FARMER-RELATED THREATS TO CHEETAH (*Acinonyx jubatus*) SURVIVAL IN NAMIBIA

by

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PREFACE

The research presented in this mini-dissertation was conducted in Namibia from July 2001 to October 2001 and was partly funded through the Animal Science Department of the University of Natal, Pietermaritzburg.

I hereby certify that the research presented in this mini-dissertation is my own original and unaided work, except where specific acknowledgement is given. No part of this mini-dissertation has been submitted in any form for any degree or diploma to another university.

Signed

Penelope Jane Orford

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This mini-dissertation is dedicated to my family.

ABSTRACT

This mini-dissertation is a comparison, by repeat survey, of farmer-related threats to cheetah (*Acinonyx jubatus*) survival on specific commercial farms in central Namibia. The research was conducted, to investigate if there had been changes in these threats to cheetah survival over a ten-year period (June 1991 to October 2001). A sub-sample of 31 farmers who were originally interviewed by the Cheetah Conservation Fund in June 1991, were re-interviewed between July and October 2001. These farmers were exposed to the Cheetah Conservation Fund awareness-raising programme. The results of this survey were compared to the results of the original survey of these farmers.

This study showed that changes in farmer-related threats to cheetah survival have taken place. These include changes in land use, the attitude and behaviour of farmers towards cheetah, and cattle management practices. The land use changes include an increase in game farming, as a major source of income, by 19% of the farmers, since 1991. This increase in game farming was associated with an increase in game proof fencing and the introduction of alien antelope species into game fenced areas. The attitude of farmers towards the presence of cheetah on their farms was found to have changed significantly ($p = 0.024$), with 13% more farmers than before 1991 favouring cheetah presence on their farms. The behaviour of farmers towards cheetah has also changed in favour of cheetah survival. During the ten-year period from 1991 to 2001, 23% of the farmers removed no cheetah, compared to 10% for the ten-year period before 1991. Thirteen percent of the farmers were found to remove cheetah by trophy hunting only, as opposed to none prior to 1991. During the ten-year period from 1991 to 2001, the number of cheetah removed by the same farmers had declined by 243 (55%) cheetah when compared to the previous ten-year period. Game farmers were found to remove on average 3.75 times more cheetah than livestock farmers. Five game farmers were responsible for removing 92 cheetah, representing 47% of the total number of cheetahs removed.

The majority (88%) of cattle farmers experienced calf losses to cheetah predation. In contrast to this, only 44% of smallstock farmers experienced losses to cheetah predation. The mean loss of livestock to predation by cheetah was found to be low, less than one animal per year for both calves and smallstock. The majority (73%) of cattle farmers

implement only one livestock management strategy to prevent predation on calves by cheetah. The majority (88%) of smallstock farmers implemented more than one strategy to prevent predation. Changes in management practices to protect calves from cheetah predation since 1991 included a 14% decline in farmers using a technique known as 'calving camps' and an increase of 42% in the number of farmers monitoring their cows during the calving season.

In conclusion, during the ten-year period from 1991 to 2001, both positive and negative changes in farmer-related threats to cheetah survival were recorded amongst the farmers interviewed. The positive changes include changes in the attitude and behaviour of farmers in favour of cheetah survival. However, this progress was tempered by change in land use from livestock to game farming, since game farmers pose a greater threat to cheetah survival than livestock farmers.

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LIST OF ABBREVIATIONS AND ACRONYMS

CBD:	Convention on Biological Diversity
CCF:	Cheetah Conservation Fund
CITES:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
IUCN:	International Union for the Conversation of Nature and Natural Resources

CHAPTER ONE

OVERVIEW

1.1 INTRODUCTION

There is growing consensus that life on earth is in the midst of a major extinction event, manifested by the loss of species (Bauman, Bell, Koechlin & Pimbert 1996, Leakey & Lewin 1996, Walker & Steffen 1999). The major reasons for this loss include human population increase and the concomitant increase in human demand for, and consumption of natural resources. This is associated with the destruction of species, natural habitats and processes (Walker & Steffen 1999, Perrings 2000, Sutherland 2000). Sub-Saharan Africa is no exception to this scenario. In the drier regions of sub-Saharan Africa the more specific proximate causes of species loss include, habitat degradation, overgrazing and overexploitation (Perrings 2000, Barnard 1998). In the southern African subregion, despite legislation, the survival of many wildlife species is threatened predominantly by habitat fragmentation and loss, exploitation and persecution for various reasons, including the protection of livestock (Perrings 2000). The maintenance of natural habitats of adequate size and the reduction of persecution are not only desirable, but also crucial for the conservation of many species (Perrings 2000, Sutherland 2000). One such species is the cheetah (*Acynonix jubatus*).

The cheetah is a member of the mammalian order Carnivora belonging to an atypical monospecific genus of the Felidae (cat) family (Eaton 1974, Skinner & Smithers 1990). Cheetah are recognised as having a high risk of extinction in the wild, in the near future. They occur at low densities and require large areas with adequate prey for survival (*c.f.* Chapter Two for data). To date the cheetah has lost much of its former habitat range and is highly persecuted (Eaton 1974, Skinner & Smithers 1990, Caro 1994, Marker-Kraus, Kraus, Barnett & Hurlbut 1996, Marker 2000). Over large parts of the cheetah's range in the southern African subregion, the responsibility of ensuring the conservation of cheetah and their habitat lies in the hands of private and communal land owners. This is due in part to a large proportion of cheetahs occurring outside of wildlife reserves (e.g. In

Namibia ± 95%) and the inadequate size of many reserves to ensure the survival of cheetah (Marker-Kraus *et al.* 1996). In southern Africa, cheetah occur, in particular, on the commercial (privately owned) farms of central Namibia, where it is estimated that up to 30% (3000) of all living cheetah are found (Myers pers. comm. in Eaton 1974, Caro 1994, Barnard 1998, Marker-Kraus *et al.* 1996).

Historically cheetah have always been threatened on these farms predominately due to:
1) farmers holding negative attitudes towards carnivore predators;
2) conflict with livestock and game farming activities resulting in the legal removal of cheetah under the auspices of livestock protection and;
3) farmers having had economic incentives that supported cheetah removal. For example, a market for live captured cheetah due to loopholes in the laws protecting cheetah (Eaton 1974, Marker-Kraus *et al.* 1996, Marker 2000, Marker pers. comm. 2001).

To avoid the elimination of cheetah from these farms, solutions to the survival threats that they face are necessary. These solutions, as with other species, involve identifying the threats to survival; setting priorities and implementing a number of actions to bring about problem resolution through conservation techniques which include habitat protection, legislation, education, public awareness and the integration of human activities and conservation (Sutherland 2000, Jackson 1999).

The integration of cheetah conservation with livestock and game-farming activities on Namibian farms is a major challenge and requires considerable effort. Amongst other organisations, the Cheetah Conservation Fund (CCF), a non-profit conservation trust, took up this challenge in 1991 by initiating in conjunction with other conservation strategies (e.g. ongoing research and a livestock guard dog project), an awareness-raising programme amongst the commercial farmers in central Namibia. These farmers own the habitat on which the cheetah occur and thus hold the fate of this cheetah population in their hands (Marker-Kraus *et al.* 1996, Marker 2000).

The awareness-raising programme was implemented with the aim of addressing farmer-related threats to cheetah survival through providing farmers, on an ongoing basis, with accurate information about cheetah behaviour, the ecological need for predators and

strategies to protect livestock from predation by cheetah. The CCF posits that, with this information, farmers can:

1) change their attitudes and behaviour towards cheetah and;

2) make adaptation to livestock and game farming activities that enable the co-existence of cheetah and farming activities without major conflict with livestock (Marker 2000).

In support of this theory numerous studies and authors indicate that information and knowledge about wildlife is an important factor in determining attitudes towards, and support for, the conservation of wildlife. (Harcourt, Pennington & Weber 1986, Jacobson & Padua 1995, Lichtenerg & Zimmerman 1999, Alexandra 2000, Sutherland 2000, Verdoorn pers. comm. 2001)

1.2 PROBLEM STATEMENT

It is acknowledged that cheetah may not survive due to a myriad of interconnected factors potentially involved in the survival of any species linked with the natural tendency for extinctions to occur over time. However, the eradication of the cheetah by humans appears to be imminent and is unacceptable. The research problem and question arose out of the need to discover if aspects of the CCF's cheetah conservation strategy on commercial farms in central Namibia are having the desired outcome. This is that the majority of commercial farmers support cheetah survival rather than eradication through no longer unduly persecuting the cheetah and ensuring that the cheetah's habitat and prey base owned by these farmers remains intact and available to cheetah. Under these circumstances it is possible that the cheetah may survive on Namibian farms rather than being wantonly driven into premature extinction. Therefore the following research question was posed.

Have there been any changes in farmer-related threats to cheetah survival since the implementation of an awareness-raising programme in 1991 amongst specific commercial farmers in central Namibia?

1.3 AIMS AND OBJECTIVES

The purpose of this mini-dissertation was to monitor changes in known farmer-related threats to cheetah survival on commercial farms in central Namibia, subsequent to efforts by the CCF from 1991 to 2001 to improve cheetah survival on these farms. Farmer-related threats to cheetah include; land use, persecution of cheetah, overexploitation of the cheetah's ungulate prey base and livestock management practices that lead farmers into conflict with cheetah. The scope of this study did not consider other potential survival threats to the Namibian cheetah, for example, their genetic homogeneity, reproductive success and disease.

Monitoring involves analysis of current situations in order to improve existing programmes (Sutherland 2000). The three main objectives of this study were to monitor changes in:

1) land-use and fencing;

2) attitudes and behaviour of farmers toward cheetah and;

3) livestock management practices, from 1991 to 2001.

A further objective was to provide the CCF with updated information on the above-mentioned issues in order that their conservation strategies remain abreast of changes in farmer-related cheetah survivability threats.

1.4 METHODOLOGY

The methodology used in this study involved an in-depth face-to-face interview of 31 farmers. In order to make meaningful comparisons the interview was based on an adaptation of the questionnaire used in a survey of 241 commercial farmers in central Namibia, by the CCF from 1991 to 1993 (*c.f.* Appendix One). A specific sub-sample of the original sample of farmers surveyed by the CCF was identified and re-interviewed for this study. This sub-sample consisted of farmers who have not been part of active follow up research by the CCF since 1991. This sub-sample are farmers from whom the CCF required follow-up data as part of ongoing research needs. These farmers have been exposed to cheetah conservation needs through the awareness raising efforts of the CCF and other conservation organisations. These efforts take the form of talks at farmers meetings, newsletters and face-to-face discussions with farmers. In order to make

meaningful comparisons, the data gathered in this study was analysed, where applicable, using the same computer database programmes and methods that were used in the analysis of the data gathered from the original survey of these farmers by the CCF. The methodology used in this thesis is described in detail in chapter five.

1.5 OUTLINE OF CHAPTERS

This mini-dissertation is structured into a further seven chapters.

Chapter two is an overview of the current status of cheetah conservation with reference to Namibia.

Chapter three briefly looks at human attitudes and behaviour with respect to predators.

Chapter four summarises the major findings of the original survey of commercial farmers in central Namibia, by the CCF from 1991 to 1993, as background information to this study.

Chapter five is a detailed description of the methodology used in this study.

Chapter six is a presentation of the findings of this study.

Chapter seven is a discussion of these findings.

Chapter eight is the conclusion and recommendations of this study.

CHAPTER TWO

CHEETAH *(Acinonyx jubatus)* CONSERVATION

2.1 INTRODUCTION

The cheetah is a large carnivorous mammalian predator that is part of the greater biological diversity (biodiversity) on earth. Biodiversity is the variability between biological elements and is observed at three levels namely genetic, species and ecosystems (Leakey & Lewin 1996, Bauman *et al.* 1997, Daily *et al.* 1997, Barnes 1998, Perrings 2000). Biodiversity matters not only because of the value of individual species, genes and ecosystems, but due to the role that this mix plays in the continuation of natural processes (Leakey & Lewin 1996, Barnes 1998, Bauman *et al.* 1997, Daily *et al.* 1997, Perrings 2000). The value of biodiversity is often either ignored or not known to the resource user (Glowka *et al.* 1994, Glazewski, Kangueehi & Figueira 1998, Perrings 2000). Difficulties arise when the extinction of a species appears to have little observable effect on the functioning of ecosystems. This can lead to the perception that certain species are redundant resulting in little incentive to conserve them (Perrings 2000), for example the cheetah. This is problematic since biodiversity maintains ecosystem resilience by ensuring the provision of key ecosystem functions over a range of environmental conditions (Caro 1994, Leakey & Lewin 1996, Bauman *et al.* 1997, Daily *et al.* 1997, Barnes 1998, Perrings 2000). The loss of biodiversity is of concern. Not only are the effects of this loss on ecosystem functioning poorly understood and potentially catastrophic for many life forms, but it is also irreversible (Leakey & Lewin 1996, Barnes 1998, Perrings 2000).

