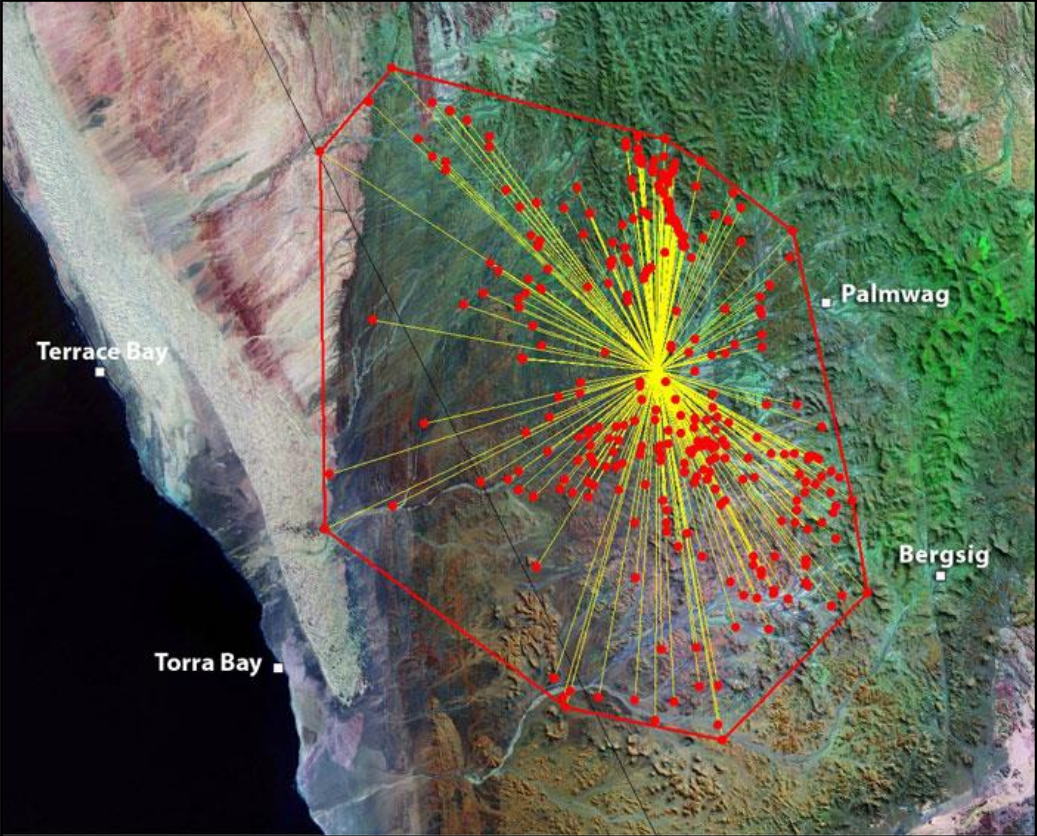
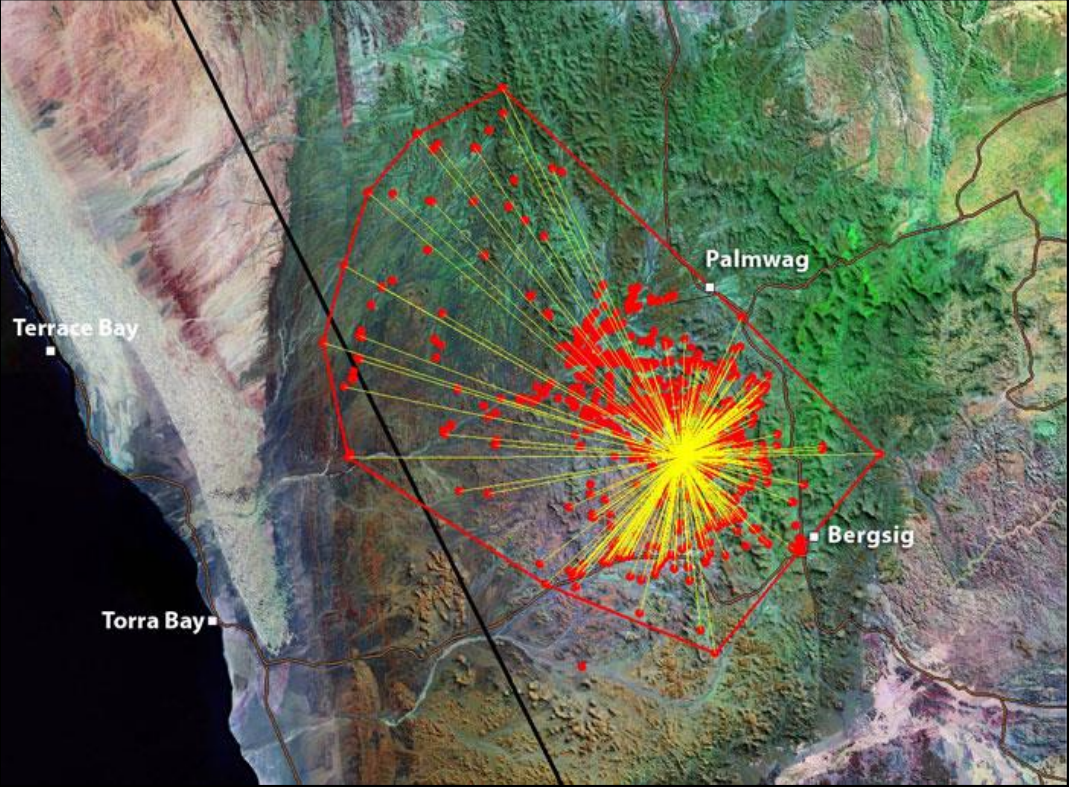


Figure 11. The home range area of Xpl-36 (female).



🐾 Huab Pride

The Huab Pride expanded from 3 individuals (1 male Xpl-68 and two females Xpl-75 / Xpl-76) in 2012 to approximately 13 – 15 lions. Five sub-adults, from the first litter of Xpl-75 & Xpl-76 born early in 2012, dispersed and settled in the Ugab River. The home range of Xpl-75 expanded from 2013 (Figure 12) to a larger area that extended up to the Ugab River by the end of 2015 (Figure 13).

Figure 12. The home range area of Xpl-75 (female) up to the end of 2013.

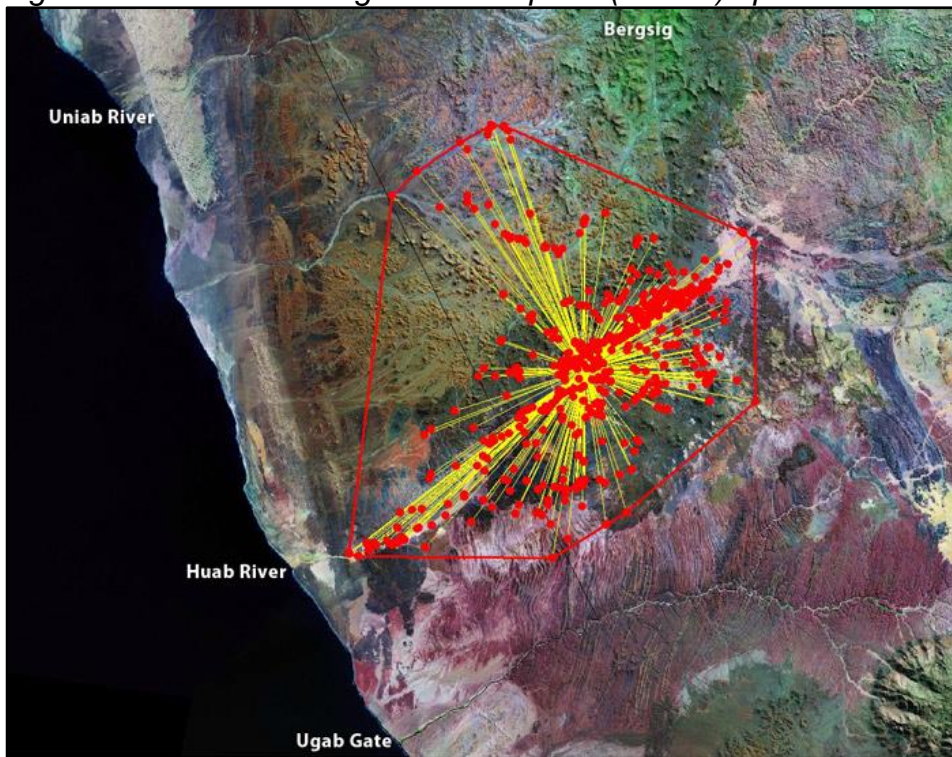
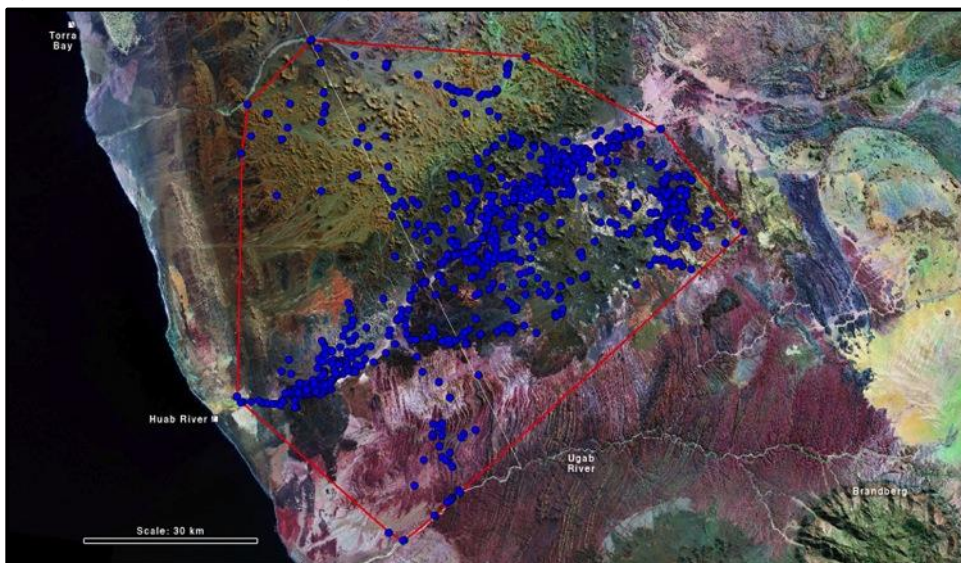


Figure 13. The home range area of Xpl-75 (female) up to the end of 2015.



🐾 Ugab Pride

After the adult male (Xpl-77, Figure 14) was shot close to Bergsig on 27 Sep 2013, the Ugab River was vacant until five sub-adult lions from the Huab Pride dispersed and occupied the Ugab (Figure 15).

Figure 14. The home range area of Xpl-77 (male) up until September 2013.

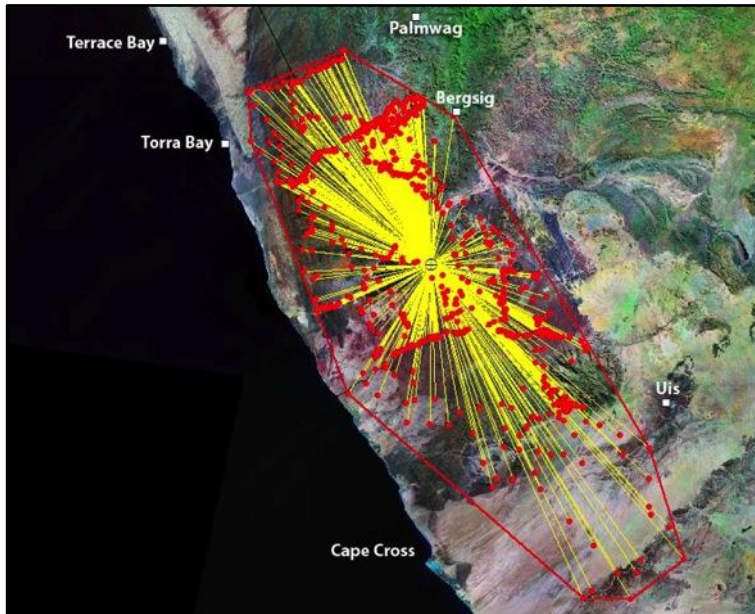
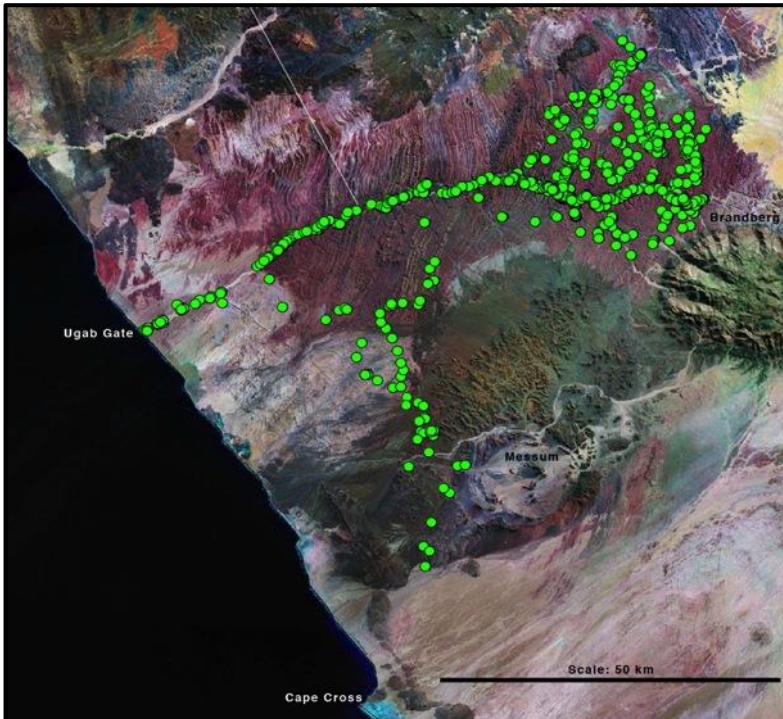


Figure 15. The current home range area of Xpl-98 (male).