Amidst the growing consensus that life on earth is undergoing a major extinction event driven by human activity, (Walker & Steffen 1999, Leakey & Lewin 1996), urgent action is needed to modify human activities to curb the loss of biodiversity (Glazewski *et al.* 1998). The 1992 international Convention on Biological Diversity (CBD) is aimed at addressing this need (Glowka *et al.* 1994, Glazewski 1998). Article One of this convention sets out the overall objective which involves the conservation of biodiversity. The signatories to this convention acknowledge that there is a threat of significant

reduction or loss of biodiversity and that the fundamental requirements for the conservation of biodiversity are the in-situ conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings (Glowka, *et al.* 1994). Furthermore, international trade in wild fauna and flora is regulated under the 1975 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Sutherland 2000).

2.2 BIODIVERSITY CONSERVATION IN NAMIBIA

Namibia is a signatory to both the CBD and the CITES and the constitution of Namibia makes provision for the adoption of policies that protect ecological processes and biodiversity (Glazewski *et al.* 1998). In Namibia the key laws concerning terrestrial habitats and species are the Nature Conservation Ordinance, Number Four of 1975 (hereafter referred to as the Ordinance), which is currently being revised and the Forest Act Number 29 of 1992 (Glazewski *et al.* 1998). The global threats to biodiversity apply to Namibia. In Namibia, statutory protection of biodiversity, including the cheetah, is complicated by and needs to be seen within the context of the country's developing-nation status, recent political independence, the heterogeneous population and the unique but fragile ecosystems (Glazewski *et al.* 1998).

2.3 NATURAL HISTORY OF THE CHEETAH

2.3.1 Introduction

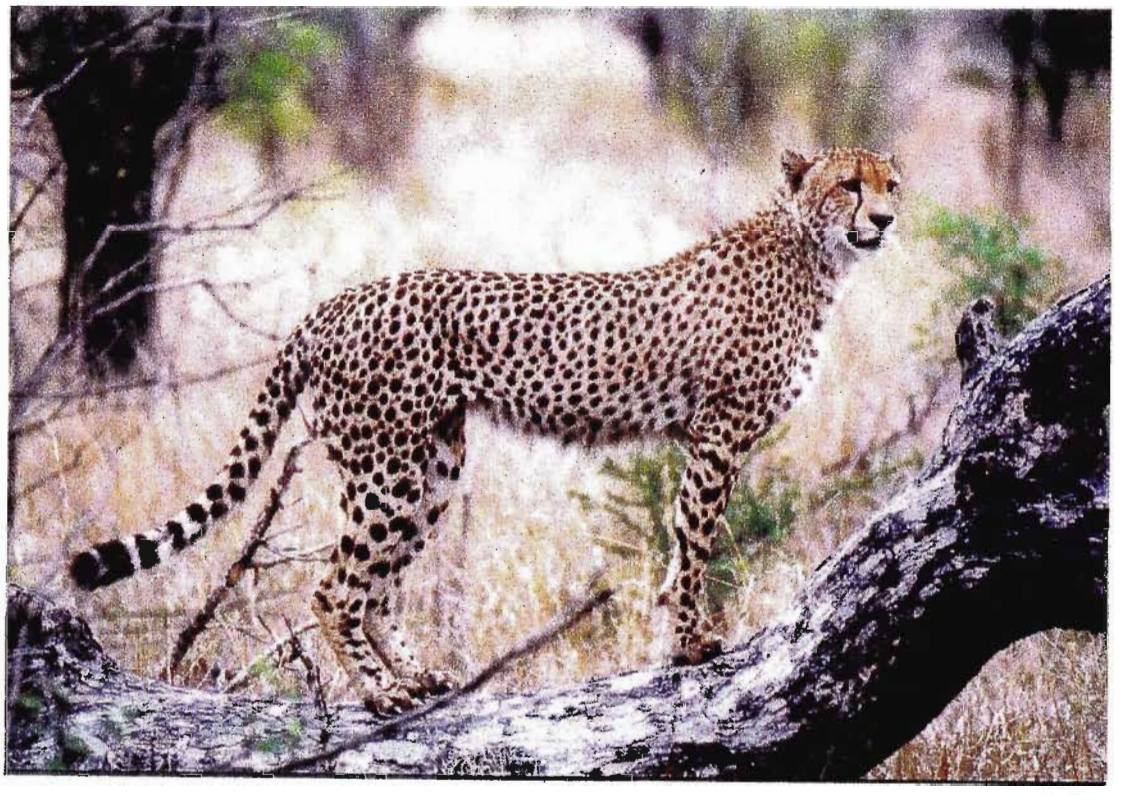
A brief summary of the natural history of the cheetah is given below. This serves as a quick reference to cheetah ecology, focusing on cheetah ecology specific to Namibian cheetah and relevant to this study.

Cheetahs are predatory mammals in the taxonomic order Carnivora, belonging to the family Felidae (cats). This family consists of a single subfamily the Felinae and is represented in the southern African subregion by three genera and eight species, including the introduced species *Felis catus* (Skinner & Smithers 1990). Of these genera, the genus *Acinonyx* is monospecific namely *jubatus* (Skinner & Smithers 1990). The generic name *Acinonyx* probably derives from the Greek *akaina*, a thorn and *onyx*, a claw referring to the cheetah's unsheathed claws. The specific name *jubatus* comes from the Latin, a crest

or mane, referring to the cheetah's nuchal crest of long hair (Eaton 1974, Rosevear 1974). The colloquial name cheetah comes from the Hindu word *chita* which means 'spotted one' (Eaton 1974, Skinner & Smithers 1990).

2.3.2 Description

The cheetah has a slim body with thin long legs. Their heads are round and relatively small with round ears set wide apart. They have a total length from snout tip to tail end of about 2m, with the tail making up half this length and they stand about 0.8m at the shoulders. They have an average body mass of between 40 and 60 kilograms. There is little difference between males and females (Skinner & Smithers 1990). Figure 1 illustrates an adult male cheetah from Namibia.



Photograph: Vorn Sweeney

Figure 1 *Adult male cheetah*

2.3.3 Distribution

Once widespread from Asia throughout the Middle East and down to the southern tip of Africa, cheetahs now have a considerably constricted range. Outside the African continent a few can still be found in Iran (Marker-Kraus *et al.* 1996, Marker pers. comm. 2001). Once widespread in India, they were extinct there by 1952 (Skinner & Smithers

1990). Cheetahs are also extinct in the countries bordering the eastern Mediterranean (Skinner & Smithers 1990). In Africa their distribution has been greatly modified with very few material records of cheetah sightings outside of reserves (Skinner & Smithers 1990). In the southern African subregion they occur widely but sparsely throughout Namibia and Botswana; in Zimbabwe they are not found in the northeast and only occur in Mozambique south of the Zambezi River (Skinner & Smithers 1990). In South Africa they occur sporadically in the northern parts of the Northern Cape, North West and the northern and eastern parts of the Northern Province down to the southern border of the Kruger National Park (Skinner & Smithers 1990). They were exterminated in Kwa-Zulu Natal in the 1930's but cheetahs from Namibia were reintroduced to reserves in 1965 and 1978 (Skinner & Smithers 1990). Since the publication of Skinner and Smithers (1990) the range could have contracted further with the global numbers now estimated at less than 15 000 free ranging animals (Marker pers. comm. 2001). In Namibia their range outside of the Etosha National Park has been restricted to the north-central commercial farmlands (Barnard 1998, Marker 2000). It has been estimated that there are approximately 2 500 cheetah in Namibia (Nowell 1996, Marker-Kraus *et al.* 1996, Marker 2000).

2.3.4 Habitat

Cheetah occur in a variety of habitats from savannah grass and woodlands, through to desert fringes (Caro 1994). They drink water if available, but it is not an essential habitat requirement as they can rely on their prey for moisture needs (Skinner & Smithers 1990, Caro 1994). In Namibia their habitat, on commercial farms, is often heavily bush encroached with *Dichrostachys cinerea africana* and *Acacia mellifera detinens* (Barnard 1998, Marker-Kraus *et al.* 1996).

2.3.5 Habits

Cheetah observations show that they are predominately diurnal with active periods in the early morning and late afternoon, coinciding with those of the common ungulate species in Namibia on which cheetah prey, including, springbok and gemsbok (Skinner & Smithers 1990). They are commonly seen in groups of two to three individuals. Cubs remain with their mother for up to 18 months and these groups usually represent families. Siblings often remain together after they have dispersed from their mother. Males only join females in oestrus. Cheetah have very large home ranges, on farmlands in Namibia,

the average area for females is 1 200km^2 up to 3 000km^2 over time and 800km^2 for males (Marker 2000). Home ranges overlap and within them they have preferred areas to which they return (Skinner & Smithers 1990, Marker-Kraus *et al.* 1996). Male cheetah are sometimes involved in aggressive encounters with other males and fights to the death over females in oestrus have been recorded (Skinner & Smithers 1990, Marker-Kraus *et al.* 1996, Marker pers. comm. 2001). Cheetah are assiduous urine and faecal markers and these markings are thoroughly investigated by other cheetahs and the area avoided for up to 24 hours after first being marked. Cheetah in Namibia use trees, commonly called 'playtrees' to mark their presences by urinating, defecating and scratching. They regularly investigate these playtrees which may occur where cheetah territories overlap, therefore farmers often set traps around these trees making it easy to catch groups of cheetah (Marker-Kraus *et al.* 1996, Marker 2001). Cheetah principally feed on medium or small sized bovid, or the young of larger bovid, with a mass of about 60kg being favoured. They also take a wide range of ground-living birds including guinea fowl (*Numida meleagris*) and bustards (*Neotis sp.*, *Ardeotis Kori*) and small mammals such as hares (*Lepus sp., Pronolagus sp.*) and porcupine (*Hystrix africaeaustralis)* and are known to scavenge (Skinner & Smithers 1990, Caro 1994, Marker-Kraus *et al.* 1996). Breeding occurs all year round and involves a complex courtship. Gestation is from 90 to 95 days with litter size averaging four. Cubs are well hidden at birth, are fully weaned by three months, and by eight to 12 months can make kills of their own. In the absence of limiting factors, cheetah populations have been known to increase rapidly (Caro 1994) and Nowell (1996) postulates that the Namibian cheetah population has the potential to double every five to seven years.

2.4 OVERVIEW OF CHEETAH STATUS IN NAMIBIA

Namibia is an arid country within the South-western Arid Zone, of sub-Saharan Africa moving from hyper-arid in the west of the country to dry sub-humid in the east. Sixty nine percent of the country is regarded as semi-arid and 16% as arid (Barnard 1998). The predominately summer rainfall is highly variable with a country wide average rainfall of under 250mm per year that is coupled with an annual mean evaporation rate of 3700mm. Desert, savannah and broadleaf woodland biomes are found from west to east, respectively (Barnard 1998). Typically of arid regions in Africa, Namibian agriculture has a heavy reliance on livestock production. Farmers commonly farm with smallstock (goats

and/or sheep), cattle, game animals or a combination of these (Barnard 1998). Livestock farming has led farmers across Africa, including Namibia, into conflict with large predators. After the introduction of firearms into the southern African subregion, including Namibia, this conflict combined with hunting and persecution had resulted in, the elimination of large carnivores from much of their range outside of protected areas (Bowland, Mills & Lawson 1994, Barnard 1998). These large carnivores included lions (*Panthera leo*), wild dogs (*Lycaon pictus*) and spotted hyaena (*Crocuta corcuta*). Ten species of carnivores including cheetahs are listed as Protected Game under the Ordinance in Namibia and this status involves various prohibitions and permit requirements. However, farmers are allowed to kill cheetah to protect stock (Barnard 1998, Glazewski *et al.* 1998, Marker-Kraus *et al.* 1996). Interestingly, unlike other large carnivores, the cheetah has thus far managed to escape extermination in parts of its range. In particular on the commercial cattle farms of central Namibia, despite persecution by farmers, the largest remaining global population of free ranging cheetah occurs (Marker-Kraus *et al.* 1996). This may be due in part to changes on Namibian farmlands that have favoured cheetah, for example, an increase in kudu (*Tragelaphus strepsiceros*) numbers and range, and limited intraguild predation (Barnard 1998). Nonetheless the Cat Specialist Group of the International Union for Nature Conservation ranks cheetahs as among the more vulnerable felids in sub-Saharan Africa (Nowell & Jackson 1996, Marker 2000).

Popular mythology holds that the cheetah species is doomed to extinction because it is overly specialised due to its ability to sprint at extremely high speed to capture prey (Caro 1994). It is argued that specialists are more prone to extinction if ecological conditions change unfavourably for the specialist (Caro 1994). This is unlikely to apply to cheetah because of the wide range of habitats, varying from woodlands to semi-desert across Africa, the Middle East and Asia, that until recently have been occupied by cheetah and their wide range of prey from jackal (*Canis sp.*) to buffalo (*Bubalus bubalis*) calves (Eaton 1974, Caro 1994). There are other reasons for believing that cheetah have only a moderate chance of persisting through the 21st century (Eaton 1974, Caro 1994, Marker-Kraus *et al.* 1996). The absolute numbers of cheetah in Africa are low despite their wide distribution and they virtually no longer occur in Asia or the Middle East (Eaton 1974, Caro 1994, Marker-Kraus *et al.* 1996, Marker pers. comm. 2001). Where cheetah do occur they are usually in low densities in comparison to other carnivores (Caro 1994).

The species has an extreme lack of genetic variability (monomorphic), which in theory may make them more susceptible to diseases and compromise their ability to adapt to future environmental conditions (O'Brien, Wildt & Bush 1986, Caro 1994, Barnard 1998, Marker-Kraus *et al.* 1996). Breeding cheetah in captivity has met with little success (Marker & O'Brien 1989, Caro 1994, Marker-Kraus *et al.* 1996), although recently improved husbandry has resulted in improved captive breeding successes (Caro 2000). Despite the above-mentioned limiting factors in cheetah survival, the fundamental threats to the persistence of free ranging cheetah appear to be persecution by humans and the loss of habitat and prey due to human activity (Eaton 1974, Caro 1996, Marker-Kraus *et al.* 1996, Barnard 1998, Marker 2000).

For millennia, cheetah have been unjustifiably persecuted by humans (Eaton 1974, Myers 1975, Caro 1994, Marker-Kraus *et al.* 1996). This persecution takes the form of hunting them for their skins, killing them due to traditional attitudes towards carnivore predators, catching them for pets, zoos and coursing, destroying their prey base and altering or destroying their natural habitat to fulfil human demands. Persecution has lead to a drastic decline in cheetah numbers throughout their range (Eaton 1974, Myers 1975, Caro 1994, Marker-Kraus *et al.* 1996). In 1975 cheetah were listed by the International Union for the Conservation of Nature and Natural Resources (IUCN) as an endangered or vulnerable species (i.e. facing a high to very high risk of extinction in the wild, in the medium to near future) (Marker-Kraus *et al.* 1996). This status resulted in cheetah being listed in 1975 in Appendix 1 by CITES, and international trade is thus forbidden unless special exception is granted by the Treaty (Marker-Kraus *et al.* 1996). In the same year the Namibian Nature Conservation Ordinance (No.4 of 1975) classified cheetah as a 'protected animal' although shooting cheetah is permitted in the interest of protecting life or property (Barnard 1998, Marker-Kraus *et al.* 1996). According to CITES reports for Namibia, between 1980 and 1991, 6 782 cheetah were shot as vermin, trophies or exported live (Marker-Kraus & Grisham 1993).

2.5 CHEETAH POPULATION IN THE WILD

Global cheetah numbers in the wild were estimated by Myers (1975) to be some where between 7 000 and 25 000 during the early 1970's. Marker (2000 & pers. comm. 2001) states that there are currently fewer than 15 000 cheetah left in Africa and less than 50 in

Iran with most populations contining to decline. Since the 1970's major changes have occurred in some of the six countries where Myers (1975) recorded cheetah as being numerous (Caro 1994). These changes included the erection of fences in Botswana and the ongoing persecution of cheetah on agricultural lands in Namibia and Zimbabwe (Caro 1994, Marker-Kraus *et al.* 1996, Marker 2000). The principal problem contributing to their range reduction is habitat destruction and loss of ungulate herds on which they depend for food (Myers 1975, Caro 1994, Barnard 1998). Habitat destruction and ungulate biomass reduction varies by regions (Caro 1994). In Kenya and Zimbabwe spreading agriculture is the main reason and in Tanzania and Zambia increasing firearm use has reduced ungulate numbers (Caro 1994). In Namibia, estimations in the 1990's vary slightly, with an estimate in 1992 via a farm survey by the Ministry of Environment and Tourism putting the number of cheetahs at approximately 2 350 adults, an apparent decline of 25% since 1972 (Barnard 1998). Based on past removal rates by farmers, Nowell (1996) estimates that the population of cheetah in Namibia is between 2 000 and 3 000 (adults and or sub-adults) an estimation supported by Marker (2000).

The direct exploitation of cheetah continues to contribute to their demise. In Zimbabwe and Namibia farmers may trophy hunt and shoot 'nuisance' cheetah (Caro 1994, Marker 2000). Human exploitation and persecution in both these countries is certainly a key factor depressing the cheetah population (Caro 1994, Marker-Kraus *et al.* 1996). In 1991 an export quota system was established for trophies and live animals this allows the annual export or trophy hunting of 150 cheetah from Namibia, 50 from Zimbabwe and 5 from Botswana (Caro 1994, Barnard 1998, Marker-Kraus *et al.* 1996).

Cheetah survival is not ensured through protected areas, since there are survival threats to cheetah within these areas and, commonly these areas are not large enough to support cheetah populations in the long term. The principal threats to cheetah in protected areas come from other predators (competition and predation) and human disturbance (Caro 1994). Interspecific competition between predators takes the form of one predator depleting the resources of another, or by stealing its prey. Evidence indicates that sympatric carnivores (e.g. lion and spotted hyena) through intraguild predation have a major impact on cheetah population growth rates in protected areas where these carnivores also occur (Eaton 1974, Caro 1994). Disease may also be an important threat.

For example, cheetah in the Etosha National Park of Namibia appear to be susceptible to anthrax (*Bacillus anthracis*) (Lindeque *et al.* in press).

CHAPTER THREE

HUMAN ATTITUDES AND CHEETAH CONSERVATION

3.1. INTRODUCTION

In the absence of other limiting factors, the survival of the cheetah like other large, endangered carnivores appears to depend largely on the integration of conservation objectives with human activities. This can only be achieved through changes in attitudes and behaviour of humans leading to greater tolerance and understanding of carnivore behaviour and their multiple values (Bowland *et al.* 1994, Marker-Kraus *et al.* 1996, Marker 2000, Sutherland 2000). The development of human attitudes and behaviour towards wildlife is a complex two way process between humans and nature. This process is influenced by economic, social-psychological, historical, cultural and biological factors that shape each other (O'Riordon 1976, Gray 1993). In order to understand human-nature interactions it is useful to briefly investigate human attitudes. Since, changing attitudes towards conservation issues is a common starting point for many contemporary conservation efforts (Sutherland 2000). This chapter serves as a reference to current theories on human attitude and behaviour, with reference to predators.

3.2 HUMAN ATTITUDES

The concept of attitude was used as early as 1918 to explain behavioural differences between people. Rosenberg and Hovland (1960:3) define human attitudes as "predispositions to respond to some class of stimuli with certain classes of response". These classes of response are affective (pertaining to feelings of like or dislike), cognitive (pertaining to beliefs, opinions about the attitude object) and conative/behavioural (pertaining to action tendencies) (Rosenberg & Hovland 1960). A meaningful starting point for behaviour modification is to change attitudes since attitudes supposedly influence behaviour (Hewstone, Stroebe, Codol, & Stephenson 1992). Other authors have stressed the evaluative nature of attitudes as their only component and that attitudes refer only to positive or negative feeling about issues, people or objects (Hewstone *et al.* 1992). This distinguishes the concept of attitude from beliefs and behavioural intention or action. Attitudes represent emotions that are connected with the attitude object rather than beliefs or behavioural intentions/actions (Hewstone *et al.* 1992).

3.2.1 Human Attitudes and Behaviour

The relationship between behaviour and attitude is complex and difficult to establish as it is influenced by personal and situational variables (O'Riordan 1976, Hayes 1993). Personal variables include *inter alia* other attitudes held, intellectual aptitude, education and personality. Situational variables include *inter alia*, opportunity for choosing an alternative course of action, legislation and peer pressure (O'Riordan 1976, Hayes 1993). These variables may result in competing motives for behaviour that do not necessarily reflect the attitude held toward a particular object or situation (O'Riordan 1976, Hayes 1993). Therefore, the connection between attitudes and behaviour is contradictory and many studies have shown that behaviour is not necessarily guided by attitude (Hewstone *et al.* 1992, Hayes 1993). However, a number of studies on the links between the attitudes of farmers about the environment and their behaviour have found that farmers with stronger conservation attitudes implemented more conservation efforts (Lichtenberg & Zimmerman 1999). The relationship between attitude and information also appears to be important. The type of attitude held tends to influence the type of information selected and receptivity to that information (Hewstone *et al.* 1992, Hayes 1993, Lichtenberg & Zimmerman 1999). Social psychologists point out that once attitudes are established, they tend to remain constant throughout life and attempts to change attitudes are often unsuccessful. However, a change in attitude is not impossible and can be influenced by factors including how relevant information is to decision-making and the source and structure of the information (Hewston *et al.* 1992, Hayes 1993).

3.2.2 Human Attitudes towards Predators

It is evident that the guiding forces behind behaviour and attitudes are multiple, but socio-cultural factors are particularly important in modern predator conservation in view of the historical conflicts between, for example, carnivores and farmers and or game managers (Bothma 1996, Packer & Birks 1999). "Assessment of attitudes among key interest groups may be central to the success of carnivore recovery programmes" (Packer & Birks 1999:76). Attitudes towards predators are often irrational and based on perceived patterns of damage rather than actual damage. These attitudes often stem from ignorance, cultural beliefs and historical experiences no longer relevant in light of the current threat of extinction to many predators at the hands of humans and current knowledge of their behaviour and multiple values (Errington 1969, Savoury 1991, Packer & Birks 1999, Oli, Taylor & Rogers 1994, Marker-Kraus *et al.* 1996). Predation problem studies in the

United States of America have shown that farmers tend to attribute death of livestock to predators regardless of actual causes (Newton 1979, Wagner 1988, Savoury 1991). Oli *et al.* (1994) measured local Nepalese farmers' attitudes towards snow leopard and found that they were strongly negative with farmers recommending the complete eradication of snow leopards in favour of improved livestock protection as the solution to the problem of sporadic predation by snow leopards on livestock. Traditional attitudes worldwide towards large mammalian predators involve predator intolerance and elimination regardless of predator behaviour. This reinforces the central need to integrate the human element in carnivore conservation biology (Clark, Curlee, Minta & Kareiva 1999, Marker, Macdonald & Mills 2001, Jackson 1992).

In light of the current understanding about human attitudes and behaviour it is necessary for any conservation biology programme concerned with changing attitudes and behaviour to adopt an integrative long term approach to altering human-nature interactions. The CCF has taken this approach in its efforts to conserve the cheetah on commercial farms in Namibia by incorporating biological and social science considerations. Caro (1994) recommends this approach to cheetah conservation. Pointing out that cheetah survival depends on maintaining viable populations in and out of protected areas, often on farms. Kleiman *et al.* (2000) states that this approach to conservation has a better chance of success than single discipline approaches. Since, amongst others, sociological forces are at the heart of most conservation problems. "Conservation programs that address biological issues but fail to assess and address the attitudes of the local public may ultimately fail or have a negative effect on future conservation opportunities" (Kleiman *et al.* 2000:359). Substantive social criteria for success refer to *inter alia*, indices such as relevant values, attitudes and knowledge of the key stakeholders (Kleiman *et al.* 2000). In Namibia, the farmers on whose land the cheetah occurs are the key stakeholders. Changes in their attitudes that lead to increased tolerance of cheetah and greater appreciation for their ecological, aesthetic, cultural, spiritual, recreational and economic importance and their conservation needs are imperative for achieving a situation where co-existence between cheetah and livestock and or game farming activities are the norm on farms in Namibia (Marker-Kraus *et al.* 1996).

CHAPTER FOUR

THE CHEETAH CONSERVATION FUND

4.1 INTRODUCTION

Approximately 1 000 Namibian commercial farmers across an area of over 275 000 km^2 harbour the world's largest remaining population of free-ranging cheetah on their farms (Marker-Kraus *et al.* 1996). The majority of these farmers hold negative attitudes towards the cheetah, perceiving the cheetah to be a pest and a threat to their livestock and game (Marker-Kraus *et al.* 1996, Marker 2000). Cheetah survival in Namibia requires a change in attitude amongst these farmers (Morsbach 1987, Marker-Kraus *et al.* 1996, Marker 2000). Various Namibian government ministries and non-governmental organisations (NGO's) including the Cheetah Conservation Fund (CCF) have taken up the challenge of promoting cheetah conservation by the farming community (Barnard, 1998, Marker-Kraus *et al.*1996). In support of this Glazewski *et al.* (1998) suggest that NGO's can play and important role in finding solutions to species loss at the local level.

4.2 THE CHEETAH CONSERVATION FUND

The CCF is a non-profit, non-government organisation. It was established in 1990 as a registered Namibian Trust and has its headquarters on a commercial farm in central Namibia. The members of the local board of the CCF represent a cross-section of interested Namibians. The CCF International Advisory Board includes recognised specialists in cheetah, predation, livestock and wildlife research. The co-founder and executive director of the CCF (Marker, L.) is an internationally recognised cheetah specialist and vice-chair for the IUCN Cat Specialist Group.