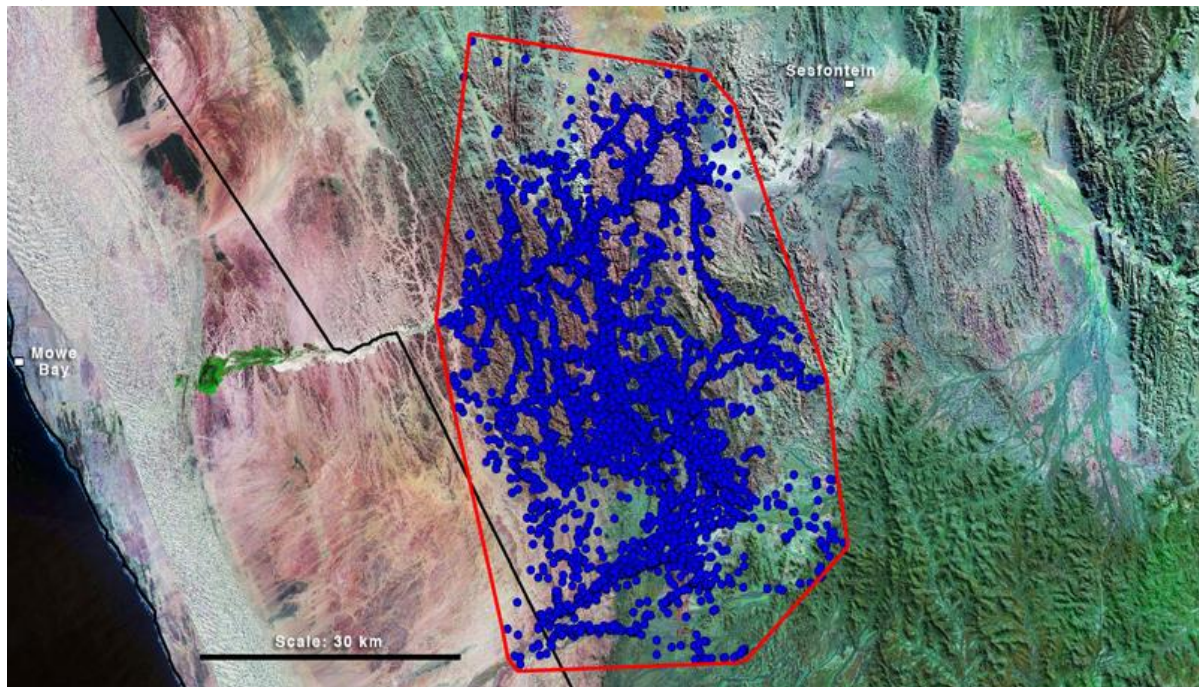
🐾 Purros, Sesfontein & Anabeb Conservancies

The home ranges of desert-adapted lions are exceptionally large and there is extensive overlap between the home ranges of different prides. This is an important strategy in their adaptation to the harsh arid environment that is particularly relevant to understanding the frequency and patterns of Human-Lion-Conflict. The home ranges of lion prides in the northern section of the study area overlap with at least two, but sometimes with all three conservancies. As a result, each of these prides is generally responsible for incidents of Human-Lion-Conflict in two or all three conservancies over the course of a few years. More relevant to understanding and the managing Human-Lion-Conflict is the fact that lions from several different prides may be responsible for Human-Lion-Conflict at any one location over time.

🐾 Hoanib Pride

The Hoanib Pride has occupied the Hoanib River between Elephant Song and Amp's Poort since 2006 (Figure 16). Their range extends up to the southern section of Okongwe and south to the Hunkap River. These lions have been responsible for Human-Lion-Conflict in both the Purros and Sesfontein Conservancies. The lioness Xpl-47 was fitted with a GPS collar in May 2008 and her movements were recorded until she was shot in the upper Obias River on 8 November 2015. A new satellite collar was fitted to the last surviving adult lioness (Xpl-59).

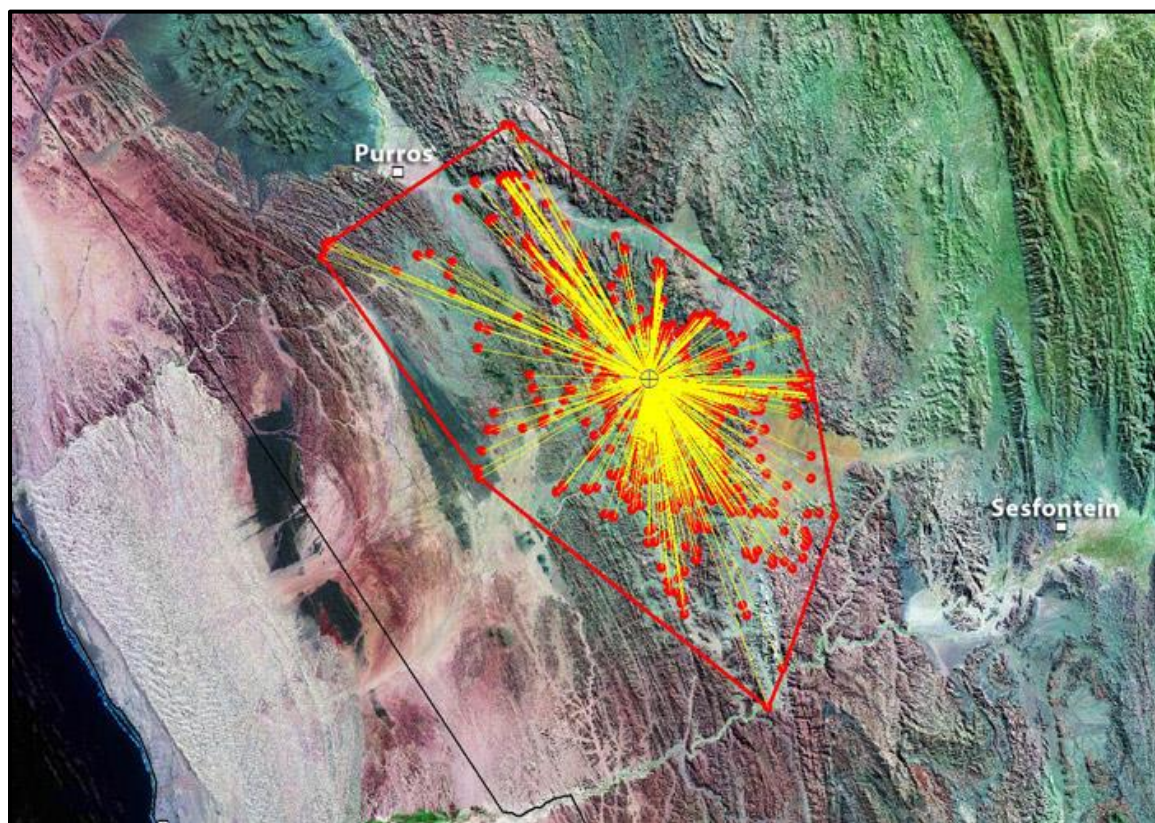
Figure 16. The home range area of Xpl-47 (female) until her death in November 2015.



🐾 Okongwe Pride

Three lionesses dispersed from the Hoanib Pride in 2007 to form the Okongwe Pride. They were known as the “70s Lionesses” and occupied the mountainous terrain around Okongwe waterhole (Figure17). Conflict with local livestock farmers at Tomakas and along the Gamatum River in Purros Conservancy and at Ganamub and Elephant Song in the Sesfontein Conservancy has resulted in high mortality rates. At least 10 lions were shot or poisoned during the past three years. These included seven adult males (Xpl-56, Xpl-73, Xpl-68 “Terrace Male” & four of the “Five Musketeers”) and three adult females (Xpl-70, Xpl-72 & Xpl-96) that were fitted with satellite collars. The collars and all evidence of the lions were destroyed. The destruction of collars and other information by local communities undermines the process of managing and limiting Human-Lion-Conflict.

Figure 17. The home range area of Xpl-70 (female) of the Okongwe Pride.



🐾 Orowau / Hunkap Pride

There are currently only two established adult pride males in the northern section of the population. The males (Xpl-81 & Xpl-87) are currently favouring the Orowau and Hunkap areas, but during the past two years they have regularly interacted with the Floodplain, Hoanib and Okongwe lionesses (Figure 18). The home range of Xpl-81 “Kebbel” indicates that there is extensive overlap with the five different groups of lionesses (Figs. 19 & 20). Both lionesses are responsible for Human-Lion-Conflict in Anabeb and Sesfontein Conservancies. The male lions have significantly larger home ranges and also cause Human-Lion-Conflict problems in the Purros Conservancy.

Figure 18. The home range area of the adult male Xpl-81 (red dots & polygon) in relation to the home ranges of five different groups of lionesses.

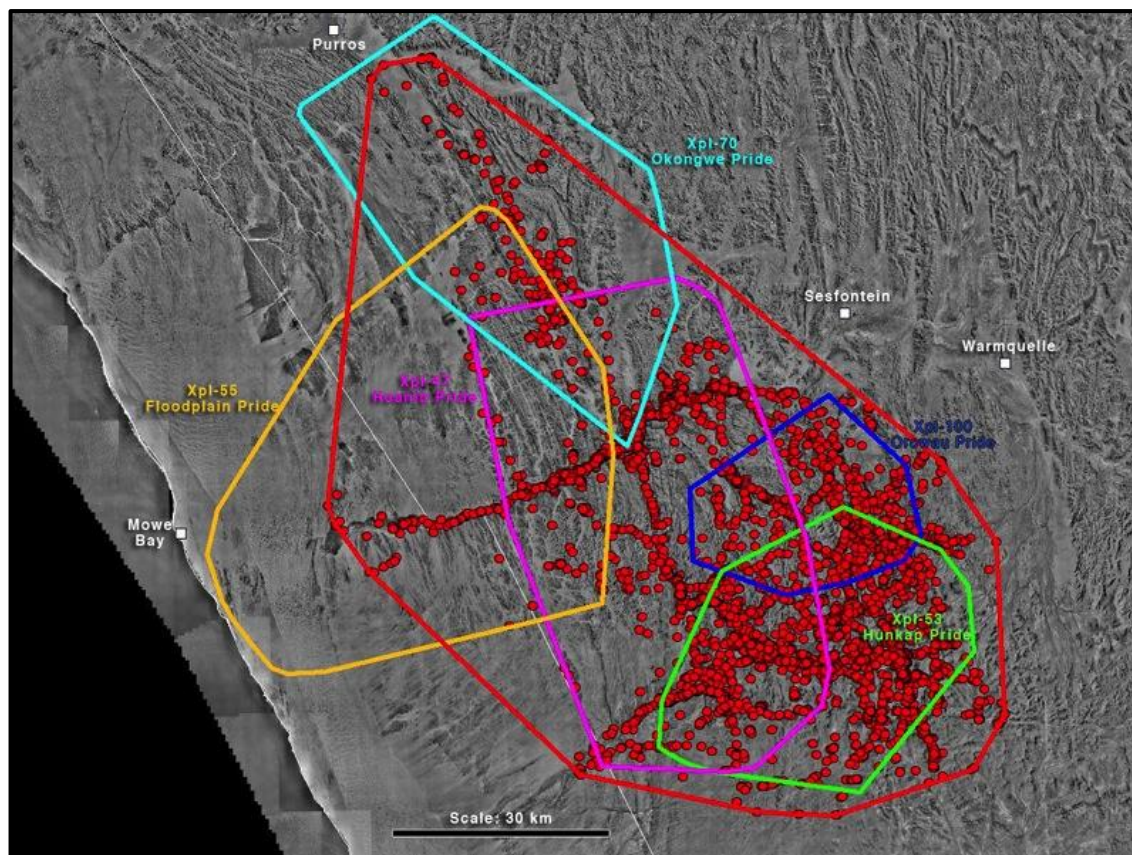


Figure 19. The home range area of Xpl-53 (female) of the Hunkap Pride.