The mission of the CCF is to "develop and implement long-term monitoring, multidisciplinary research and conservation efforts for the survival of the free-ranging cheetah and its ecosystem in remaining habitats in Namibia and other appropriate areas in Africa. One of the main foci of CCF is assisting farmers in predator management. The CCF serves as a resource for farmers and actively promotes awareness of conservation

issues" (Marker-Kraus *et al* 1996:2). Awareness promotion includes providing information to farmers by talking directly to individual farmers, speaking at farmers' meetings, and distributing a regular newsletter (Marker 2001 pers. comm.).

4.3 THE FARM SURVEY

The following information is an overview of information collected by the CCF from 1991 to 1993. This provides background information for and the basis of the follow-up research for this mini-dissertation.

An in-depth farm survey was conducted from 1991 to 1993 as the initial phase of the CCF's research into farmer-related threats to cheetah survival on the commercial farms of central Namibia. The purpose of the survey was to "....obtain a basic understanding of the ecosystems on the farmlands which sustain cheetah populations and to research ways for humans and cheetah to co-exist" (Marker-Kraus *et al.* 1996:19). The survey assessed: a) components of the farmland ecosystem that sustain the cheetah population; b) livestock and wildlife management practices, including local predator issues; c) livestock management recommendations by the farming community to protect livestock from predation; and d) behavioural observations of the Namibian cheetah by farmers (Marker-Kraus *et al.* 1996). The CCF acknowledges that "...conclusions based on questionnaires are debatable", but believes that the survey provided useful information which is now essential to the CCF's long-term conservation and research strategies (Marker-Kraus *et al.* 1996:19).

4.4 METHODOLOGY

4.4.1 The Methods

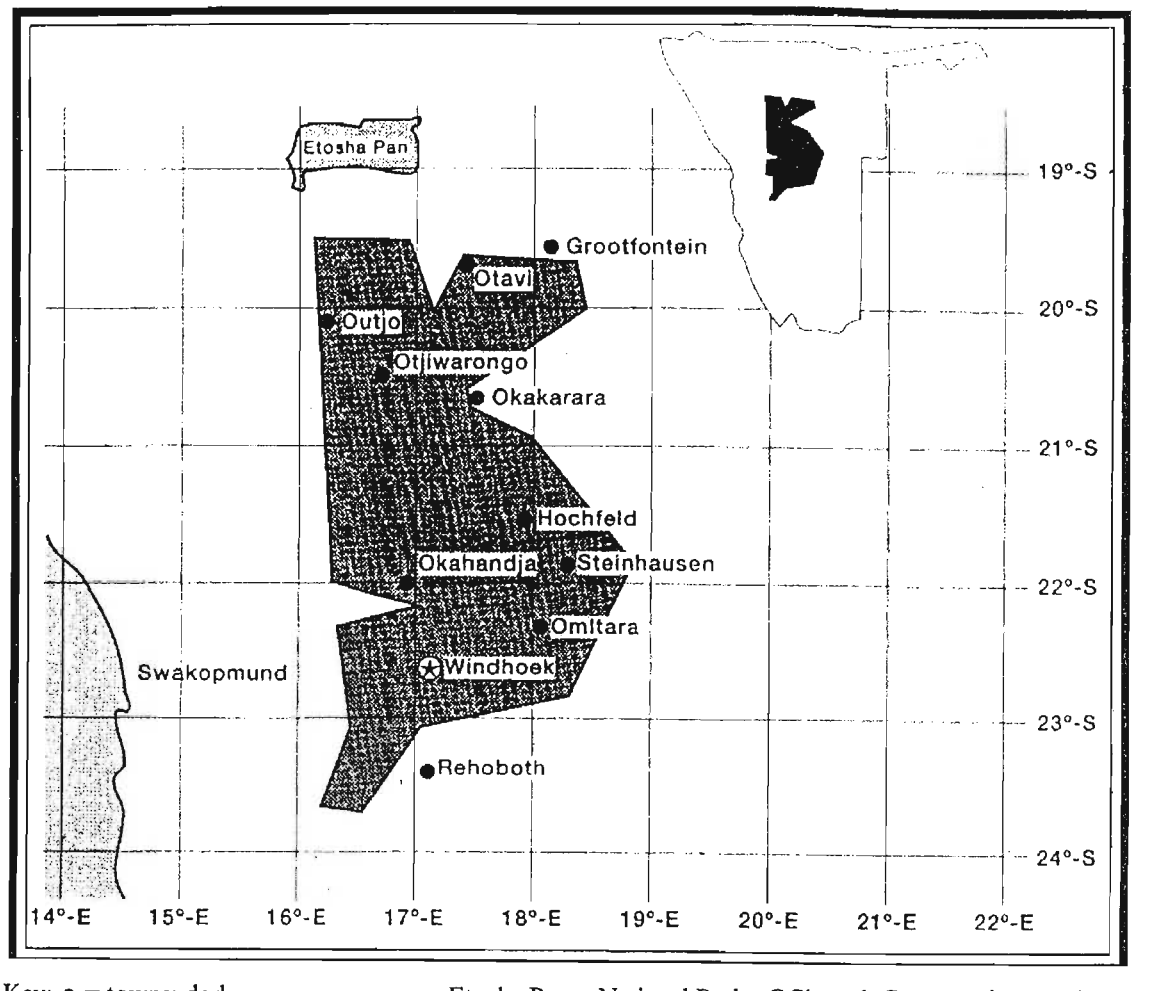
The co-directors of the CCF using two types of questionnaire forms collected information between 1991 and 1993. Form A is an in-depth personal interview with farmers and Form B a shortened questionnaire for completion by farmers at farmers' association meetings attended by CCF co-directors. The main focus of the survey was cheetah/livestock conflicts management. The data gathered was entered into MS EXCEL computer database programmes for analysis.

4.4.2 The Subjects

Two hundred and forty one farmers in the north-central commercial farmlands were surveyed over a two year period. The commercial farmers of Namibia have been found to be a homogenous group and the sample is considered representative of the commercial farming community (Marker 2000). Farming activities were predominantly livestock farming with cattle, smallstock (sheep/goats), game and/or a combination of these.

3.4.3 The Survey Area

The farms surveyed covered an area of 2 671 908 hectares representing 14.5% of Namibia's commercial farms and lie between 19°30'S to 23°30'S and 16°E to 19°E (*cf.* Figure 2). These farms fall into the regions of Omaheke, Khomas and Otjizondjupa. The area is predominately semi-arid thornbush savannah. Farm size was classified as small (< 7 000ha), medium (7000 to 15 000ha) and large (>15 000ha).



Key: • = towns; dark area = survey area; Etosha Pan = National Park. ©Cheetah Conservation Fund

Figure 2 *The Cheetah Conservation Fund Farm Survey Area with the insert illustrating the survey area location within Namibia*

4.5 SUMMARY OF THE RESULTS OF CCF SURVEY

4.5.1 Livestock and Game Numbers

Livestock accounted for 66% (243 972) and game accounted for 34% (132 534) of animals on surveyed farms. Eighty one percent of all game was outside of game fenced areas. Fifteen percent of the 20% of game that occurred in the game fenced areas were exotic species.

4.5.2 'Cheetah Problems'

A 'cheetah problem' was not easily defined, perceptions differed and livestock losses specifically due to cheetah, are often unknown to the farmer. Seventy five percent of the 241 farmers reported that they were not having cheetah problems at the time of the survey. Many farmers accepted losing one or two head of livestock a year to predation, while others found any loss an economic hardship. Farmers with larger farms reported more cheetah problems. Nine percent of the area surveyed was game-fenced. These farmers did not report more problems with cheetah. However they removed on average higher numbers of cheetah than livestock farmers. Farmers that reported problems with cheetah had a lower ratio of game to cattle than farms with no cheetah problems.

4.5.3 Stock Losses to Predation

Cattle and smallstock losses to cheetah comprised 33% and 22% out of all predation, respectively. The average age of the calves lost to cheetah was 4.4 months with 51% of the total under 3 months. Smallstock in a kraal (penned in), if not adequately protected, can suffer high losses due to predator behaviour and instinct. Farmers stated that they experienced more problems with other predators such as black-backed jackal (*Canis mesomelas)*, caracal (rooikat) (*Felis caracal)*, and leopard (*Panthera panthera)* than with cheetah although they removed more cheetah than leopard.

4.5.4 Management Techniques

Many techniques to protect livestock from predation were used by the farmers. The most prevalent technique was used by 43% of the farmers and is known as 'calving camps'. This involves keeping cows that are about to calve in a camp close to the homestead so that calving takes place in close proximity to humans. Until the calf is three months of age it is kept in a kraal, while the cows go out to graze. After three months of age the calf

is no longer confined in the kraal but goes out with its mother. Calves are usually only vulnerable to predation by cheetah until six months of age. The number of camps a farm was divided into did not appear to influence predation on livestock, however farms with more camps tended to practice more intensive livestock management, thus reducing predator conflict. Peak calving months were November, December and January. Heifers suffered greater calf loss due to predation than experienced cows, in particular when calving during winter. Many farmers felt that Brahman cattle crosses and Afrikander cattle are more protective of their calves and are better adapted to Namibian conditions than other breeds, however it could not be shown that these breeds had lower rates of predation. Donkeys were reported to deter predators and were used successfully as guard animals in calving cattle herds. The use of guard dogs, baboons and herders for smallstock were found to reduce mortalities. Electric fencing was found to be worth the investment in the long-term to protect game, especially valuable game species kept at low numbers.

4.5.5 Cheetah Removals

Indications are that between 1980 and 1991 more than 10 000 cheetah were removed in Namibia. Sixty five percent (157) of the survey participants removed a total of 2 845 cheetah during this period. Removals were compared to specific stock losses and it was found that removal of cheetah was not in response to specific loss of livestock and it was difficult to relate the attitude of the farmer with the number of cheetah removed. A few farmers removed a large number of cheetah. Farmers with playtrees where cheetah are easily trapped tended to remove more cheetah than those not reporting playtrees.

4.5.6 Cheetah Observations

Almost half of the farmers sighted cheetah at least monthly and nearly one fifth saw cheetah or spoor on a weekly basis. The more cheetah that were observed on a farm, the more they were perceived as a problem, even though they were not necessarily connected to specific livestock loss. Not previously considered social, groups of up to 18 cheetah were seen by the farmers. The average group size observed was five. The farmers who observed cheetah kills reported that the wild prey consisted of the following 16 species listed in order of frequency: kudu calves, springbok, warthog piglets, steenbok, gemsbok calves, hartebeest calves, duiker, eland calves, blesbok, ostrich, smaller game birds, guinea fowl, impala, hares, dik-dik and kori-bustards.

CHAPTER FIVE

METHODOLOGY

5.1 INTRODUCTION

The Cheetah Conservation Fund (CCF) aims to secure habitats for a viable population of wild cheetah on commercial farmlands in Namibia (Marker 2000). To achieve this aim the CCF has since 1991 been raising awareness amongst the commercial farmers on whose land the habitat of cheetah occurs. This awareness raising attempts to influence the farmers to change their attitudes and behaviour towards cheetah, and their livestock husbandry practices with the aim of enabling the co-existence of cheetah and farming activities on these farms (Marker 2000). This study attempts to monitor the outcome of these awareness-raising efforts amongst specific Namibian commercial farmers with respect to farmer-related threats to cheetah survivability. This study uses quantitative research methods as well as aspects of qualitative research methods. Qualitative research can add depth to quantitative data and attempts to measure the effectiveness of a programme in achieving its goals and solving problems as a means of contributing to improving decision making about the programme (Weiss 1972, Patton 1990, Clark 1999).

5.2 TERMINOLOGY

In order to measure change over time and make comparisons with the CCF survey, questions were asked with respect to a ten-year period. This period is from June 1991 when the farmers in this study were interviewed by the CCF until the interviews for this study in July, September and October 2001 and is referred to as *the ten-year study period.* For example, How many cheetah have you removed in the past ten years (1991 to 2001)? (Appendix One: Section A Question 12). Data from the *full CCF survey* refers to the entire CCF survey (1991 to 1993) to distinguish this data from the CCF data of the same farmers who were interviewed in this survey in 1991. *Smallstock* refers to sheep and/or goats collectively. *Cattle speculators* as opposed to cattle breeders, refers to cattle ranchers who buy weaned cattle that are sold on maturity to cattle breeders or butchers. *Game farmers* are defined as farmers who derive their main source of income from their

farms, (some farmers have other commercial interests) out of game utilisation and areas of or the total perimeter of their farms are fenced with various game proof fencing. *Game farming* refers to breeding game (ungulate species) for live sale, game products, trophy hunting and/or game viewing. A *kraal* refers to a pen for holding livestock. *Spoor* means animal tracks and is more commonly used by the farmers in Namibia.

5.3 APPROACH

This study was based on a follow-up questionnaire survey of 31 farmers in the Omaheke, Khomas and Otjozondjupa regions of central Namibia. The methods used in this study followed those used in the original survey by the CCF, in order to make comparisons to previous answers given by the same subjects over time.