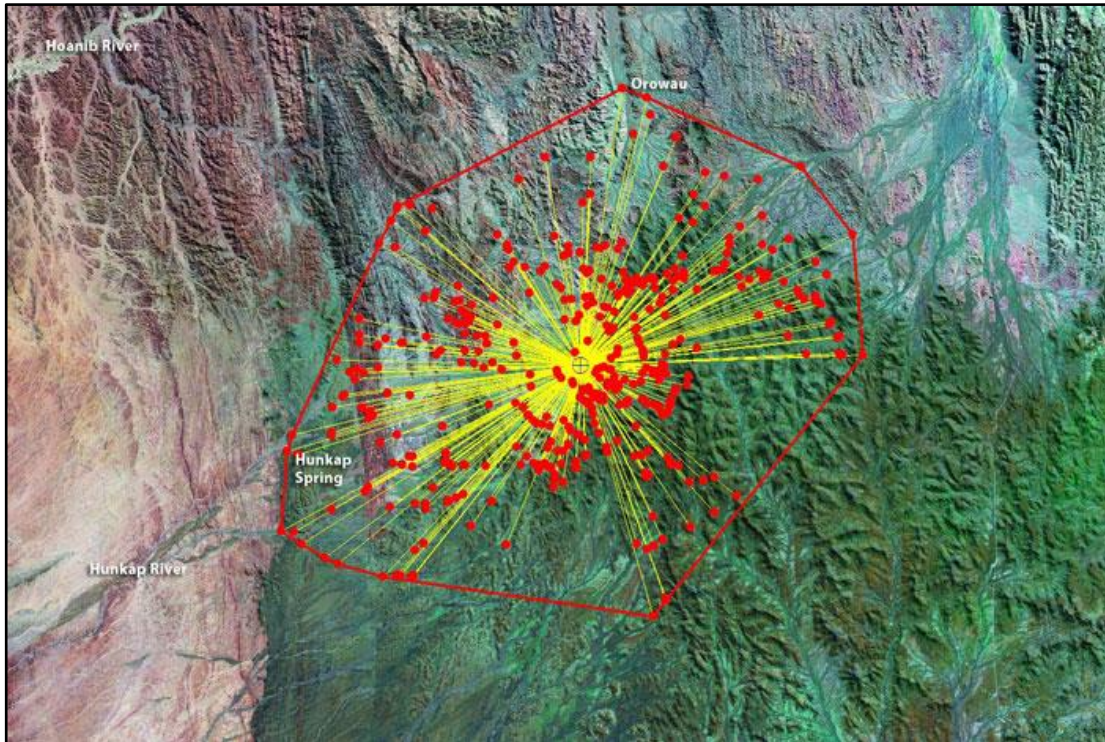
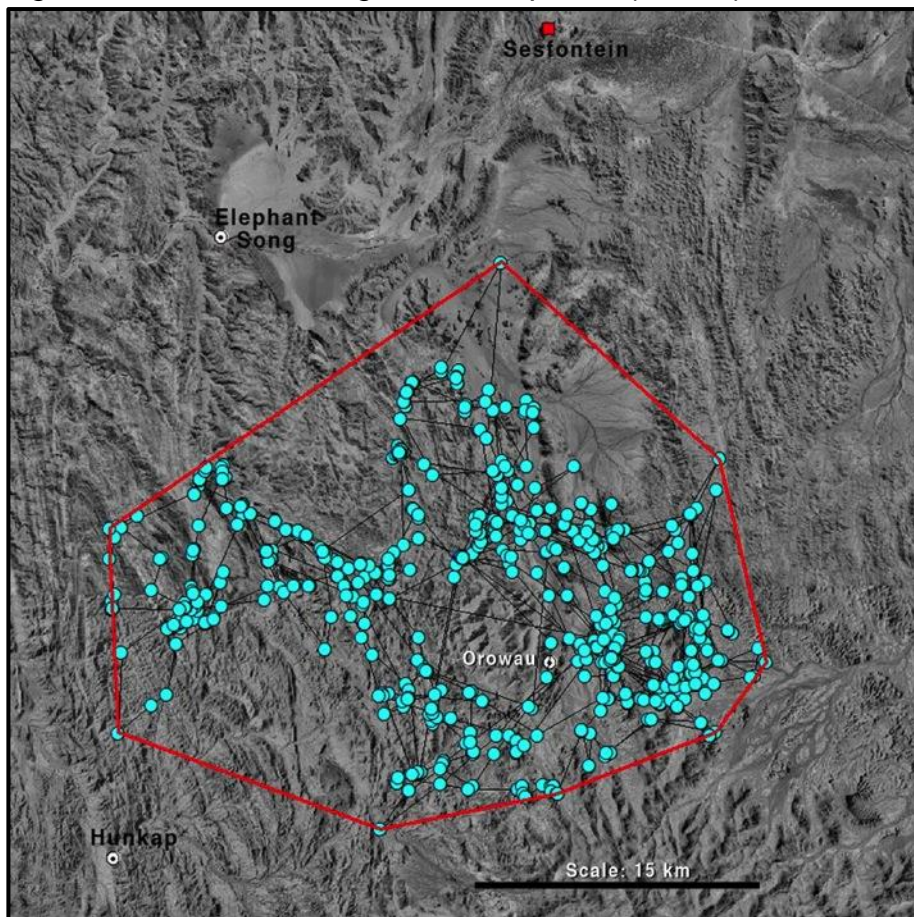


Figure 20. The home range area of Xpl-100 (female) of the Orowau Pride.



6.5.2.2 *Understanding “Hotspots”*

In order to survive in the harsh arid conditions these lions have developed particular skills and adapted behaviour. They have large overlapping home ranges and they move long distances of up to 70 km per night. This is necessary because the sporadic and highly variable rainfall in the arid environment results in a heterogeneous and unpredictable distribution of prey animals. Detailed behavioural observations over the past 17 years suggest that the lions maintain and rely on a mental “map” (both spatial and temporal) of rich food patches. Rich food patches are areas where prey animals concentrate at certain times of the year, or after certain environmental conditions, and/or where the habitat (e.g. broken terrain or thick vegetation) results in higher hunting success. These rich food patches are therefore referred to as “hotspots” and lions regularly return to them to search for prey.

To demonstrate the significance of “hotspots”, the movements and behaviour of the Uniab Delta Pride in relation to a “hotspot” are presented here.

The mouth of the Uniab River consists of a delta structure with numerous fresh water springs and thick reed beds that attract large numbers of Oryx, springboks and ostriches. Lions regularly visited the Uniab Delta before the population crash during the 1990s and the knowledge of the rich food source died with them. In December 2014 a sub-group of the Obab Pride discovered the Uniab Delta and feasted on the selection of prey that are vulnerable between the thick reeds and with strong coastal winds that aid their hunting success. The discovery of the rich food source resulted in the lions separating from their natal pride to form the Uniab Delta Pride (Figure 21). Between January and November 2015 the Uniab Delta Pride visited the mouth of the Uniab River on six occasions (Figure 22). On average they spent 23.3 days along the coastal habitat of the Uniab Delta (range: 7 – 60 days). In between these visits the four lionesses moved inland, up to 38.9 km from the mouth of the Uniab River, for an average of 20 days (range: 5 – 41 days, $N=5$). When the lionesses were at the Uniab Delta they moved an average of 4.8 km/day, but when they moved inland their daily distances increased to 8.5 km/day.

Figure 21. The home range area of Xpl-45 (female) in relation to the Uniab Delta.

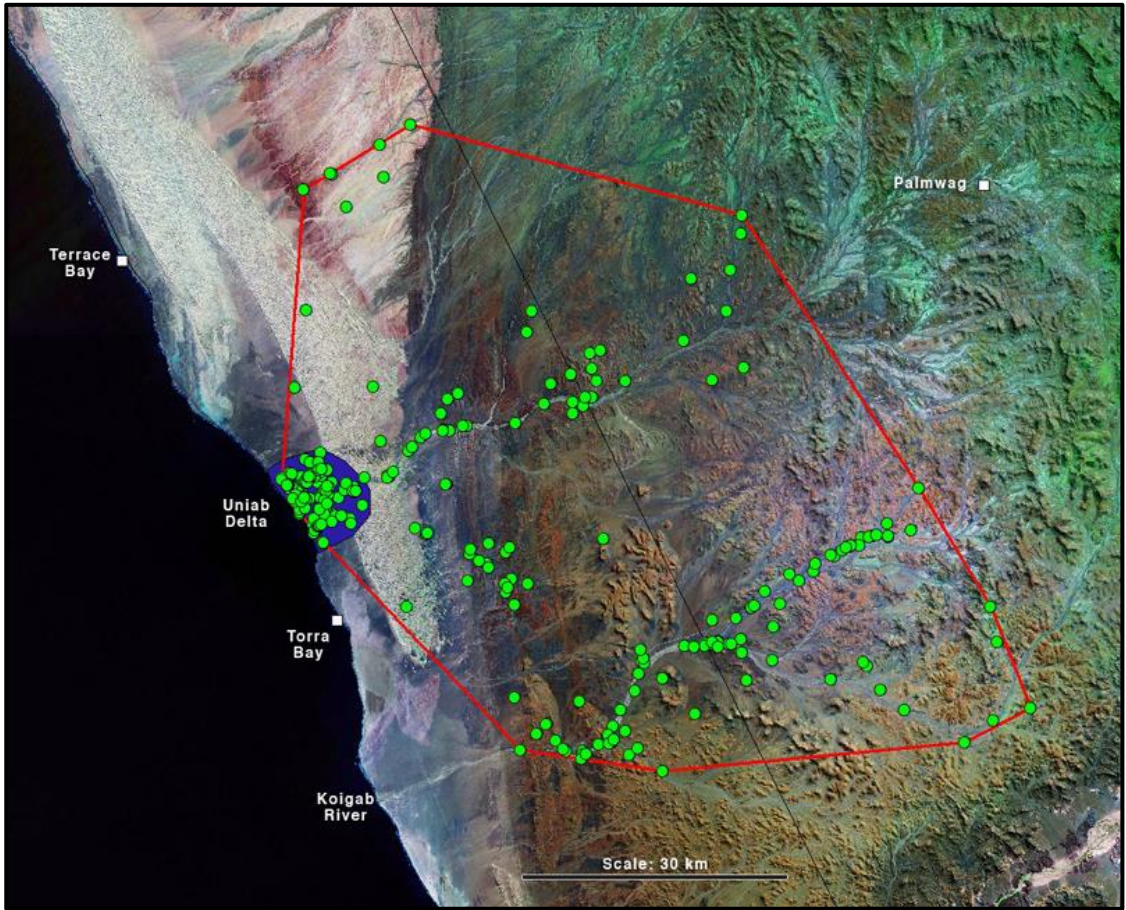
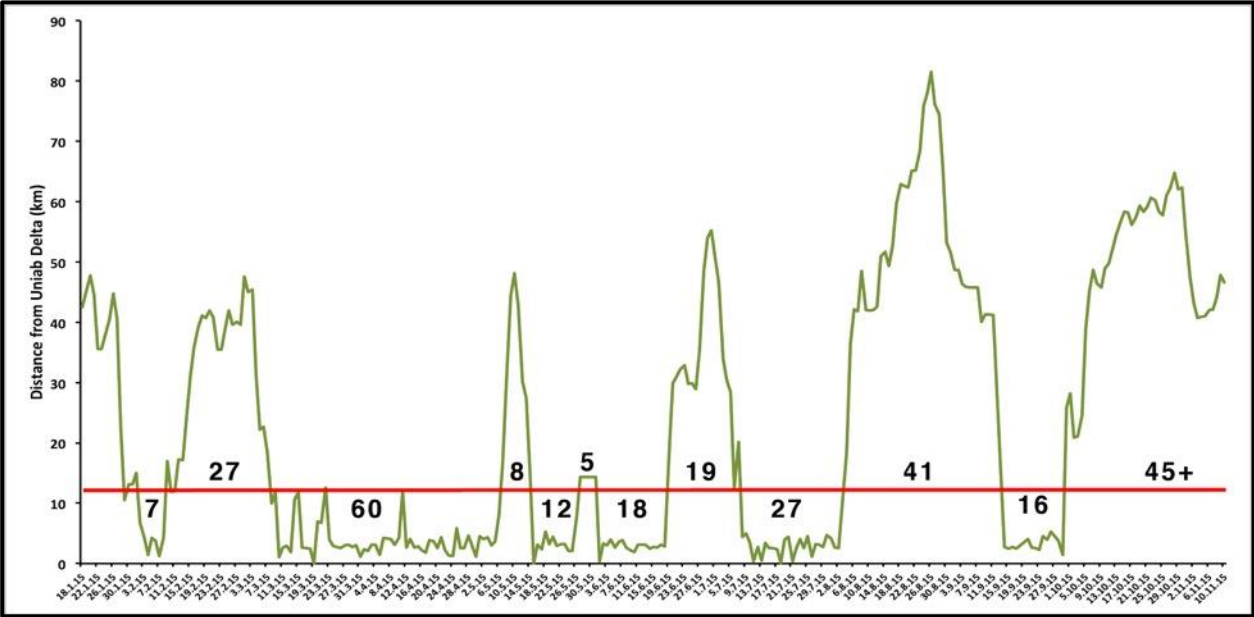


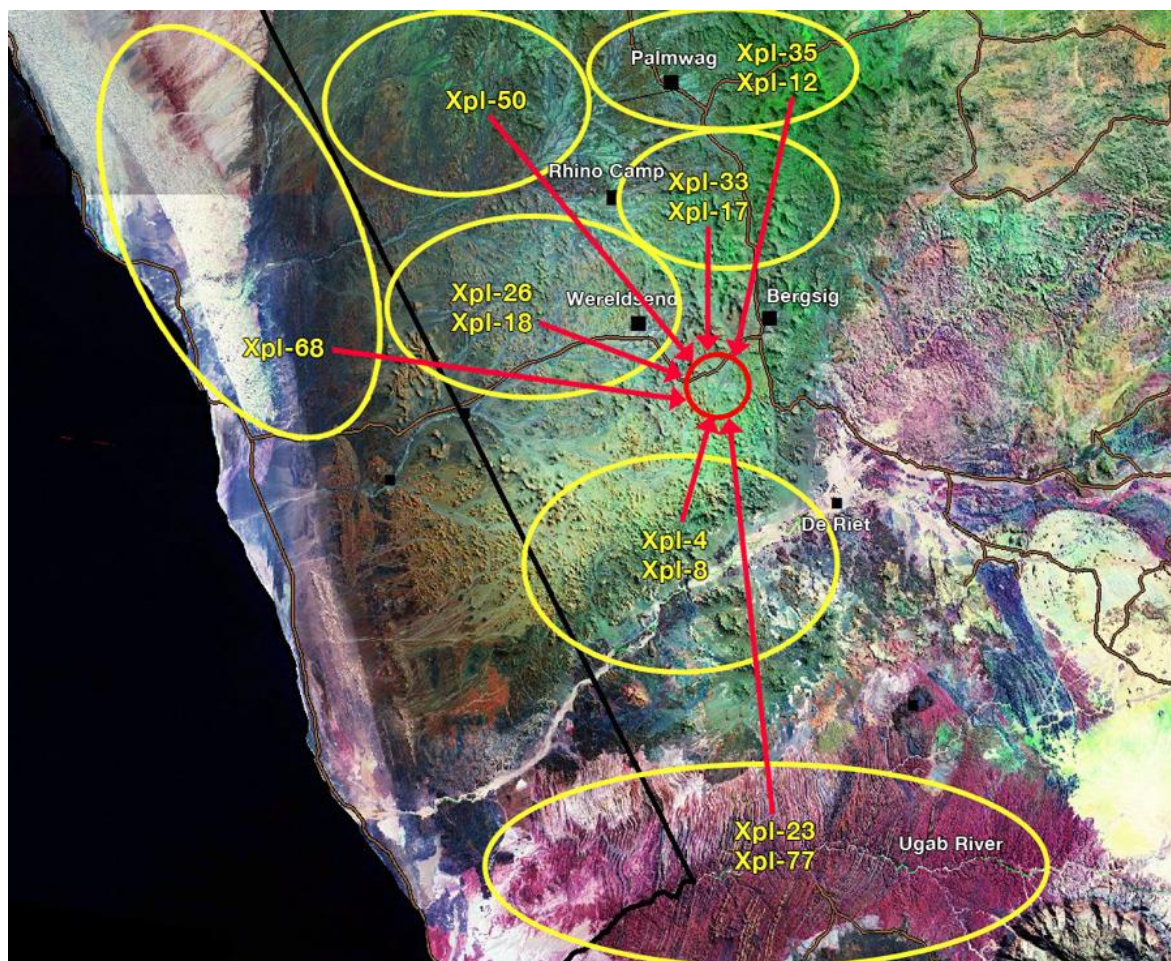
Figure 22. Sequential distances of the Floodplain Pride from the mouth of the Hoanib River between Aug 2014 and Nov 2015. The red line denotes the border of the coastal habitat and the numbers represent the number of days spent at the coast (below the red line) or further inland (above the red line).



Domesticated animals have been selectively bred over thousands of years to meet the needs of humans. As a result they have lost the ability to fend for themselves in nature and rely on humans to protect them. This is particularly pertinent at night when predators, such as lions, are active. Livestock, such as cattle, goats and donkeys are extremely vulnerable to predation by lions. The presence of livestock around a settlement that roam freely at night constitute all the hallmarks of a “hotspot”. Once lions become aware of the rich food source, they will return regularly.

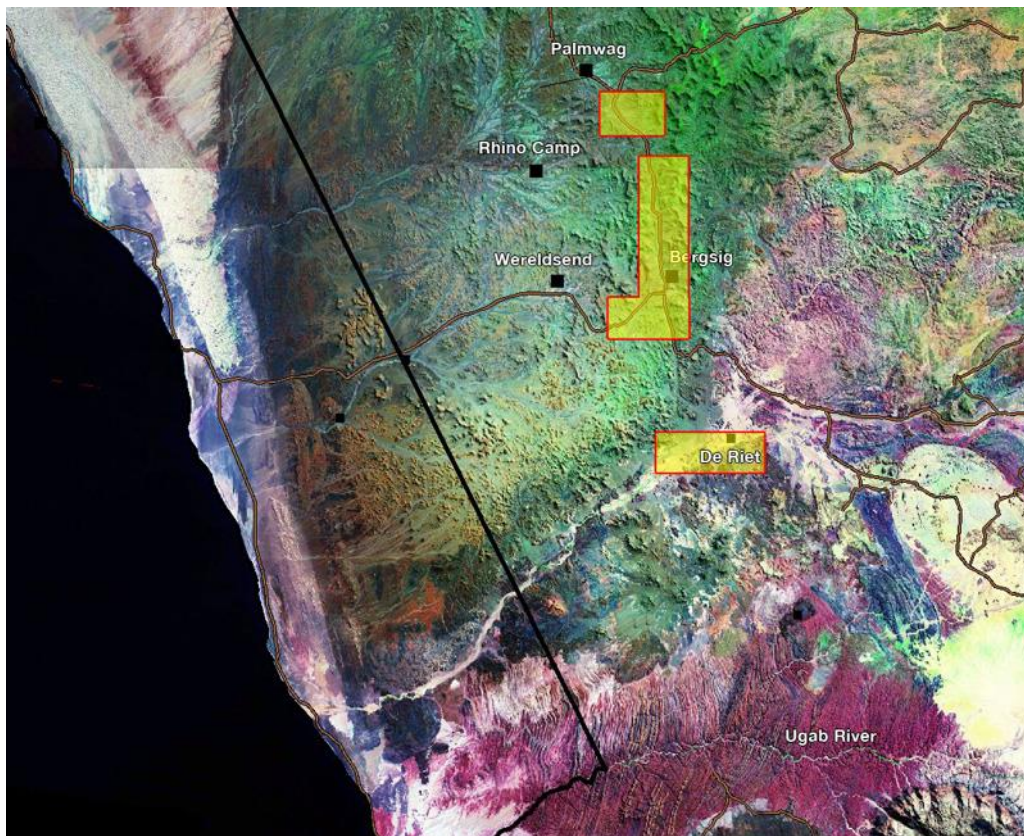
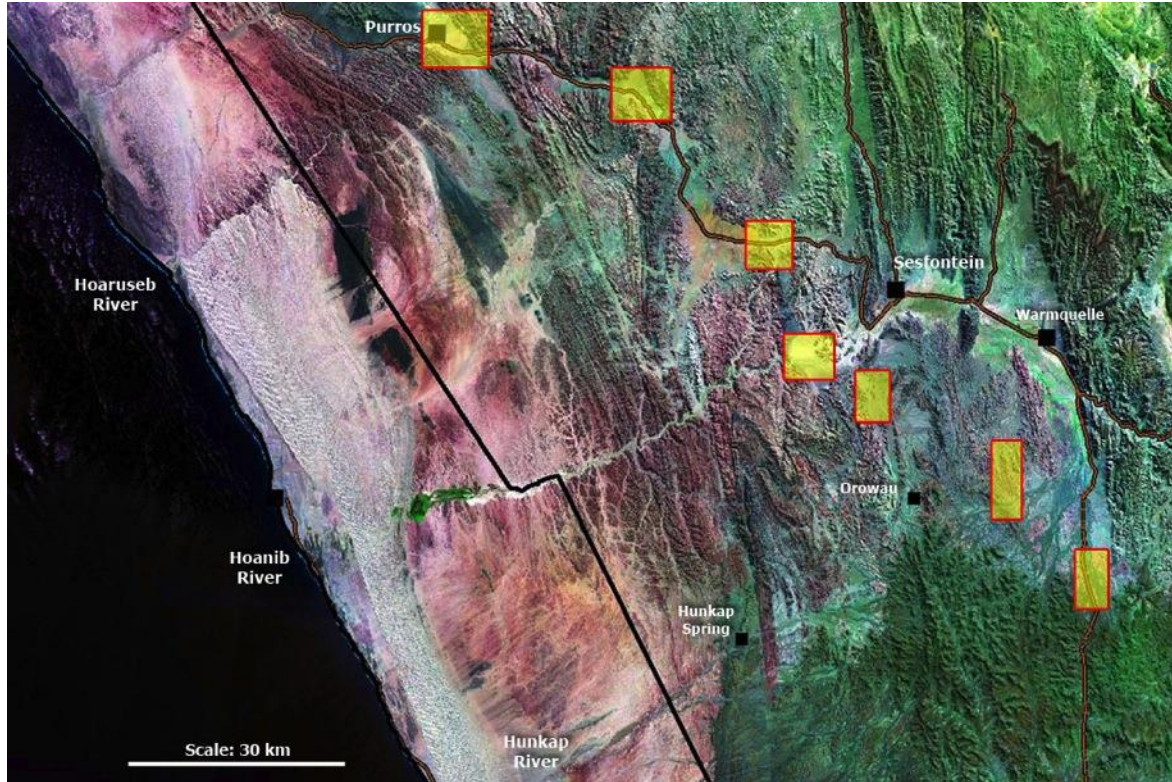
Over a seven-year period between 2006 and 2013 a total of 22 cases of human-lion conflict were recorded at Driefontein near Bergsig in the Torra Conservancy (Figure 23). Driefontein has all the characteristics of a “hotspot” and attracted 12 radio-collared lions from seven different prides with some individual returning to Driefontein several times. During this sample of human-lion conflict 16 lions were destroyed including 11 of the 12 radio-collared lions.

Figure 23. The origins of 12 radio-collared lions that caused human-lion conflict problems at Driefontein in the Torra Conservancy between 2006 and 2013.



Based on monitoring data collected since 2000 a total of ten “hotspots” were identified where lions have regularly been attracted to settlements and livestock (Figure 24). There are two “hotspots” in Purros Conservancy, three in Sesfontein Conservancy, two in Anabeb Conservancy and three in Torra Conservancy. These “hotspots” can be managed effectively for a marked reduction in human-lion conflict problems.

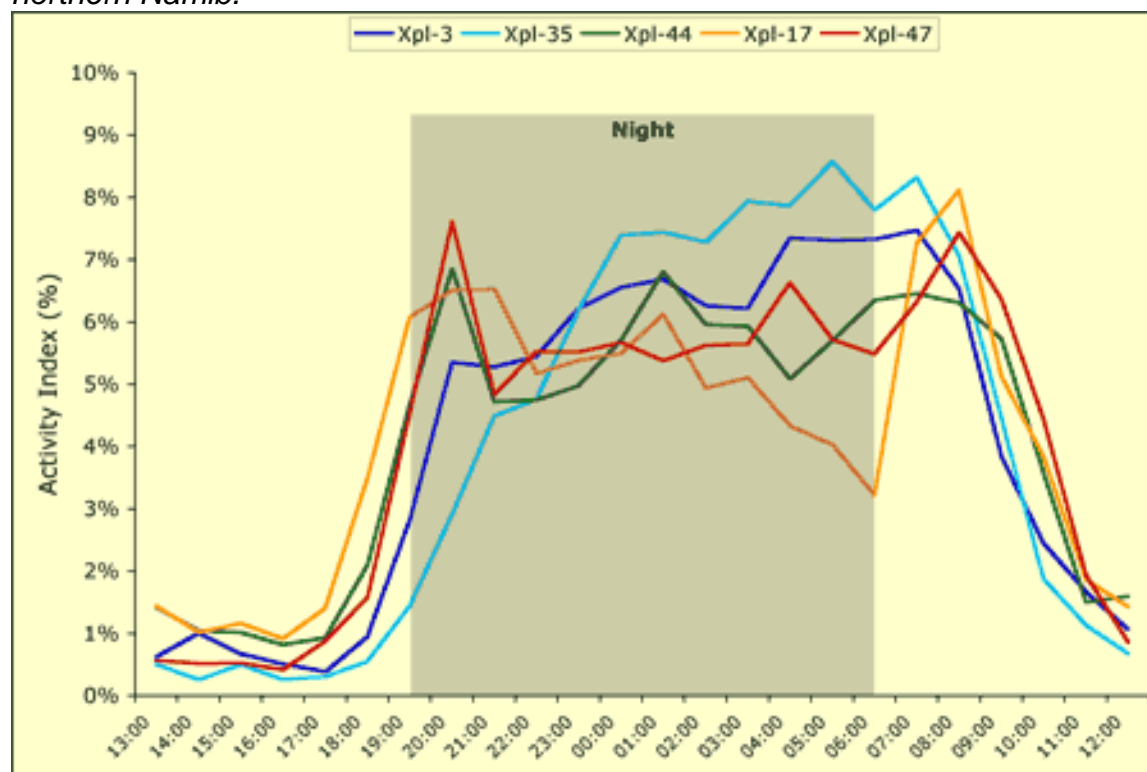
Figure 24. The locations of ten “hotspots” where lions are regularly attracted to settlements and livestock in the Purros, Sesfontein, Anabeb and Torra Conservancies.