In-depth open-ended interviews were used to collect quantitative data such as numbers of cheetah removed or seen by the farmers in conjunction with gathering qualitative data. Farmers' qualifying statements were written down verbatim. Interviews were requested telephonically after giving a brief description of the research topic and appointments made with the farmers for these interviews. The rights of the farmers' to confidentiality are maintained, by using a numbering system in such a way that they cannot be identified in the research publication. The familiarity of the researcher to the study area was useful in gauging whether answers were exaggerated, which appeared not to be the case.

5.4 DATA ANALYSIS

The analysis of the data (where appropriate) followed similar methods to those used in the original survey. The data from the questionnaire was entered into MS EXCEL and SPSS PC version 10.0.5 for Windows 95/98 & NT computer programme data sheets for analysis. When a range of values was reported the average value was used for analysis purposes. Where appropriate, values given for the entire study period are expressed as annual values. For example, if a farmer stated losing a total of twenty calves to cheetah predation in the past ten years (the study period) this was averaged out to two per year. Record keeping by the farmers of annual stock losses and reasons for these losses was not prevalent and farmers relied on memory. Interviews took place in the farmers work environment and not every farmer answered every question due to distractions during the

interviews such as telephone calls or interruptions and as with the CCF study the number of respondents was denoted as 'n = x' were x equals the number of farmers responding to the specific question, to whom the question was applicable.

Where appropriate the quantitative data from the study was tested using inferential statistical tests. Descriptive statistics were generated. With respect to the farmers attitudes a four point Likert-type attitude scale was used to measure the farmers' current and prior (before awareness raising efforts by the CCF) attitudes towards having cheetah on their farms. Likert Scales are commonly used in social sciences research and are thought to be one of the most reliable techniques for measuring attitude, these scales use varying degrees of like or dislike to establish attitudes differences (Hayes 1993). With respect to the farmers' attitudes (current and prior) towards having cheetah on their farms the hypothesis to be tested was H_0: $m_1 = m_2$ A non-parametric statistical One-Sample Kolmogorov-Smirnov Test for normality was run on the scored attitude means (current and prior) and these were found to be nonnormally distributed. Graphs were then generated to verify if the distributions were unusually asymmetrical which was not found to be the case, the distribution of the sample data was mound-shaped and therefore the use of a t test is likely to be valid (Howell 1995). A t-test for paired samples was then conducted to establish if the difference between the attitude means was likely to be due to chance. Probability was $< .05$ and the null hypothesis was rejected indicating that the means were significantly different. In order to confirm this result a non-parametric test for significant difference was then run on the attitude means using Wilcoxon Signed Ranks Test, this test that does not rely on distribution assumption and being non-parametric is more conservative (Howell 1995). The probability level used to judge the significant difference was p values < 0.05, this is commonly used in social science studies (Howell 1995, Weisenberg, Krosnik & Bowen 1996).

As previously discussed in chapter two, attitudes towards wildlife and the environment involve elements of a person's perceptions, preferences, beliefs and values. A single attitude cannot explain actions, which are influenced by many factors (O'Riordan 1976, Gray 1993). The answers to questions that related to cheetah conservation were scored on a scale of one to four, with one being positive for cheetah conservation and four being negative. For example, a farmer would score one if he/she never removed cheetah, two if they only trophy hunted and/or discriminately removed cheetah, three if they

discriminately removed cheetah using only non-lethal methods and four if he/she indiscriminately removed cheetah using lethal methods. This was carried out to establish if there were any relationships between the farmers' current attitude toward having cheetah on the farms and the farmers': 1) behaviour towards cheetah with respect to cheetah removals and; 2) livestock management strategies that enable co-existence with cheetah and livestock by avoiding major conflict over livestock. Links between the above mentioned variables and attitudes might indicate whether farmers' attitudes are accompanied by behavioural changes that are of benefit to cheetah survival. Livestock losses were also scored and then correlated with livestock management practices, for example, a farmer would score one if he/she experienced no losses and one if he/she used four our more management strategies to protect livestock calves from predators. This was carried out in order to see if there was a relationship between losses and management. Correlations were conducted using a Kendall's tau-b non-parametric test for ordinal or ranked variables that do not meet the assumptions of normality. This test was used because the scored variables mentioned above did not follow a normal distribution. Probability values $p < 0.05$ was considered to show a correlation that merits investigation. In the case of cheetah sightings/year and total livestock losses/year these were correlated using actual values.

Qualitative data were categorised and analysed according to various themes and common statements. For example, farmers' reasons for liking having cheetah on their farms was qualified by a common statement such as the enjoyment of seeing cheetah. In the discussion actual quotes are used to highlight farmers' stated attitudes, behaviour and knowledge in relation to cheetah conservation on their farms. To illustrate the behaviour of farmers towards cheetah, each farm was colour coded on a 1:1 000 000 map of the area (*c.f.* Figure 12). This provides a visual description of the occurrence of this farmer-related threat (behaviour) to cheetah. This map illustrates the areas available to cheetah and the relationship of these areas to each other. This map could be used to identify specific conservation strategies with respect to these farmers.

5.5 THE STUDY AREA

This study was conducted in the Seeis, Omitara, Hochveld, and Steinhausen commercial farming communities of central Namibia, which lie in the Omaheke, Khomas and

Otjozondjupa regions (*c.f.* Figure 2 and Figure 12). The area is between longitude 17° to 19° East and latitude 20° to 23° South. This area falls into the south eastern section of the original study area. Follow-up of the effects of conservation efforts was required in this area because programme monitoring has predominantly been taking place in the north western section of the original study area, since the original survey conducted between 1991 and 1993 (Marker pers. comm. 2001). The mean annual rainfall is between 300 and 400 mm per annum increasing in a north easterly direction. The elevation is between 1200 and 1800m above see level and the farms surveyed are located on the central plateau and Kalahari sandveld (Barnard 1998) with the following landforms according to FAO (1983): the plateau country with ridges in the plateau, hills and slopes on Karoo rocks in the plateau country and/or loose sand drift of the Kalahari (Barnard 1998). The most widely used terrestrial biome classification of Namibia is that of Irish (Barnard 1998). According to this system the farms fall within the savannah biome. The vegetation types that occur on the farms surveyed include highland savannah, camelthorn savannah and thornbush savannah (Geiss 1970 in Barnard 1998). Bush encroachment is prevalent on the commercial cattle farms of Namibia and caused a reduction by 47% in cattle numbers from 1960 to 1990 on these farms (Schneider 1994, Barnard 1998, Marker-Kraus *et al.* 1996). The water source on these farms is underground water accessed via boreholes and is of limited quantity and quality (Barnard 1998).

5.6 THE SUBJECTS

The subjects in this study are all farmers and are referred to as *the farmers*. The sample was a purposive sample in order to monitor changes in farmer-related threats to cheetah survival in a specific area, namely where the CCF requires follow-up research. Farmers within the study area were selected on the location of the farms to each other and the farmer's availability. Since cheetah survival is nested within the availability and interconnection of large enough areas of suitable habitat and an adequate prey base, as well as farmers attitudes and behaviour towards cheetah, it was meaningful to assess farmer-related threats to cheetah on interlinking farms rather than randomly selected farmers. A total of 31(13%) out of the original 241 farmers interviewed by the CCF were re-interviewed. Thirty of the original 241 farmers where re-interviewed during September and October 2001 and one in July 2001. All farmers within the study area were identified using a 1:250 000 farm survey map available from the Office of the surveyor general in

Windhoek and the original list of farmers interviewed by the CCF. The Namibian Economic Policy Unit (NEPRU) has shown that Namibian commercial farmers are a homogenous group and hence subjects in both surveys are considered to be a representative sample of the general farmer population in the study area (Marker 2001).

5.7 THE QUESTIONNAIRE

The original questionnaire that was used by the CCF in their survey of 1991 to 1993 was used, but with the inclusion of some additional questions (shown in italics) and the exclusion of a few original questions (Appendix One). The questions (Q) were asked in relation to the study period and farmers were asked only about their experiences on their farms in order to avoid farmers giving answers that did not directly pertain to them and their farms. For example, "How many cheetah have you seen in the past ten years on your farm?"(Appendix One, Section A Q18). In addition a separate set of questions was added which related to the farmers' attitudes towards cheetah and the livestock management practices used by these farmers during the study period to prevent predation (Appendix One, Section B Q1-15).

The information collected focussed on the following topics over the study period:

1. The survey area;
2. The perceptions of the farmers with regards to cheetah population dynamics;
3. Cheetah and other predator problems;
4. Level of knowledge about cheetah
5. The attitude of farmers towards cheetah;
6. The behaviour of farmers towards cheetah
7. Livestock management practices to protect their stock from predation.

5.8 THE INTERVIEWS

Twenty-seven face-to-face interviews and four telephonic interviews were conducted. Appointments where made with the farmers by telephone to arrange interviews times that suited the farmer. No farmer was telephoned more than twice, if a farmer did not answer the telephone one more attempt was made and after that another subject was selected out of those that fell into the study area. No farmer who was contacted refused to be interviewed. Interviews lasted between one and two hours. Appointments were also made

for the telephonic interviews at times that suited the farmer and to allow for the full length of time required to get through the questions. This permitted personalising of the telephonic interview and adequate time allocation to enable the researcher to obtain in-depth answers similar to the face-to-face interviews. No subject terminated the interview by hanging-up, which is cited as a problem with telephonic interviews, in terms of the amount of information obtained during the interview when compared with face-to-face interviews (Weisberg *et al.* 1996).

The answers were noted down during all the interviews. Care was taken to minimise interviewer bias by asking the questions in the same way, using as neutral a tone as possible and avoiding giving opinions. The farmers appeared interested in the subject and keen to speak about their experiences and no farmer refused to answer any question.

5.9 LIMITATIONS OF THE STUDY

The data

Data gathered in this study that related to cheetah populations, game numbers and habitat changes were based on opinions formed via crude observations and estimations often relying on memory over long time periods. Turner *et al.* (1995) points out that habitat change is often difficult to observe and remains poorly understood due to lack of research and the complex nature of change. The data gathered about the above mentioned variables are not a record of what is actually happening on these farms with respect to these variables but a record of the farmers' opinions about these variables.

The questionnaire and interviews

The researcher realises that a more conventional five or seven point Likert scale for attitudes, would have been useful in gaining insight into subtle degrees of attitude in relation to cheetah (if any) and would have made statistical analysis of the data more reliable. Greater experience by the researcher in interviewing techniques and possibly a shorter questionnaire would have avoided questions being inadvertently left out, which resulted in not all farmers responding to all the questions. The researcher acknowledges that the biases inherent in survey research limit the extent to which the information gathered can be interpreted as a true reflection of the situation. Nevertheless a survey of this nature leads to an understanding of real life situations and provides insight into what

type of intervention could be appropriate in an attempt to integrate conservation and human activities.

Time constraints

The findings of this study show that the calving season for the majority of the commercial cattle farmers interviewed in this study begins in October and it would have been useful to asses the farmers attitudes and behaviour towards cheetah just after the calving season when conflict with cheetah due to predation on calves would potentially have been at its peak. This was not possible due to fieldwork time stipulations. With respect to changes in attitudes and behaviour towards cheetah it would have been advantageous if a probability sample of the original farmers surveyed could have been selected to make inferences about the finding with respect to the entire farmer population involved in the awareness raising efforts. This was only one aspect of the study and as previously mentioned the survival of the cheetah is nested within the area of habitat and prey available to them as well as the farmers' attitudes and actions towards cheetah. The results are preliminary and ongoing research into the efficacy of awareness raising efforts is recommended to ensure cheetah conservation needs are met in an ever-changing world.

CHAPTER SIX

RESEARCH FINDINGS

6. 1 INTRODUCTION

The results of this study are presented in the following six sections: 6.2) the survey area; 6.3) the perceptions of the farmers' regarding cheetah population dynamics; 6.4) the cheetah and other predator problems; 6.5) the farmers level of knowledge about cheetah; 6.6) the attitudes of farmers towards cheetah; 6.7) the behaviour of the farmers towards cheetah and; 6.8) the livestock management practices used by farmers to protect their livestock from predation.

6.2 THE SURVEY AREA

6.2.1 The Farms

The 31 farmers interviewed in this study owned a total of 347 153 hectares (ha) of commercial farming land in Namibia, this represents 13% of the 2 671 908ha owned by the farmers surveyed in the original CCF survey. Five (16%) of the farmers interviewed had bought additional land totalling 3 800ha and two (6%) farmers had sold a total of 9 138ha during the study period. Table 1 illustrates the number of farms within the three size categories in 2001 and in 1991. The farm size was given as the total number of hectares owned by the farmer and this can be made up of several individual farms. The average farm size was 11 131ha. The total area reported by the same farmers in 1991 to the CCF survey was 341 562ha, including the reported land that was bought and sold during the study period, there is a discrepancy of 1 791ha which could be due to farmers sometimes rounding off the area of their farms. Marker *et al.* (2001) found that larger farms correlated significantly with more cheetah removals ($p = <0.008$)

Table 1 *The number of farmers (N) with farms in the three size categories in 2001 compared to in 1991 also expressed as a percentage (%) of the total N.*

	2001	***1991***
Farm Size	**N (%)**	***N (%)***
a) Small (< 7 000)	**6 (6)**	*6 (6)*
b) Medium (7 – 15 000)	**20 (16)**	*20 (16)*
c) Large (> 15 000)	**5 (17)**	*5 (17)*

6.2.2 Fencing

Of the total area, 83 100ha (24%) is game fenced of which 24 000ha (29%) is game fenced for non-jumping (creeping) game (e.g. gemsbok (*Oryx gazella*), hartebeest (*Alcelaphus buselaphus*) and springbok (*Antidorcus marsupialis*)) and 59 100ha (71%) is fenced for both jumping (e.g. kudu (*Tregalaphus strepsiceros*)) and creeping game. Since 1991 an additional 54 750ha (17%) of previously non-game fenced land has been game fenced for jumping and creeping game. Of the farmers surveyed, 12 (39%) had at least a portion of their land game fenced, the smallest area game fenced was 200ha and the largest 18 000ha. Of these 12 farmers, nine had the entire farm's perimeter game fenced (66 400ha) for creeping game or jumping and creeping game. Table 2 shows the current number of hectares fenced (and the types of fencing used) in the study area as opposed to the CCF survey of the same area in 1991. Figure 3 illustrates the number of game fenced areas within the various size ranges for game fenced areas.

Table 2 *The number of hectares (ha) fenced with the types of fencing in 2001 and in 1991, also expressed as a percentage (%) of the total ha.*

	2001	***1991***
Fencing	**ha (%)**	***ha (%)***
a) Standard livestock (1.2m high with 5 stands of wire*)	**264 053 (76)**	*313 212 (92)*
b) Game fenced:- Total area	**83 100 (24)**	*28 350 (8)*
b) i) Non-jumping game (1.2m high with 10 strands of wire or mesh)	**24 000 (7)**	*14 350 (4)*
b) ii) Jumping game (2.4m high with 21 stands and/or mesh)	**59 100 (15)**	*14 000 (4)*

*Fencing is non-barbed, 2.5mm thick galvanised steel.

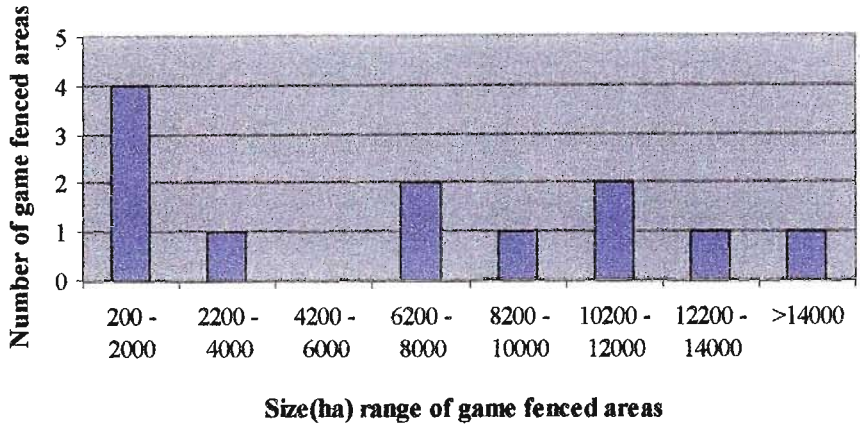


Figure 3 *The number of game fenced areas with in the various size (ha) ranges*

6.2.3 Land Use

Of the 31 farmers surveyed, 28 operate mixed livestock farming activities (cattle and smallstock), two farmers are horse breeders and three farmers are solely game farmers, of these game farmers two kept small herds of smallstock for their own consumption. All farmers reported hunting game for personal use and trophy hunting, or permitting trophy hunting to take place on their farms. Figure 4 illustrates the numbers of farmers earning their main income from the various sources listed by the farmers. Three (10%) of the 31 farmers reported stopping cattle farming and converting entirely to game farming during the study period. Nineteen (62%) reported running smallstock, as opposed to 23 (74%) observed in the CCF survey of the same farmers in 1991. Five (26%) of the 19 smallstock farmers in this study reported owning herds of less than 50 animals.

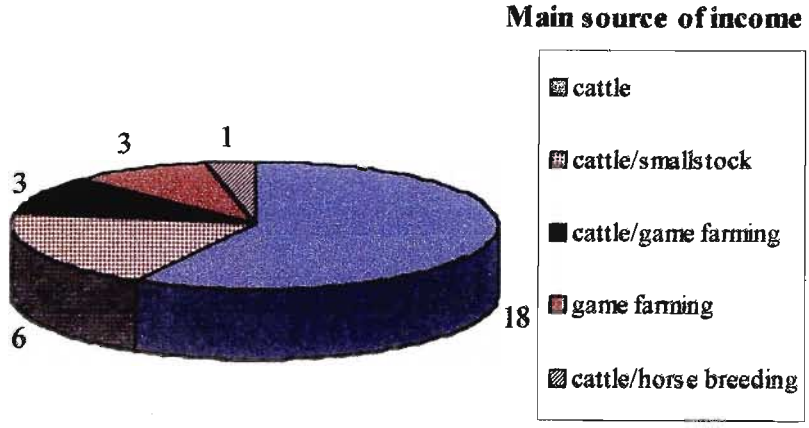


Figure 4 *The numbers of farmers deriving their main source of income from the various sources reported.*

6.2.4 Livestock Numbers

In this survey the reported number of cattle declined by 5 963 (21%) head and the number of smallstock numbers increased very slightly by 70 (1%) head during the ten-year study period. The average cattle herd size in 2001 was found to be 790 animals with a range from 200 to 2000. The average cattle herd size for the same farmers in 1991 was 906 cattle with a range from 300 to 2 400. Twenty-one (75%) out of the 28 cattle farmers in this survey reported that they reduced their cattle by a total of 9 675 (44%) animals in the period 1991 to 1999 due to drought conditions. Four did not report and one farmer reported moving his cattle to another area and one reported that he wanted to reduce the numbers of cattle but, had left it too late and as a result had to feed his cattle until the 1999/2000 rainy season. All the cattle farmers stated that since 1991 they were attempting to increase their cattle numbers. Table 3 illustrates the livestock numbers and density at which this livestock occurs on the farms surveyed in 2001 and 1991. This table reflects a decrease in smallstock numbers due to one farmer in this study not reporting the amount of smallstock owned and he was excluded from the calculations resulting in the increase of 70 (1%) as reported above for smallstock during the study period.

Table 3 *The number of livestock (N), also expressed as a percentage (%) of the total N and the area of land (ha) on which this livestock occurred expressed as a density* (ha/head) of occurrence in 2001 and 1991.*

	2001	**2001**	***1991***	***1991***
1) Livestock	**N (%)**	**ha (ha/head)**	***N (%)***	***Ha (ha/head)***
Cattle	**22 125(86)**	**315 153ha (14ha/head)**	*28 088(88%)*	*341 562(12ha/head)*
Smallstock	**3 634(14)**	**197 950ha (54ha/head)**	*3 834(12%)*	*298 684(83ha/head)*

*Density (ha/head) = the number of hectares at which a weaned animal (smallstock or bovid) occurs.
2001 n = 28 out of 28 cattle owners and n = 18 out of 19 smallstock owners.
1991 n = 31 out of 31for cattle and n = 23 out of the 23 smallstock farmers.

6.2.5 Game Numbers

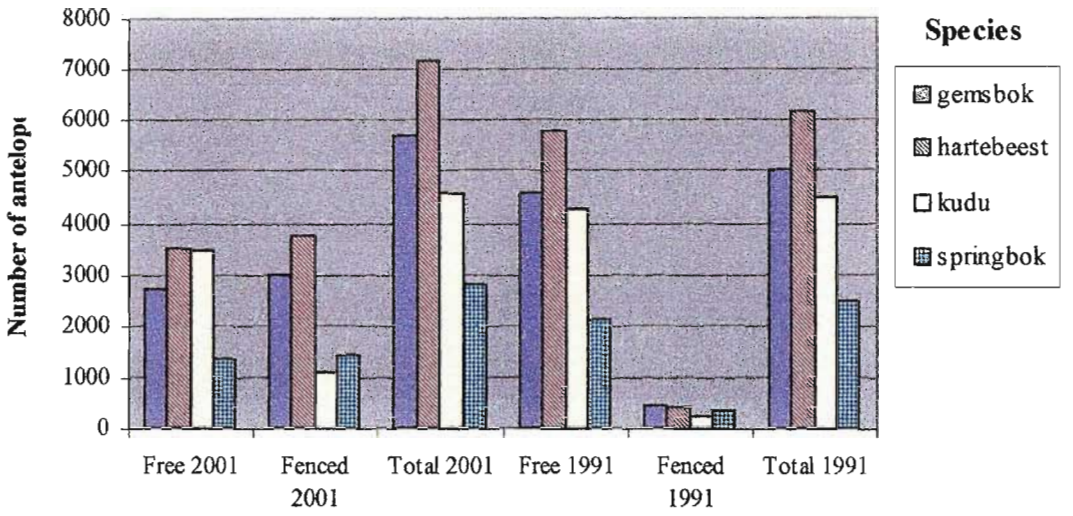
Farmers gave estimates of the numbers of each game species (that are potentially part of the cheetah prey base on the farms) at the time of the interview. Table 4 shows these estimates in two categories i.e. *free ranging* and *fenced* and the estimated figures for the same species in 1991. Free ranging refers to game that occurs outside of game fenced areas and *fenced* refers to game that has its movements restricted to specific areas by fencing design (jumping and/or non jumping fencing). The estimates for jumping game were given under free ranging if the game occurred in game fenced areas that were only game proofed for creeping game. Of the four common indigenous antelope species in the

survey area (i.e. gemsbok, hartebeest, kudu and springbok) the majority (92%) were free ranging in1991 but, indications are that at the time of this study in 2001 only 55% were still free ranging. Figure 5 highlights the changes in the estimates by the farmers of the four most common antelope species on the farms and Figure 6 shows the density (number of hectares/head) at which the estimated total number of these four species occurred. The estimated density of occurrence at the time of the interview represents a declined by 21% (4ha/head) since 1991. Nine out of the ten farmers responding to the question whether they thought the game numbers had increased/decrease or stayed the same, thought that the game numbers had declined outside of fenced off areas. The reasons these farmers gave for this perceived decline included the following answers: a) restricted movements of free ranging game due to increased game fencing in the study sight; b) drought; and c) increased exploitation driven by economic incentives like the biltong market, trophy hunting and live capture for sale.

Table 4 *The estimated numbers of free ranging game ($N^{1)}$ and fenced in game (N^2), by the farmers in 2001 and 1991 also expressed as a percentage (%) of the total number (N) of each species.*

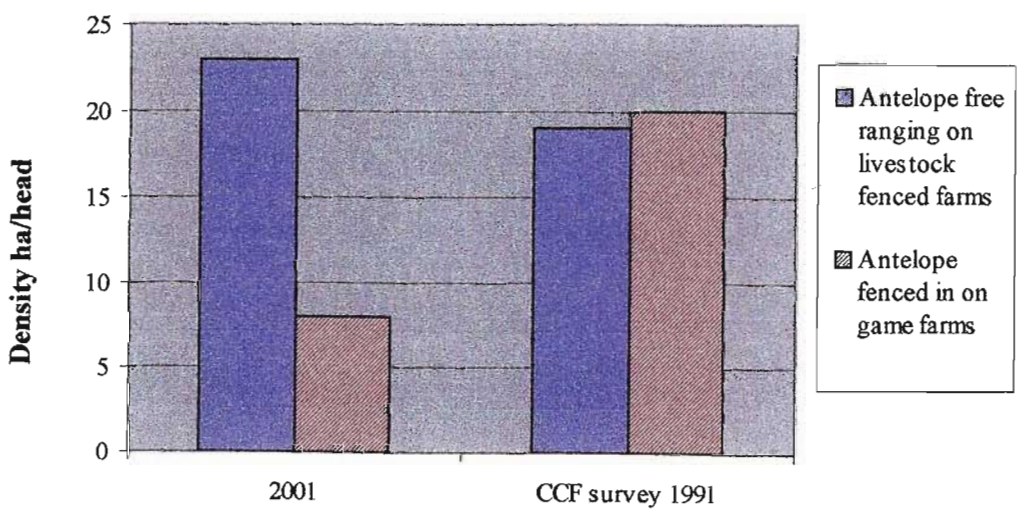
	2001 Free/Fenced	**2001 Total**	***1991 Free/Fenced***	***1991 Total***
Game	**N^1 (%)/N^2 (%)**	**N**	***N^1 (%)/N^2 (%)***	***N***
Blesbok*	**30 (9)/289 (91)**	**319**	*0/79 (100)*	*79*
Eland	**0/337 (100)**	**337**	*101 (41)/145 (59)*	*246*
Gemsbok	**2 689 (47)/2 984 (53)**	**5 673**	*4 592(92)/425 (8)*	*5 017*
Giraffe	**0/49 (100)**	**49**	*0/27 (100)*	*27*
Hartebeest	**3 511 (48)/3 742 (52)**	**7 253**	*5 764 (79)/399 (21)*	*6 163*
Impala # *	**0/14 (100)**	**14**	-	-
Impala*	**0/320 (100)**	**320**	*0/110 (100)*	-
Kudu	**3 460 (76)/1 103 (24)**	**4 563**	*4 255 (95)/240 (5)*	*4495*
Lechwe*	**0/21 (100)**	**21**		-
Ostrich	**18 (60)/12 (40)**	**30**	*60 (18)/277(82)*	*337*
Raon*	**0/11 (100)**	**11**	*0/26 (100)*	*26*
Sable*	**0/49 (100)**	**13**	*0/27 (100)*	*27*
Springbok	**1 341 (48)/1 429 (52)**	**2 770**	*2 106 (86)/342 (14)*	*2 448*
Warthog	**1 730 (71)/700 (29)**	**2 430**	*1 575(66)/800 (34)*	*2 375*
Waterbuck*	**0/330 (100)**	**330**	*0/90 (100)*	*90*
Wildebeest black*	**0/596 (100)**	**596**	*0/110 (100)*	*110*
Wildebeest blue*	**0/479 (100)**	**479**	*0/330 (100)*	*330*
Zebra Burchell's*	**0/96(100)**	**96**	*0/75 (100)*	*75*
Zebra Hartmann's*	**0/79(100)**	**79**	*0/47 (100)*	*47*