6.5.2.3 Activity Patterns

Lions are active primarily at night. Data from five satellite collars, where the sampling frequency was ≥ 1 fix/hour, were included to assess patterns of activity. Distances moved per hour were used as an index of activity. To control for individual biases (e.g. mean distances moved by different lions per night) the distance moved per hour was expressed as a proportion of the total distance moved by the lion on that night. The patterns of activity are remarkably similar for all five lions (Figure 25). A sharp peak of activity occurred from between sunset and 20h00, followed by a drop in activity between 21h00 and 22h00. Activity increased again around midnight, but thereafter the pattern became less uniform although activity decreased towards daybreak, especially amongst the females. After sunrise activity increased and peaked between 07h00 and 08h00, followed by a uniformly sharp decline, and by 11h00 all five lions had stopped moving.

Figure 25. Activity patterns of five lions (males = blue/green, females = red/orange) in the northern Namib.



6.5.2.3 *Population Dynamics*

Aspects of the population dynamics of the Desert lion population, such as group structures, reproduction and mortality, have been monitored since 2000. Human-lion conflict and the related shooting or poisoning of lions is the main limiting factor of the population and amounts to 89 % of all adult and sub-adult mortalities.

The major cause of mortality in the lion population between 1999 and 2012 was the killing (by local people during Human-Lion-Conflict) and trophy hunting of adult and sub-adult lions. Male lions were particularly vulnerable and contribute to >80% of the recorded mortalities. The regularity, especially since 2004, at which male lions were shot, poisoned or hunted, and the selection of adult males for trophy hunting, has resulted in a significant reduction of males in the population. It also contributed to vastly different age-specific mortality rates between males and females (Figure 26), which serve to illustrate the negative impact on the population. Increasingly skewed sex ratios, favouring females (Figure 27), have reached critical levels (2010 - 1 ♀ : 0.18 ♂). Seven of the nine major prides are currently without a pride male.

The excessive killing of adult and sub-adult males has compromised the long-term viability of the Desert lion population. There is an urgent need to adapt the management and utilisation strategies relating to lions, if the long-term conservation of the species in the Kunene were to be secured.

Figure 27. Probability of age-specific mortality rates for females (red line) and males (blue line) in the Desert lion population (females: $n = 277$ lion-years; males: $n = 225$ lion-years).

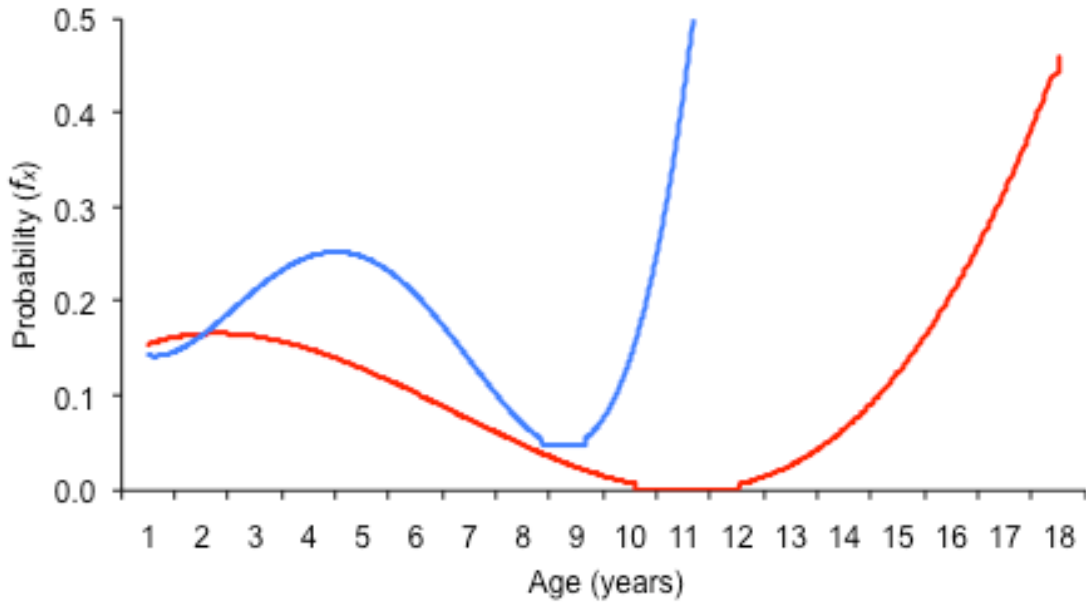
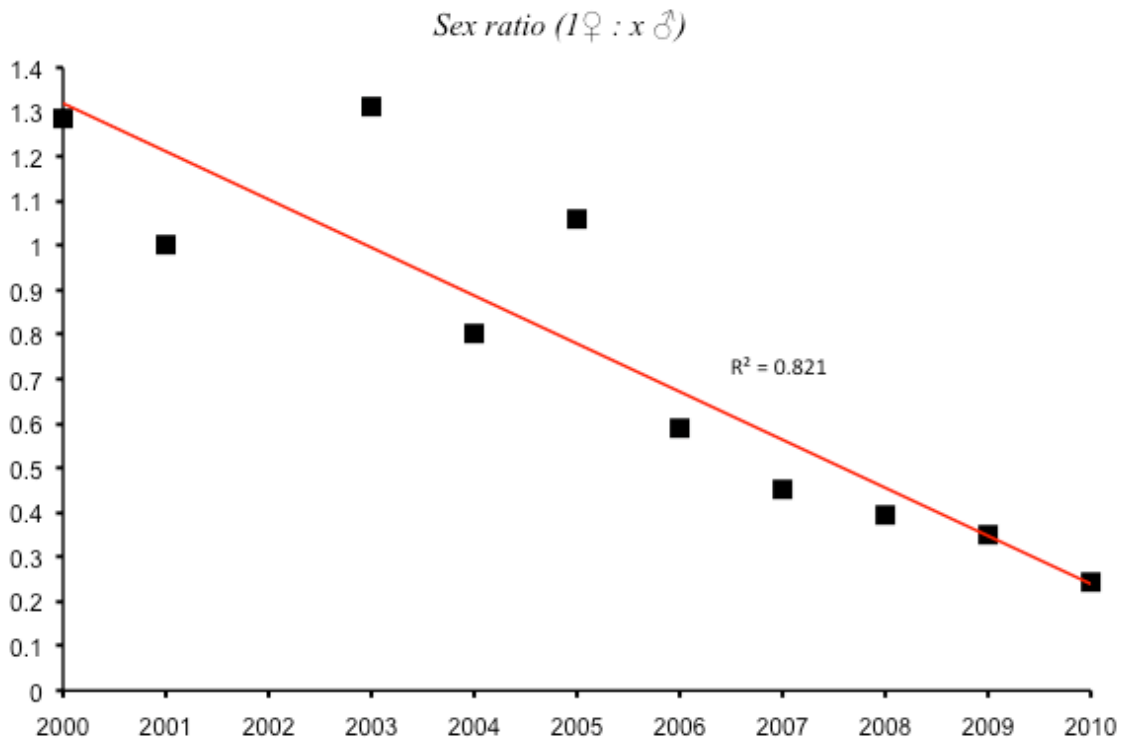


Figure 27. The decline of males in the sex ratio ($1♀ : x ♂$) of sub-adult and adult lions in the Desert lion population, between 2000 and 2010.



6.5.3 Developing & implementing appropriate technical solutions for mitigating HLC

The National Policy on Human-Wildlife Conflict Management states that the implantation of preventative measures is an effective and efficient way to manage Human-Lion Conflict. Local wildlife management units should carry out local level land-use planning as a means to reduce Human-Lion-Conflict. As part of zoning their area for different land-uses, such as exclusive wildlife and tourism zones, they should also identify wildlife corridors. In this case the establishment of a “high-risk lion corridor” that includes all the conflict “hotspots” will isolate the problem and facilitate an efficient management structure.

Effective and appropriate land use planning must be regulated and enforced by the elected committee for each conservancy and by the traditional leaders and Regional Councils. The exclusive wildlife zones, as per the gazetted registration of conservancies, and the “high-risk lion corridors” should be respected and implemented.

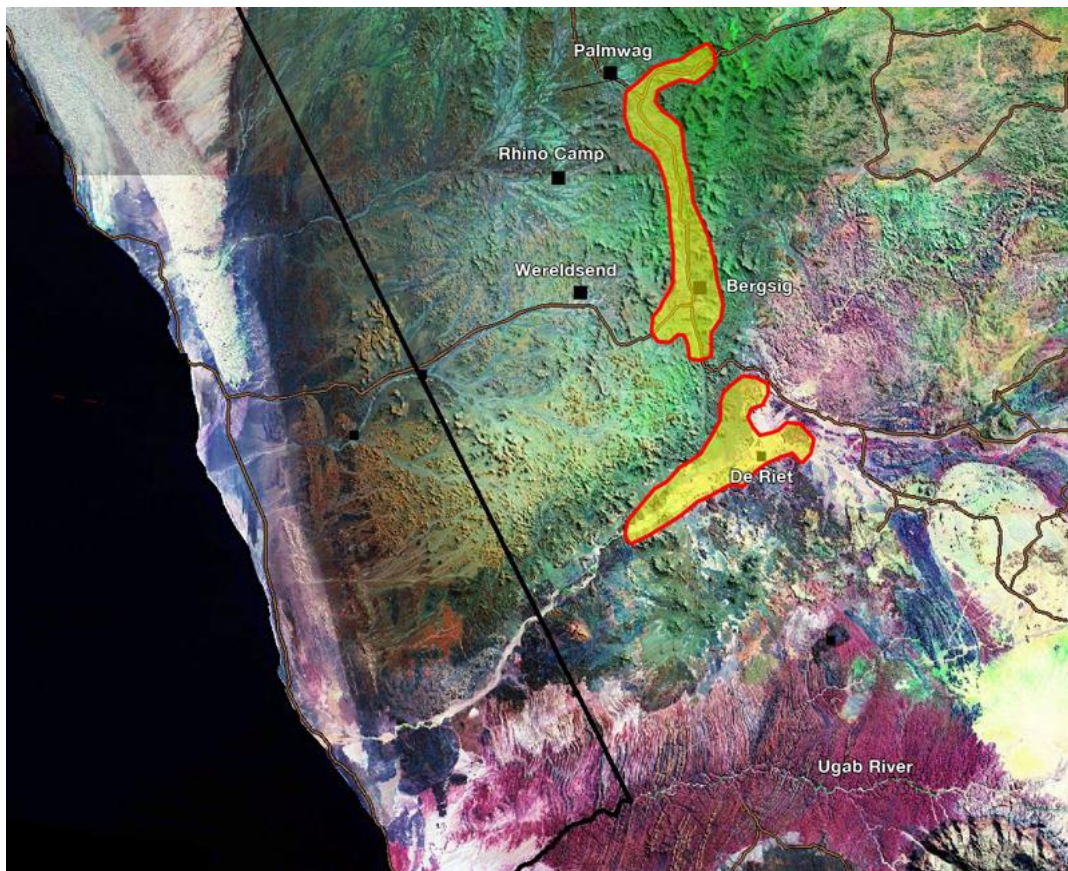
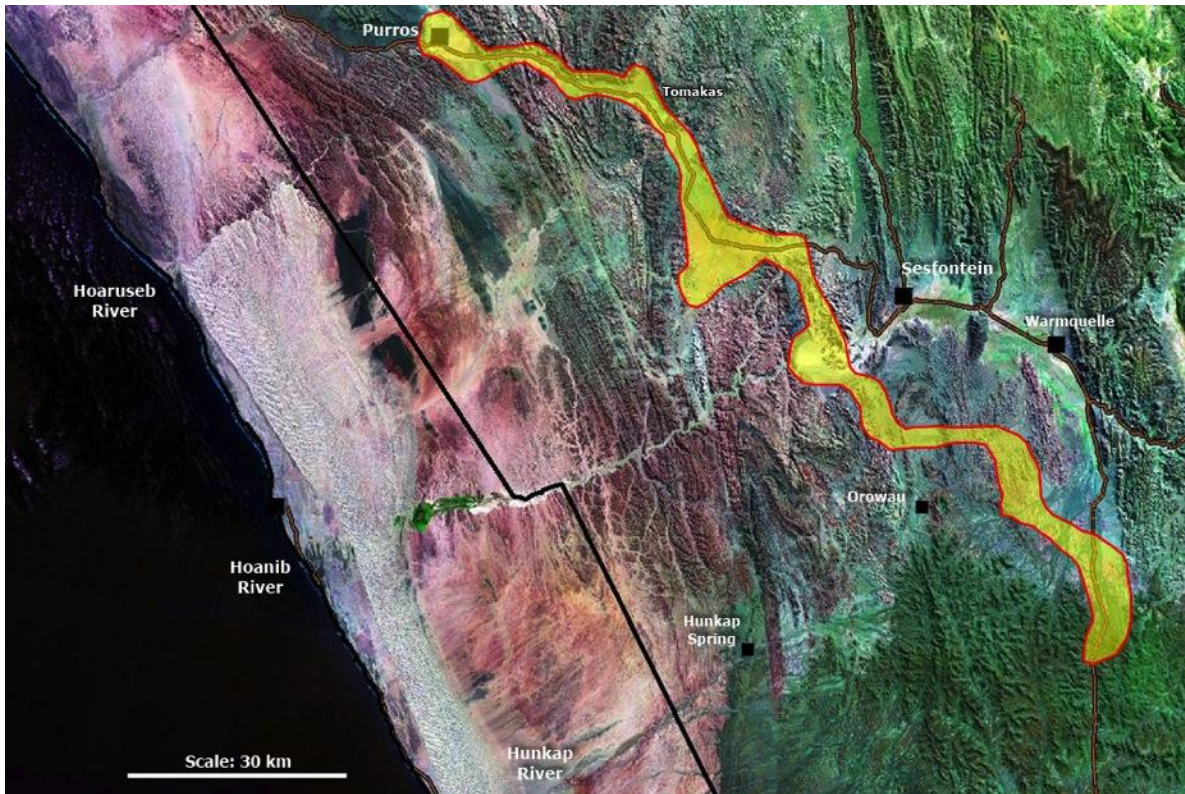
6.5.3.1 “High-Risk Lion Corridor”:

Research and monitoring of the Desert lion population and incidents of Human-Lion-Conflict over the past 15 years have produced reliable data indicating that lion problems occur repeatedly at the same locations. All previous management efforts, including the destruction of many lions, at these locations have failed for the following reasons:

- a) Livestock that roam freely at night constitute all the characteristics of a rich food patch or “hotspot”.
- b) Lions are quick to identify “hotspots” and will return regularly in search of prey.
- c) Lions have large overlapping home ranges and as a result individual lions from several different prides will be attracted to these “hotspots”.