*game species not indigenous to the study site (Smither & Skinner 1990). #refers to the black-faced impala (*Aepyceros melanmpus petersi*) that occur in northern Namibia and southern Angola (Smither & Skinner 1990). n = 27 except for warthog where n = 12 for 2001, n = 27 and 9 for warthog for 1991



(n = 27)

Figure 5 *The estimates by the farmers of the four most common antelope species on the farms at the time of this survey(2001) as compared with the CCF survey of the same farmers (1991).*



(n = 27)

Figure 6 *Density (ha/head) at which the estimated total numbers of the four common game species occur within the game fenced areas and the areas where game is free ranging based.*

6.2.6 Bush Encroachment

Bush encroachment is a limiting factor for grazing livestock and has been implicated as a possible cause of the loss of certain grass species and reduced beef production (by up to 30% per year in some areas) on many commercial cattle farms of Namibia (Richardson 1998, Maker *et al.* 1999, Strohbach 2001). Of the 14 (45%) farmers responding to the question regarding bush encroachment on their farms, eight (57%) thought that the bush had increased, four (29%) thought is had stayed the same and two (14%) thought it had decreased during the study period due to drought conditions throughout the 1990's. Three farmers reported having engaged in bush clearing operations (poisoning and/or chopping out the bush) but stated that the results were unsatisfactory, as the bush had started to grow back and that it was too costly to clear on a large enough scale to make an impact.

6.2.7 Conservancies

A conservancy on privately owned farms in Namibia has been defined as a strategy whereby adjacent farms are joined together in broad units with guidelines for managing these farms, according to a constitution that has been developed by the farmers and usually pertains to issues around wildlife utilisation (Marker-Kraus *et al.* 1996, Barnard 1998). Twenty (65%) of the farmers in this survey belonged to a conservancy. Figure 7 shows the numbers of farmers belonging or not to the six listed conservancies in the study area. All of the six conservancies reported by the farmers had been established since 1991. The farmers were not aware if the conservancies that they were members of had any specific policies regarding cheetah, except for the Richtberg Conservancy which requires members wishing to remove cheetah to obtain a two-thirds majority agreement from the other members before cheetah are removed by any method from these farms (The Richtberg Conservancy Constitution, 2000). It was not clear from the farmers in this survey how active the conservancies were, but the farmers stated that biannual counting and recording of hunt-able game on their farms was their main activity with regard to their conservancies.

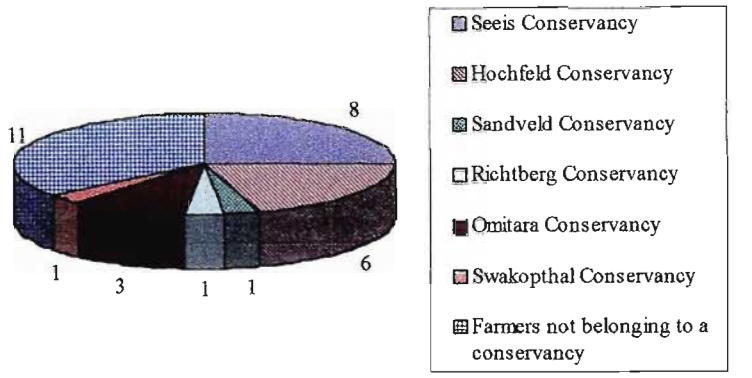
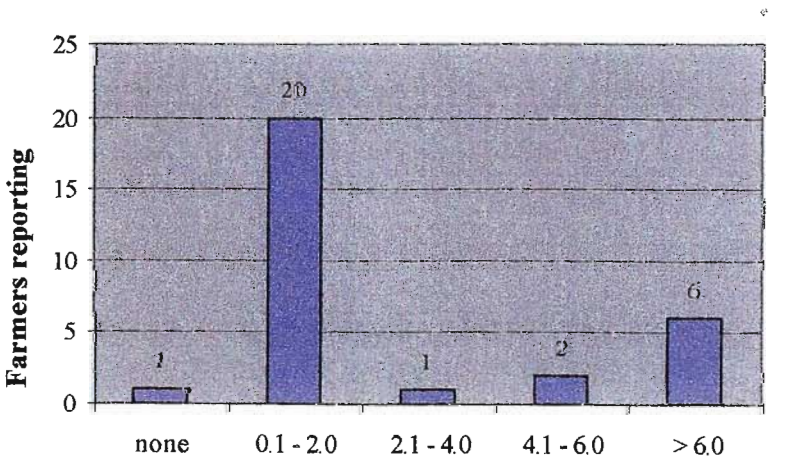


Figure 7 *The number of farmers belonging or not to specific conservancies found in the current study area.*

6.3 THE PERCEPTIONS OF FARMERS REGARDING CHEETAH POPULATION DYNAMICS.

6.3.1 Cheetah Sightings

Figure 8 shows the average number of cheetah sightings per year during the ten-year study period (1991 – 2001) as reported by the farmers. In the CCF survey the farmers reported the number of times per year that they saw cheetah or their tracks. In the CCF survey of the same farmers ten (43%) reported sightings from one to eight times per year, eight (35%) reported sightings 12 times per year and five (22%) reported sightings of over 12 times per year.



(n = 30)

Figure 8 *Average number of times cheetah were sighted per year by the farmers during the study period.*

6.3.2 Cheetah Population Dynamics

Table 5 shows that at the time of the survey 21 (72%) farmers believed that the cheetah population had increased on their farms since 1991. The farmers who believed that the numbers of cheetah had increased on their farms gave the reason for this opinion as increased sightings of cheetah and/or their spoor. These farmers reported that there was a marked increase in cheetah sightings following the rainy season of 1999/2000 and all these farmers recorded seeing cheetah during 2001. Two out of the six game farmers sighted increased predation by cheetah on game in particular on blesbok (*Damaliscus dorcas sp*), black faced impala (*Aepyceros melampus sp.*) and springbok (*Antidorcus marsupialis*) as well as increased sightings as reasons for an increase in cheetah numbers. Farmers gave various opinions as to why they believed that the cheetah population had increased on their farms during the ten-year study period. Table 6 illustrates the possible reasons for increased sightings as perceived by the farmers. None of the livestock farmers who perceived there to be an increase in cheetah numbers sited increased predation on livestock by cheetah as the reason for their perception.

Table 5 *The number of farmers (N) also expressed as a percentage (%) of the total N responding and their opinion of the status of the cheetah population on their farms during the study period.*

	N	%
Farmers opinion		
No opinion	1	(3)
Cheetah numbers have increased	21	(73)
Cheetah numbers have stayed the same	6	(21)
Cheetah numbers have decreased	1	(3)

n = 29 (94%) reporting

Table 6 *The opinion of the farmers for believing that the numbers of cheetah had increased on their farms during the study period and the number of farmers (N) holding these opinions also expressed as a percentage (%) of the total N responding.*

	N	%
Primary reason		
a) Increased prey base	5	(26)
b) Decreased capture of cheetah - there is no longer a market for live cheetah	4	(21)
c) Conservation efforts and increased awareness resulting in reduced persecution	2	(11)
d) Increased value due to hunting	2	(11)
e) Natural cyclical population fluctuations	2	(11)
f) A combination of the above factors	4	(21)

n = 19 (61%) reporting

6.4 CHEETAH AND OTHER PREDATORS PROBLEMS

6.4.1 Cheetah Problems

Farmers were asked if they thought that they had a cheetah problem at the time of the interview (2001). Table 7 shows that 14 (48%) of the 29 (94%) farmers responding indicated that cheetah were a problem. This represents a 31% increase since the CCF survey of the same farmers (1991). The main reason farmers gave for believing they had a problem with cheetah was perceived or actual predation on livestock and/or game. Some farmers stated that there was a "conflict of interests" between farming activities and cheetah presence on the farms. Two farmers reported that aside from predation on livestock, cheetah caused cattle to stampede and this resulted in the cattle damaging the kraals.

Table 7 *Comparison of the number of farmers (N) who thought they had a problem with cheetah on their farms at the time of this study (2001) and the initial CCF survey (1991) also expressed as a percentage (%) of the total N responding.*

	2001	***1991***
Farmers response	**N (%)**	***N (%)***
a) Has a cheetah problem	**14 (48)**	*5 (17)*
b) No cheetah problem	**15 (17)**	*25 (83)*
c) Cheetah were becoming a problem	**1(3)**	-
d) Not sure if they have a problem	**1(3)**	-

n = 29 (2001) and n = 30 (1991)

6.4.2 Livestock Losses to Cheetah Predation

Livestock losses to cheetah predation as reported by the farmers for the study period were low. Tables 8 and 9 show the estimated losses of cattle calves and smallstock per year to cheetah predation over the ten-year study period, contrasted with the losses reported by the same farmers in the CCF survey (1991). Of the farmers experiencing losses to cheetah predation the average loss per year for smallstock was 0.9 per year and for cattle calves it was 0.6 per year for the ten-year study period (1991 – 2001). The percentage of livestock that these losses represents ranged from 1.0 to 2.8% for five of the smallstock farmers and for the sixth farmer the losses represented 15% calculated from the farmers reported number of smallstock at the time of the interview (2001). Eighteen (72%) of the farmers

experiencing calf losses to cheetah experienced losses of between zero and ten calves per year during the ten-year period and the reported range of losses was from none to four per year. The full CCF survey found that farmers reported a range from 0 to 25 calves per year. The calving percentage for commercial cattle farmers in Namibia ranged from 58 to 71% during the past five years (van der Merwe 2001 pers. comm.). The percentage of calf losses was calculated from the average calving rate (64.5%) for the number of cows that the farmers reported owning on average over the ten-year study period. These losses represent very low percentages, 16 out of 25 farmers experienced losses of less than 1% and five experienced losses between 1.0 to 3.2%.

Table 8 *The number of farmers (N) and their estimated number of cattle calves lost per year to cheetah predation during the ten-year study period (1991 – 2001), also expressed as a percentage (%) of the total N responding.*

Average calf losses/year	**N**	**%**
a) Unknown	1	-
c) None	3	(12)
d) Under 1	0	(0)
e) 1-4 calves	21	(88)
Break down of reported calves lost to cheetah predation		
a) 10 calves	15	(63)
b) 20 calves	4	(17)
c) 30 calves	1	(4)
d) 40 calves	1	(4)

n = 25 out of 26 cattle farmers breeding cattle for this study
n = 4 for the CCF survey of the same farmers

Table 9 *The number of farmers (N) and their estimated losses of smallstock per year to cheetah predation during the ten-year study period (1991 – 2001), also expressed as a percentage (%) of the total N responding.*

Losses	**N**	**%**
a) Unknown	2	(11)
b) None	10	(56)
c) 1 - 4	4	(22)
d) 5 – 10	1	(6)
e) 11 – 20	1	(6)
f) Over 20	0	(0)

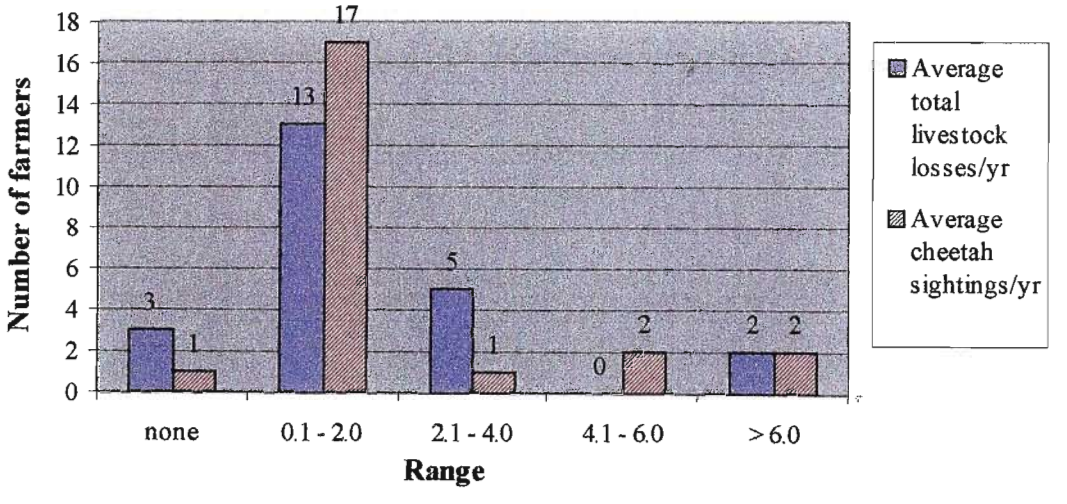
n = 18 out of 19 smallstock owners in this study. CCF survey n = 13 out of 23 smallstock owners.