Establishing a “high-risk lion corridor” that includes all the known “hotspots” (Figure 27) and implementing stringent livestock management protocols, supplemented by various techniques to deter lions, within the corridor will effectively reduce Human-Lion-Conflict.

Figure 27. Proposed “High-Risk Lion Corridor” that includes all the major areas of HLC in the Puros, Sesfontein, Anabeb and Torra Conservancies.



6.5.3.2 *Effective Livestock Management*

Most conflict situations arise from livestock management practices that leave animals vulnerable to predators, such as allowing livestock to roam freely at night or untended during the day. The communities from all four conservancies have expressed their reluctance and disagreement to keep livestock inside protective corrals at night. Due to the low rainfall and lack of sufficient grazing in the region the communities prefer to allow their livestock to also feed at night. This is a key element to the success of Human-Lion-Conflict management that needs to be reconsidered. Based on the information presented here with regards to lion behavioural ecology, “hotspots” and on-going problems that occur at the same locations, the protection of livestock at night is paramount to the implementation and success of this Human-Lion-Conflict Management Plan.

6.5.3.2.1. Herding and guarding

The use of a person and/or dogs to walk with the livestock while grazing during the day can have a significant positive impact in reducing predator incidents. However care should be taken that guard dogs do not kill non-target predators or natural prey species.

6.5.3.2.2. Lion-proof Corrals

Keeping livestock inside protective corrals overnight will not only prevent lions from killing livestock, but it will also prevent the escalation of Human-Lion-Conflict problems in the area. Without free-roaming livestock (all species, including donkeys) at night lions will not identify the area as a “hotspot”, other methods of deterring lions from the area will be more effective and lions are likely to vacate the area. A compromise can be reached between the local livestock farmers, the conservancies and MET where only those farmers inside the proposed “high-risk lion corridor” (Figure 27) need to herd their livestock and place them inside corrals at night. Supplemented by the other preventative measures, such as early warning systems, discussed below the proposed “high-risk lion corridor” will essentially create a buffer zone that will deter lions from leaving the safety of their known home ranges. Without livestock grazing at night to attract them and low

numbers of wildlife (due to the livestock controlling the available grazing) lions are unlikely to move into areas utilised by people and livestock.

Lion-proof corrals are made from metal poles, wire mesh and other commercially available materials. The structure consists of short posts 2.5m apart, 1.8m high with an over-hang to the outside, mesh wire and shade netting surrounding the whole structure. There are two gates at opposite corners, thus allowing farmers to erect their own internal fencing. The following materials are required for a corral that is 30 x 40 metres in size:

- Tar (gum) poles: length = 3 metres x 49 poles
- Diamond mesh: height = 3 metres x 140metres.
- Steel wire x 1 roll (sufficient for several additional kraals).
- Medium thickness binding wire x 1 roll (sufficient for several additional kraals).
- Extra thin binding wire x 1 roll (sufficient for several additional kraals).
- Metal farm gates: length = 2.4 metres x 2 gates.
- Threaded rods (12-15mm x 1 metre) with nuts x 10.
- Wire-straining tool x 1 (to be used for the construction of all future kraals).
- Large-size Crescent fencing pliers x 4 (to be used for the construction of all future kraals).

6.5.3.3 Early Warning Systems and Scare Tactics

Since November 2012 a total of 16 lions from selected prides in areas where there is potential for high conflict were fitted with satellite collars and their movements monitored by the DLP. The daily positions of the lions were plotted on a map and posted on the Desert Lion website. Lion Rangers, appointed by conservancies, or other community organisations monitored the website and the information on lion movements was then given to farmers who could then take precautionary actions when lions moved towards their livestock. This initiative served as an early warning system where local farmers can monitor the locations of lions in their area and take precautionary actions when lions move towards their livestock. This approach, referred to as the Satellite Early Warning System, produced promising results, but lacked institutional support and did not reach its full potential. A central “Early Warning” unit in Windhoek controlled by MET, as described

in the National Policy on Human-Wildlife Conflict Management, will provide the necessary structure to support this approach.

A second more direct early warning system (the Logger Early Warning System) was developed in 2016. The Desert Lion Conservation Trust (DLCT) collaborated with a highly qualified electronic engineer in Swakopmund and they designed and built several units. The system produced favourable results during a dry-testing phase and now needs to be implemented in the field at settlements where regular problems with lions are experienced.

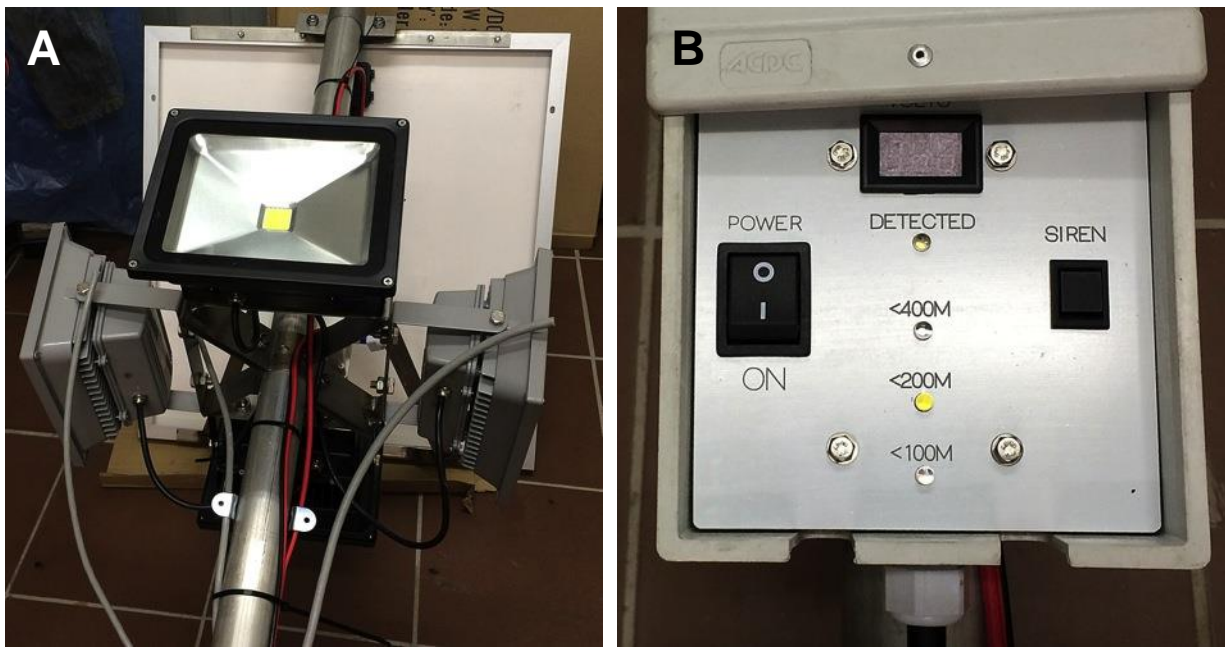
The Logger Early Warning System consists of several components (Figure 28) and a brief summary of the mechanisms is described here.

- 🐾 Several lions from all the prides that border human settlements or that may be responsible for HLC are fitted with collars that contain GPS recorder and a special RFID Tag unit in addition to the normal VHF transmitter.
- 🐾 The GPS unit will record accurate position coordinates every hour at night and every four hours during the day. The coordinates will be stored on a memory chip in the collar and can be downloaded remotely.
- 🐾 An “Early Warning Logger” will then be mounted adjacent to a corral at settlements with high incidents of HLC.
- 🐾 The “Early Warning Logger” consists of an antenna, an electronic circuit board that acts as a small computer processor, four powerful LED floodlights (Figure 28a) and a siren that are mounted on top of a 4 metre pole. The unit is also fitted with a solar panel and a 12 Volt battery to provide sufficient power throughout the night. The logger will be mounted so that each of the four LED floodlights point towards one of the four wind directions (North, East, South and West).
- 🐾 The Logger will continuously transmit RFID signals to probe for any RFID Tags (fitted to the lion collars) that may be nearby.
- 🐾 Preliminary results indicate that the Logger can detect the lion collars from a distance of 2 – 3 km.
- 🐾 When the Logger detects a lion collar it will instruct the collar to record a GPS position every 5 minutes and relay the information to the Logger. Whereupon the Logger will calculate the direction and distance of the lion from the settlement and

trigger one or two of the LED floodlight to “point” in the direction of the lions. The floodlights are very powerful and will allow the people to see the lions as well as deter the lions from approaching the corral.

- 🐾 A control/display unit that is mounted lower down on the Logger pole (Figure 28b) will display the distance of the lions from the settlement. When the lions reach a distance of 200 metres from the settlement a powerful siren will be triggered to deter the lions from approaching.

Figure 28. Elements of the “Logger Early Warning System” that will be mounted at settlements that experience HLC problems.



Generating disturbances associated with settlements, people & livestock is an effective way to scare lions away and prevent Human-Lion-Conflict. Whenever the lions come into contact with settlements and livestock they should be deterred & discouraged. However, it is vitally important for the lions to form a clear association between the disturbance and the settlement/livestock. Various scare tactics have been tested and the successful methods are addressed below:

- 🐾 Sound playbacks. In recent years lions have successfully been deterred from approaching human settlements by playing modern music or recordings of human

voices, especially stand-up comedy shows with female or high-pitched male voices, at high amplitude.

- 🐾 Loud Noises. The use of fireworks and especially rockets that explode overhead have been successful in scaring lions away from settlements. Air-horns and whistles can also be used but they are less effective than fireworks.
- 🐾 Ultra-sound playbacks. A method of reproducing ultra-high frequencies (above human hearing) using electronic oscillators and frequency generators was designed in Swakopmund along with the Logger Early Warning System. The electronics were attached to an amplifier and a powerful speaker (Figure 29) and the system is currently being tested in the field. The preliminary results are exceptionally good. Lions immediately reacted to the sound playbacks and moved away. The same response was observed with several black-backed jackals and one brown hyaena.

Figure 29. Ultra-sound system developed to deter lions



- 🐾 Vehicles. Lions can be chased-off and deterred by vehicles, but there are several important elements to consider. 1) Lions are capable of distinguishing between different types of vehicles based on engine type (petrol or diesel), appearance (e.g. game-drive vehicles or open pick-up vehicles with people on the back) and the manner of driving. 2) Some lions that live inside tourism areas are habituated to tourist vehicles and this leads to high quality sightings for tourists. 3) Care must be taken not to compromise this important tourism value by using game-drive vehicles to deter lions. 4) This can be

achieved by a) only using white open pick-up trucks, b) with people on the back, c) that are making a lot of noise and shouting, d) by driving fast and aggressively, and e) by ensuring that lions can easily associate these vehicles and the disturbance with human settlements and livestock.

6.5.3.4 Rapid Response Unit

Following the guidelines under the National Policy on Human-Wildlife Conflict Management two Rapid Response Teams need to be established. An initiative led by IRDNC with support from DLCT and DECP is underway to secure funding and implement the Rapid Response programme.

Objectives of the Rapid Response programme:

- Develop two teams, each comprising of trained local people, to monitor aspects of the lion population and to respond to potential or actual incidents of HLC. Critical is that these teams will liaise with conservancy management, lodges and traditional leaders. Develop systems of local community game guards and rangers to assist in this.
- Through these Teams, to mentor conservancies and farmers into taking rational and objective decisions about lions and the challenges of living with them. This goes right from managing threats and incidents to drawing up and adopting conservancy management plans for the species.
- Reduce HLC through a variety of means, for example, constructing lion-proof corrals, deploying and maintaining automated early warning systems at key villages
- Educate and train farmers, game guards, tourists, guides and residents on living with lions and promote the value of lions.
- Add value by providing information on individuals, movements and history of the lion population, and by encouraging tourism industry development and buy-in to the in-situ conservation of these animals.
- Mentorship of local qualified Namibians to run the program in the long term.
- Develop systems to monitor the progress and success of this program

The development of two teams to respond to human wildlife conflict incidents, facilitate in training farmers, communicate with Traditional Leaders, conservancy management and farmers and to gather information and data is essential. The procurement of 2 vehicles and recruitment of 4 suitable members is important and already underway. The appointment of a Project Co-ordinator and a Project Administrator to drive and manage the project is necessary. Training will be extensive and is to be provided by DLCT, DEP and IRDNC. These teams will be mobile, have satellite phones, radio communication (vehicle and hand held sets), spotlights and be equipped to respond to incidents and stay in the bush for several weeks at a time. The vehicles will also be monitored by commercial satellite fleet management systems. While the ideal is to have two operational independent teams, this will be phased in gradually to allow for developing efficient management and reporting structures. A system of Lion Rangers is already in place in three of the lion range conservancies. These rangers were nominated and appointed by their communities. However, it is only with the development of the Rapid Response Teams that they can become truly efficient. In year two a suitable UNAM conservation graduate will be sourced to join the program. Training and mentoring will be on site with focus on all aspects, research, HWC, logistics and admin with a view to this person eventually taking over management of the program.

Reducing Human-Lion-Conflict is a crucial aspect of the program. There have been extensive meetings with affected local communities to seek solutions to this problem. The main thrust of this aspect is to build structures and systems to reduce losses to farmers and to ensure human safety. Over and above the response teams and education this will entail constructing lion-proof corrals, providing early warning of the presence of animals using collaring and providing lights in key localities at farms/homesteads. While most conservancies have land use zonation plans in place, these are often not respected properly and some of these need to be changed to better accommodate lions and elephants.

The Rapid Response Teams will be trained in (excluding the skills they need for their daily tasks) living with elephants and lions, basic elephant and lion behaviour, basic biology and requirements of the two species. The Kunene Region Communal Conservancy

Association (KRCCA) is an influential organization with respected leadership. They will also be trained to pass on the information and to monitor peoples' reaction and attitudes to these efforts. A major part of the education effort is to build capacity within these communities to deal with living with wildlife and also to communicate to visitors to these areas. A concerted effort will be made to educate the tourism sector, local guides and visitors to the area about these unique animals. This will take the form of formal training for guides and the production and distribution (via key entrance points to the area and car hire firms) of pamphlets. This is already taking place, but does need to be increased. The ambition is to accommodate one Namibian University of Science and Technology student per year on their 6-month practical or internship. This will provide them with an opportunity to partake in meaningful and relevant surveys and actions.

Poaching at present is not a problem in the region. However, there is an increase in poaching of both elephants (for ivory) and lions (bones and body parts for the Asian traditional medicine market) in southern Africa. As anti-poaching efforts become more successful elsewhere, so we can expect poachers to target our area. This has already been evident with the free-ranging black rhino population in the Kunene Region. We urgently need to increase our efforts in this regard to make it as difficult as possible for poachers to operate in this area. Our Teams and Coordinator will work closely with the Ministry of Environment and Tourism, the Save The Rhino Trust and the Protected Resources Unit of the Namibian Police. A relationship has already been established with these stakeholders and will be maintained as a priority.

Adding value or increasing tangible benefits to farmers and residents affected by these animals is a priority. Employment and increased compensation rates are seen as crucial in this regard. Tour operators and Lodge or accommodation operators will be asked to encourage their guests to contribute to a "sightings fund". Whenever lions or elephants are seen, a small donation can be made. It is important that research provide information on individuals, group sizes, habits, personality etc. of lions and elephants. This makes the experience tourists might have more personal and meaningful. In the long-term, we will develop Lion and Elephant Rangers to the point where visitors can accompany them on their patrols, thus gaining an insight into local conservation first hand.

Systems will be developed to measure the success of the Rapid Response programme. This is not just about work completed, number of kraals built or number of patrol days, but also includes monitoring actual number of HWC incidents and very importantly, the attitude and buy-in by local farmers and residents.

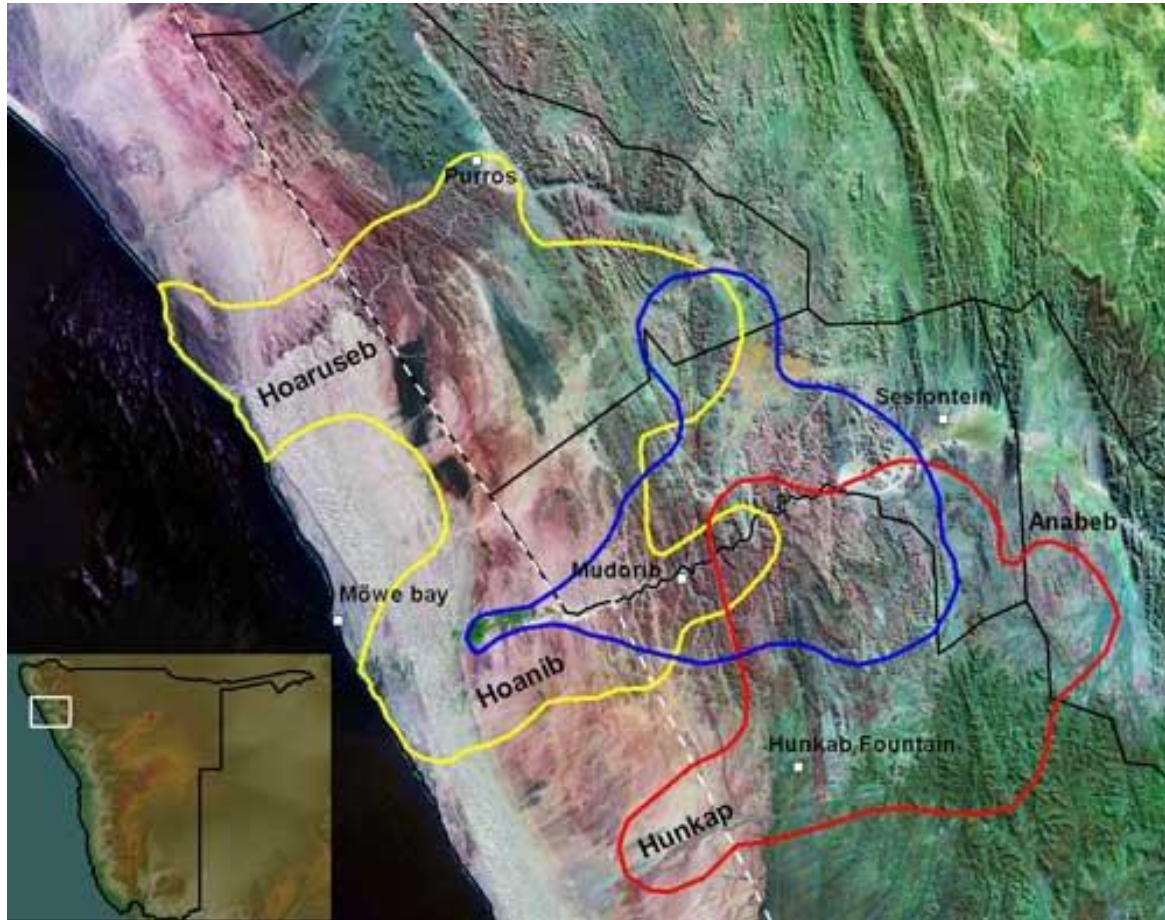
6.5.4 Lion Tourism

Tourism can play an important role in the conservation of lions and in the mitigation of Human-Lion Conflict. The simultaneous growth of wildlife populations, tourism, and community-based conservation efforts during recent years in NW Namibia is testimony to this. Under the current climate where local people benefit from wildlife and communal conservancies enter into contractual agreements with tour operators, the tourism industry's potential role in wildlife conservation is ever increasing. Along with black rhinos and elephants, lions are one of the most popular species among tourists. The value of lions and the benefits derived through tourism in the region, must arguably out-way the losses incurred as a result of Human-Lion Conflict.

Notwithstanding, people still pose the biggest threat to lions. Local communities suffer financial losses when lions prey on their livestock, upon which they often retaliate (legally) by killing lions. The tourism industry and related entities (including the communal conservancies) enjoy the benefits, but the local people that live close to lions (i.e. individual farmers) have to bear the costs. This discrepancy has been identified and according the National Policy on Human-Wildlife Conflict Management there is a need for preferential benefits to those local people.

Between 2007 and 2008 a detailed study was conducted in the Hoaruseb River (Purros Conservancy), the Hoanib River (Sesfontein Conservancy) & Hunkap River (Anabeb Conservancy; Figure 30). The objectives were: a) to evaluate the tourism potential of lions, and b) to propose a system where direct benefits derived from lions would reach the appropriate local people in order to offset the losses.

Figure 30. The home ranges of three lion prides that utilise the Hoanib River (Yellow - Hoaruseb pride 4584 km², Blue - Hoanib pride 2345 km², Red - Hunkap pride 2927 km²).



There were a total of 35 individually known lions in three separate prides (Hoaruseb = 14, Hoanib = 14, Hunkap = 7) and they occupied a combined area of 6171 km² (Figure 30). There was overlap between the home ranges of all three groups, but they rarely interacted with each other.

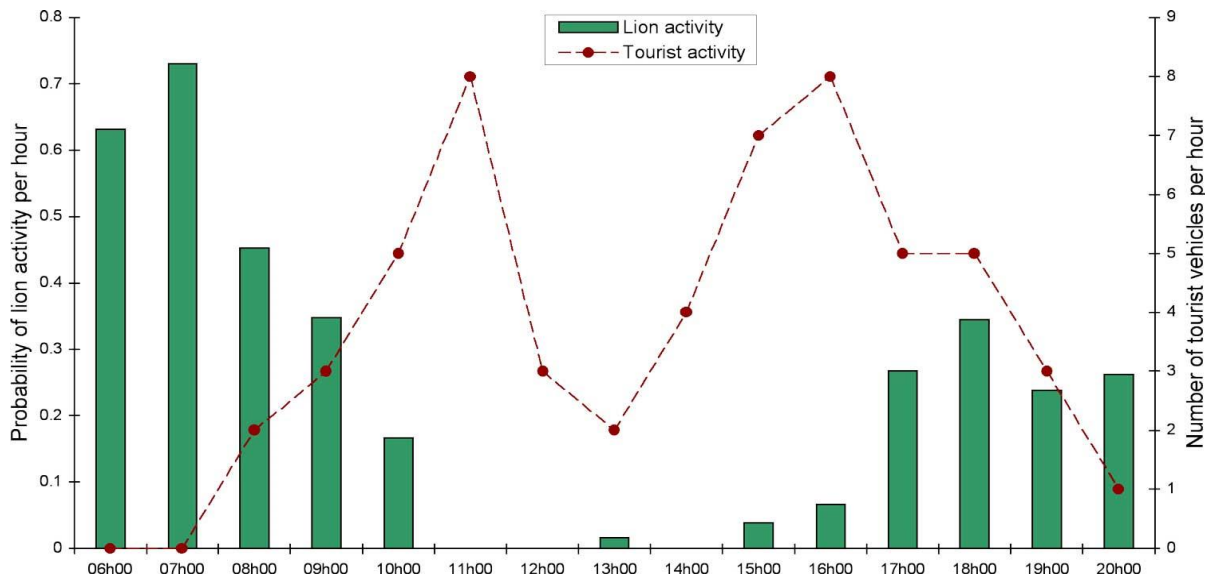
The lions were observed intensively for 2208 hours (92 x 24hrs) during which time they killed 51 prey animals of 12 different species. Oryx was the most important prey species and along with zebra, ostrich and springbok, formed 75% of the lion's food. Livestock (donkeys) represented only 5% of the kills.

Lions were inactive for 72 % of the 24-hour day (N = 92 days) and activity was highest at night and during the early morning up until. During the middle of the day (10h00 – 15h00)

they generally rested in thick vegetation and were not visible. Although lions were active mostly at night, the main peak of activity was around sunrise, followed by another increase in activity at sunset.

The Hoaruseb lions spent 85 % of their time in the riverbed and the remainder in rocky outcrops close to the river (5 – 10 km). The likelihood of finding and seeing the lions, during a sample of 82 attempts, was high (69 %). The average distance between passing vehicles and lions was 74 metres (range: 15-250 m). Despite this high probability of seeing lions, only 8 % of the 86 tourists vehicles that drove past the lions (average = 4.2 vehicles per day) actually saw them. The peak tourism traffic was between 09h00 and 18h00 when lions were inactive (Figure 31) and resting behind vegetation and other forms of cover. The lions were mostly relaxed when vehicles drove past them, but when vehicles were noisy or caused disturbance, they often walked or ran out of sight.

Figure 31. Daytime activity patterns of lions and tourist vehicles in the Hoaruseb River. Data were collected during 83 periods of 24-hour observations. Tourism activity represents the number of vehicles that drove past the lions per hour, during the 24-hour observations.



Because of their nocturnal habits, the movements and behaviour of lions are often poorly understood. Tour operators will benefit from accurate and current information on lions, and there is a need to provide such information to the industry, so as to increase the

potential benefit of tourism to wildlife conservation. Collaborating with the communal conservancies and involving them in the process is essential.

The Desert Lion Project has provided numerous training courses to conservancy members and local tour operators to improve the tourism potential of Desert lions. Such training has helped to increase the success rate of finding and approaching lions during game drives, and improve the quality and accuracy of information conveyed to tourists. In the Hoaruseb River the proportion of tourist vehicles spotting and observing lions increased to 52 % after such training courses.

The major tour operators and TOSCO should be approached to discuss the mechanisms of a establishing a “Lion Fund” where operators agree to donate a minimal fee (e.g. N\$ 100 per vehicle) for every sighting of lions. A system of collecting and managing the funds must be developed and approved by MET. Each communal conservancy should establish a separate “Lion Fund” account where income derived from lions-related tourism and hunting can be used to off-set the losses and costs of Human-Lion Conflict. Options of securing matching or “gear-up” funds from other sources to supplement the “Lion Funds” at conservancy level should be investigated.

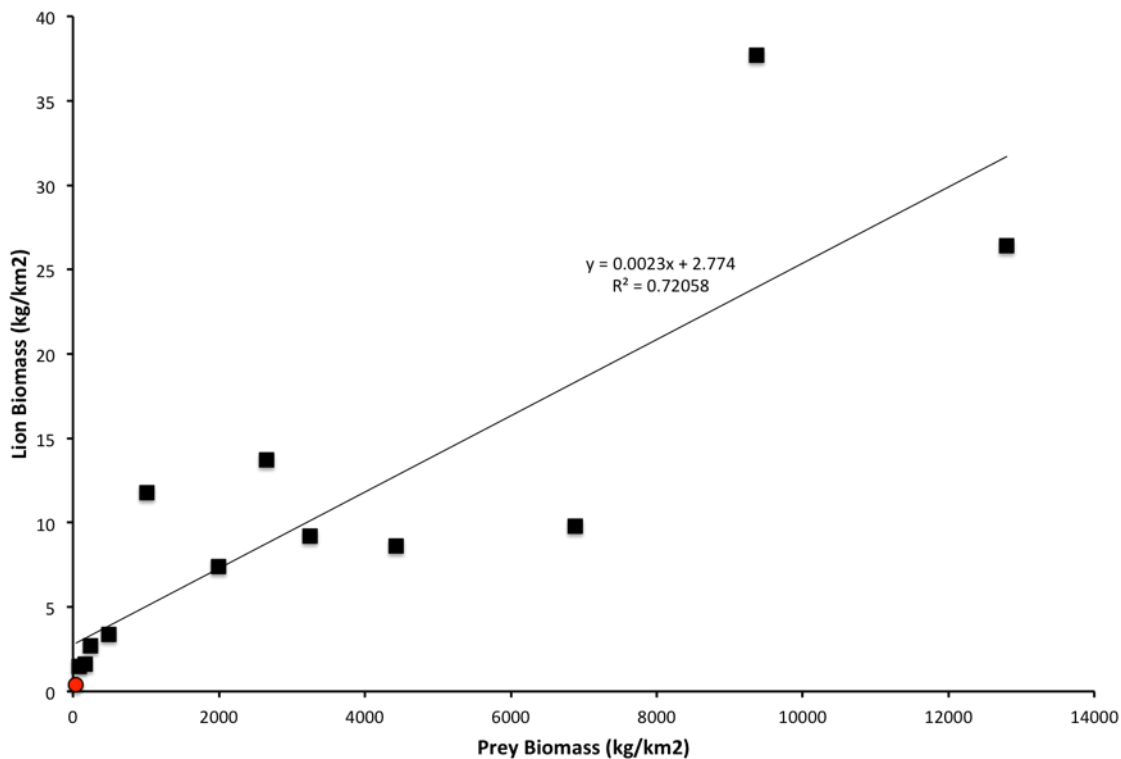
6.5.5 Lion Population Management

Some conservancies and local communities have raised concern that the Desert lion population have increased beyond the expected ecological carrying capacity and that their numbers may need to be reduced.

An analysis of the frequency of Human-Lion Conflict incidents (see Page 22) between conservancies and between years revealed that increased levels of Human-Lion Conflict occur randomly and are generally related to a localised abundance of particularly sub-adult males in one of two prides. The Hoanib Floodplain pride is currently the only pride that do not move into areas used for livestock farming and that are safe from human-related mortalities. The home ranges of all the other prides overlap to some extent with livestock areas (Figure 7).

The density of lions in the Desert population (0.48 – 0.62 / 100 km⁻²) appears to be in balance with the arid environment and compares favourable with lion population densities in other semi-arid environments, such as Etosha National Park (1.8 – 2.4 / 100 km⁻²) and Kalagadi Transfrontier Park (1.5 / 100 km⁻²). Furthermore, the relationship between lion biomass and prey biomass (based on figures from the 2016 Aerial Survey in NW Namibia) compares favourably with similar data from 13 other lion populations in sub-Saharan Africa (Figure 32).

Figure 32. Lion biomass as a function of available prey biomass in 14 conservation areas in sub-Saharan Africa. The Desert lion population is indicated by a red dot.



The genetic heterozygosity of the Desert lion population is sufficiently diverse and similar to that of the Etosha lion population. However, due to the skewed adult sex ratio and shortage of adult pride males there is a need for regular monitoring. The genetic variability and viability of the Desert lion population should be measured at least once every ten years.

6.5.5.1 Trophy Hunting

Trophy hunting of lions can be a very lucrative and selective option for turning a problem into an asset. As with every form of utilisation there is always the fear of exploitation and greediness. Notwithstanding with good scientific data as backup and carefully designed control measures in place the selective use of trophy hunting can be valuable in managing Human-Lion Conflict, removing “problem” lions and generating income towards the “Lion Funds” at conservancy level.

Hunting quotas are generally allocated for each conservancy separately, but in NW Namibia it is, however, essential that sustainable off-take quotas are first calculated for the whole Desert lion population, and then divided between the relevant conservancies. This is necessary because lions move across several conservancies and the home ranges of all the prides overlap extensively.

Quota settings should be based on the CITES standard of 5% off-take and follow the import conditions of the US Fish and Wildlife Service under the Endangered Species Act, that require proof of sustainable and ethical hunting of free-ranging lions where trophy fees are used for the conservation of the species.

In the event of prolonged incidents of Human-Lion Conflict, the Ministry of Environment & Tourism could identify and declare a “problem” lion that can be utilized for trophy hunting. Clear and binding conditions must be stipulated and an MET staff member should accompany the PH to ensure that the actual “problem” lion is shot. On numerous occasions during the past 15 years hunters have misused such hunting permits by ignoring the “problem” lions and selecting unrelated adult male lions. Care must be taken that “problem” lion trophy hunting permits in addition to the allocated annual quotas do not amount to unsustainable off-takes. Due to the current skewed sex ratio in the population – the result, partly, of excessive numbers of adult males shot on quota and “problem” trophy hunting permits – adult male lions (> 4 years of age) may not be trophy hunted.

Funds generated through trophy hunting will provide a much need income to local communities and conservancies. Permit conditions issued by MET must stipulate the proportion of funds to be allocated to the relevant conservancy “Lion Funds” and to the Game Products Trust Fund (GPTF).

6.5.5 Research and Monitoring

In order to manage Human-Lion Conflict in NW Namibia conflict effectively and efficiently it is crucial to have adequate data that is available in a usable form for key decision-makers. There is a need for more comprehensive data that enables the Government and other stakeholders to understand better the nature and scale of the problems, to develop solutions and monitor the success of the solutions. Data gathering needs to be standardized so that results can be compared from area to area and over time. Data needs to be stored in a central database that all stakeholders can have access to.

The specific objectives of this strategy are:

- 6.5.5.1 To develop a standardized monitoring and reporting system on HLC that captures the most relevant data for use by all stakeholders
- 6.5.5.2 To monitor and evaluate the effectiveness of different HLC mitigation methods and to disseminate findings to all stakeholders
- 6.5.5.3 To determine the social and ecological carrying capacity for lions

Strategic approach

Establish National database with the MET that should include historical and current data from existing systems including the MET Permit Office.

Record data from each reported HLC incident capturing:

- Numbers, age and sex structure of lions
- Location of incident

- Date & time when incident occurred
- Damage caused
- Who was affected
- Action taken
- Was any mitigation in place (e.g. were animals in a corral?, etc.)
- Who recorded the data;
- Sex and age structure of the animal
- Any other information which may be appropriate

Provide data on the economic impact of HLC on households – this provides a better indication of the costs to citizens than simply recording the cost of damage as it takes into account the economic status of the household bearing the loss and other factors. For example, the impact of losing five cows to a lion is much higher on a household owning eight cows compared to a household owning 50 cows. Similarly the loss will be greater to a female-headed household with few other assets and little or no cash income.

Provide data on the effectiveness of HLC mitigation methods including type of method, features of the method (e.g. detailed description of the infrastructure, components, ingredients, position in relation to other important features such as other water points, houses, etc), aim of the method, extent to which the method has achieved its aims, reasons for success or failure, length of time over which monitoring has taken place, description of monitoring methodology, provide comparative data to improve our understanding of the factors influencing patterns of HLC, and designed to detect possible duplication of data.

Work with all other stakeholders to develop standardized data gathering and monitoring systems that are simple and cost-effective to implement. Disseminate data in appropriate forms to all stakeholders. Build capacity of stakeholders in collecting, recording and using data and ensure that there is systematic and consistent data recording in terms of level of effort and across temporal, spatial and numerical scales.

Develop various forms of “Early Warning Systems” to provide communities and farmers with sufficient and timely information in order to take appropriate measures to prevent livestock losses. The early warning system should provide information on a daily basis.

MET will coordinate a centrally-based Rapid Response structure which will coordinate with Rapid Response Units deployed in NW Namibia to address incidents of HLC and manage “problem” lions.

All efforts to monitor and manage HLC will be coordinated by MET. The general public, interested parties and individuals may not be involved in any form of HLC management without the written approval of MET and the conservancies.

6.5.6 Human Lion Conflict Insurance Scheme

It has not been Government policy to provide compensation to farmers for losses due to wild animals since compensation schemes implemented elsewhere have proved to be very problematic and open to abuse. However, there is a need to reduce the growing tension around HWC as losses of human lives, livestock, and crops as well as damage to infrastructure are highly emotional issues and affect livelihoods.

The National Policy on Human-Wildlife Conflict Management is addressing new approaches to insurance against HWC that will also cover the Human-Lion Conflict Management Plan for NW Namibia. Income generated from lion-related tourism and hunting in the NW should be applied to balance the losses at grass-route level.

7. IMPLEMENTATION FRAMEWORK

7.4 Monitoring and Evaluation

7.4.1 The impact of the implementation of this Management Plan and progress and constraints regarding its implementation will be periodically assessed by the Ministry of Environment and Tourism in consultation with other stakeholders.

7.4.2 The Event/Incident Book System and the Human-Wildlife Conflict Data form will be used for monitoring and evaluation of HLC.

7.5 Implementation Action Plan

Table 1: Land use planning and livestock management structures

Programme Strategy	Five Year Target	Key Actions	Required Funds	Responsible Organizations
Monitoring of livestock & HLC	On-going	Planning aimed at avoiding HLC	General operational funds	Conservancies MET, IRDNC DLCT

Table 2: Aspects of lion demography & behaviour ecology relevant to HLC

Programme Strategy	Five Year Target	Key Actions	Required Funds	Responsible Organizations
Monitoring of lion population	On-going	Record population demography & ecology	General operational funds	MET, DLCT & IRDNC

Table 3: Developing & implementing appropriate technical solutions for mitigating HLC

Programme Strategy	Five Year Target	Key Actions	Required Funds	Responsible Organizations
Zoning of conservancies to avoid HLC	Wildlife zones & high-risk areas free of livestock	Implement “High-Risk Lion Corridor”	General operational funds	Conservancies, Traditional authorities, MET

Table 4: Effective Livestock Management & “High-Risk Lion Corridor”

Programme Strategy	Five Year Target	Key Actions	Required Funds	Responsible Organizations
Establish protocols for livestock management inside “High-Risk Lion Corridor”	Erect several lion corrals inside “High-Risk Lion Corridor”	Ensure that no livestock, including donkeys, roam freely at night	N\$ 250,000	Conservancies, IRDNC & MET

Table 5: *Early Warning Systems and Scare Tactics*

Programme Strategy	Five Year Target	Key Actions	Required Funds	Responsible Organizations
Satellite Early Warning System	Six key lions fitted with satellite collars	Provide early warning movement data to farmers	N\$ 150,000	DLCT, MET
Logger Early Warning System	Establish 4 Logger Systems at key locations. Fit RFID collars to 15 key lions.	ID key lion prides & fit collars. Erect Loggers at 4 corrals.	N\$ 285,000	DLCT, MET

Table 6: *Rapid Response Units*

Programme Strategy	Five Year Target	Key Actions	Required Funds	Responsible Organizations
Develop Rapid Response protocol	Establish 4 RRU teams	MET establish central control	N\$751,920	MET, IRDNC, DLCT, Conservancies

Table 7: Lion Tourism

Programme Strategy	Five Year Target	Key Actions	Required Funds	Responsible Organizations
Establish “Lion Funds” at conservancy level to manage lion-sighting fees	All major tour operators pay N\$ 100 for every lion sighting	Involve tourism industry		TOSCO, Conservancies, MET & IRDNC

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