6.4.3 Estimated Ages of the Calves Lost to Cheetah.

Fifteen (71%) of the 21 farmers reporting calf losses to cheetah stated that the calves were under six months of age and of these 15 farmers, nine (60%) reported that the calves were less than three months of age when they were caught by cheetah.

6.4.4 Livestock Losses and Cheetah Sightings in the Study Area

Figure 9 shows the average number of times that cheetah were seen per year and the average number of livestock lost per year attributed to cheetah predation in the various range of losses over the ten-year study period. This figure indicates that an increased number of sightings of cheetah per year was not associated with an increase in predation on livestock per year. To test whether there was a relationship between livestock losses attributed to cheetah predation and cheetah sightings a Kendall's tau-b test was performed, but the results showed no significant correlation.



(n = 23 reporting losses and sightings)

Figure 9 *Average calf and smallstock losses per year and the average cheetah sightings per year as reported by the farmers.*

6.4.5 Identification of Cheetah Predation

Table 10 indicates how farmers identify that the death of livestock was caused by cheetah predation and not other causes.

Table 10 *The number of farmers (N) and their reasons for identifying cheetah as the culprit for the stock losses, also expressed as a percentage (%) of the total N responding*

Reason	N	%
a) Cheetah seen at the carcass	6	38
b) Cheetah spoor found at the carcass	6	38
c) Not sure how they knew it was cheetah	3	19

n = 16 out of the 21 farmers reporting losses

6.4.6 Problems with Other Predators

Table 11 shows the number of farmers reporting other 'problem' predators and the number of farmers reporting using poison to eradicate predators during the ten-year study period compared to the number of farmers using poison in 1991. Despite all of the farmers who use poison stating that they applied poison in the recommended way to avoid secondary poisonings, four (29%) of the farmers that used poison reported discovering secondary poisoning of wildlife. This secondary poisoning involved vultures (*Gyps sp. and Torgos sp.*), aardwolf (*Proteles cristatus*) and bat-eared fox (*Otocyon megalotis*). The problems farmers reported with regard to these predators involved predation on livestock and/or game and the transmission of rabies to livestock. Baboon (*Papio ursinus*) were reported to damage property. Five farmers reported black-backed jackal (*Canis mesomelas*) attacking cows in labour. Two farmers reported that they believed that the jackal population was to high and they eradicated jackal to keep the numbers down although they had not experienced any losses. Predation by all other predators was not reported by any farmers as higher than four head of livestock per year during the ten-year study period. There has been a decline by seven (29%) in the number of farmers experiencing problems with black-backed jackal and by 13 (72%) experiencing problems with caracal (*Felis caracal*).

Table 11 *The number of farmers (N) identifying predators other than cheetah that are problematic, also expressed as a percentage (%) of the total N and the number of farmers using poison to eradicate predators during the study period (1991 – 2001).*

	1991 –2001 N (%)	1991 N (%)
1) Animal		
a) baboon (Papio ursinus)	**4 (15)**	-
b) jackal (*Canis mesomelas)*	**17 (65)**	24 (80)
c) caracal (*Felis caracal*)	**5 (19)**	18 (60)
d) domestic dog (*Canis sp.)*	**2 (7)**	-
e) leopard (*Panthera pardus)*	**3 (10)**	5 (19)
2) Farmers using poison to kill predators	**14 (48)**	14 (56)

n = 26 for a) to c) and 29 for e), n = 29 for farmers using poison in this study
n = 30 for b) and c) and 27 for e), n = 25 for farmers using poison for the CCF survey

6.5 LEVEL OF KNOWLEDGE ABOUT CHEETAH

Most farmers 18 (64%) stated that they believed that predators play an important role on the farms. The majority of these farmers stated that this role was to maintain the "balance of nature". Of the other farmers responding to this question five (18%) felt that that predators no longer play an important role on the farms because "man had taken over their role in nature" and five (18%) were not sure whether they still play a role. All the farmers who had a positive attitude toward cheetah stated that they thought that predators played an important role in the farmland ecosystem.

Table 12 reports how much the farmers thought they had learnt from the CCF about cheetah. A small majority, 13 (52%) of farmers felt that the CCF had the farmers' interests in mind and that the CCF showed this by their understanding of the farmers' problems. Ten (40%) where not sure and had some doubts, two (8%) felt the CCF only had the cheetah's interests in mind. Six (23%) farmers had contacted the CCF with cheetah problems during the study period and reported being satisfied with the response from the CCF. Eight (30%) of the farmers said they would contact the CCF if they had a problem. The rest said they would handle the problem themselves or contact other conservation organisations involved with cheetah conservation in the area. Ten (43%) of the those receiving the newsletter stated that they found it useful, eight (35%) did not find

it useful and stated that is should contain more specific information on cheetah numbers in the study area and five (22%) farmers stated that they did not read the newsletter.

Table 12 *The number of farmers (N) and their opinion about how much they had learnt about cheetah from the CCF also expressed as a percentage (%) of the total N responding.*

	N	%
Amount learnt		
a) Could not remember	7	(26)
b) Learnt nothing	5	(19)
c) Learnt a little	7	(26)
d) Learnt a great deal	8	(30)

n = 27

6.6 THE ATTITUDE OF FARMERS TOWARDS CHEETAH

6.6.1 Attitudes of the Farmers toward Cheetah Presence

To determine whether there had been a change in attitude toward cheetah, farmers were placed in one of four attitude categories for both current and prior attitudes towards having cheetah on their farms (Table 13). This information is displayed in the graph in Figure 10 to highlight these changes graphically. The prior attitude was defined as their attitude before the cheetah awareness raising campaign conducted by the CCF started in 1991. Results were consistent with the theory that attitudes tend to remain constant throughout life (Gray 1993, Hayes 1993). However, there has been a statistically significant change in the farmers attitudes in favour of having cheetah on their farms at the time of the interview (2001) compared to what they thought their attitudes were before 1991 (Wilcoxon Signed Ranks Test $p < 0.05$, $p = 0.024$).

6.6.2 Changes in Attitudes of the Farmers and Awareness Raising Efforts by CCF

Of the 10 farmers (*c.f.* Table 13) whose attitudes had changed in favour of cheetah, seven (70%) stated that they had learnt a great deal about cheetah from the CCF. Five (50%) of the farmers whose attitude had changed used the phrase (or a similar phrase) "we saw them (cheetah) in a different way" to explain the change in their attitude, after they had learnt about the behaviour and plight of the cheetah from the CCF.

Table 13 *The number of farmers (N) current and prior attitudes toward having cheetah on their farms, also expressed as a percentage (%) of the total N responding.*

	Current[1]		*Prior*[2]	
Attitude	**N**	**%**	*N*	*%*
a) Like/liked having cheetah on their farm	8	(33)	*4*	*(17)*
b) Do/did not mind having cheetah on the farm	13	(54)	*12*	*(50)*
c) Dislike/disliked having cheetah on their farm	1	(4)	*3*	*(12)*
d) Strongly dislike/disliked having cheetah on the farm	2	(8)	*5*	*(21)*

There was a statistically significant difference between prior and current attitudes p = .024 (Wilcoxon Signed Ranks Test, c.f. Chapter Five)
n = 25 responding to both questions.
[1]Current means at the time of the interview (2001) and [2] Prior means prior to the awareness raising efforts by CCF since 1991.

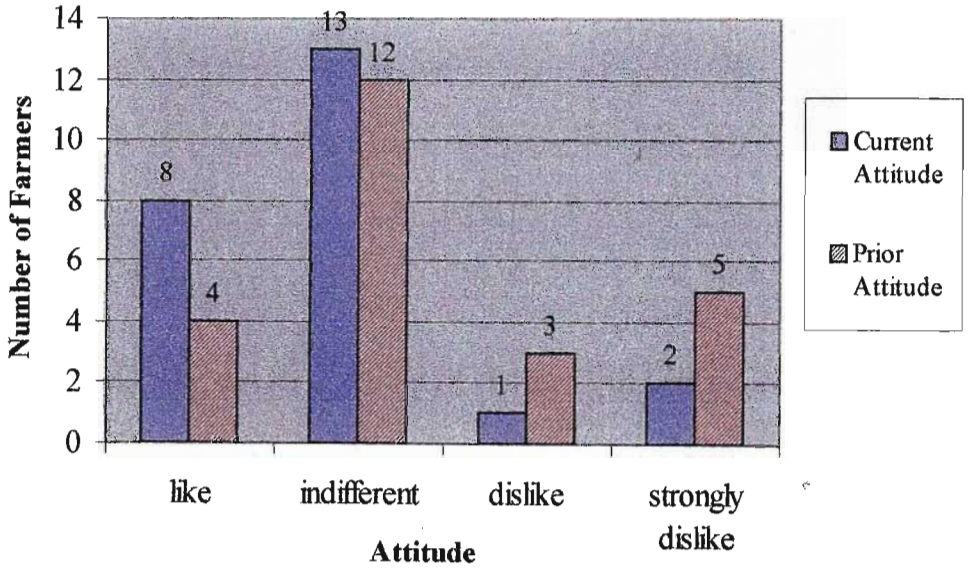


Figure 10 *The number of farmers' stated current and prior attitudes towards cheetah on their farms.*

6.6.3 Estimated Tolerance of Cheetah Predation by Farmers

Farmers were asked to estimate the number of livestock losses to cheetah predation that they would tolerate before they would consider cheetah a problem and/or taking action against cheetah. Table 14 shows the percentage of calves lost that farmers would tolerated, using a calving percentage of 60%. Most farmers 14 (56%) felt they would tolerate between one and four calves and smallstock lost per year.

Table 14 *The number of farmers (N) and their estimates of the percentage of calves lost to cheetah predation that they would tolerate before considering the cheetah a problem, also expressed as a percentage (%) of the total N responding.*

	N	%
Predation tolerance		
a) Tolerates 0 (zero) losses	4	16
b) Tolerates losses of 1 - 2%/year	7	28
c) Tolerates losses of 3 - 4%/year	7	28
d) Tolerates losses of 5 - 6%/year	2	8
e) Tolerates losses of 7 - 10%/year	1	4
f) Not sure how many losses they would tolerate	1	4

n = 25 (96%)

6.7 THE BEHAVIOUR OF FARMERS TOWARDS CHEETAH

6.7.1 Cheetah Removals

Removal of cheetah refers to removing cheetah from the farms by lethal or non-lethal method. Non-lethal methods involve the live capture and relocation of cheetah particularly by conservation organisations. Indiscriminate removal of cheetah from the farms refers to the removal of cheetah regardless of cheetah predation on livestock or not. Table 15 compares the numbers of cheetah removed during the study period and the methods used to remove them. This table shows during the ten-year study period the number of cheetah removed declined by 243 (55%) when compared to during the ten-year period from 1980 to 1991. The average number of removals was 8.2 per farmer who removed cheetah over the ten-year study period compared to 15.6 per farmer in the previous ten-year period. In the CCF survey the time frame for removals by the same farmers ranged from 1940 to 1991, and the total removals for that period by these farmers was 525 cheetahs, however the majority 438 (83%) of cheetah were removed between 1980 and 1989. One farmer reported removing 189 cheetahs in the period from 1980 to 1991 as opposed to removing only one cheetah between 1991 and 2001.

This study found that game farmers removed on average 15 cheetah per game farmer. Livestock farmers removed on average four cheetah per livestock farmer during the ten-year study period. Five (16%) game farmers were responsible for removing 92 (48%) cheetahs during the ten-year study period. Seventeen (55%) livestock farmers were responsible for removing the other 104 cheetahs that were removed.

Twenty-eight (90%) of the farmers trophy hunt cheetah when possible, two do not trophy hunt cheetah and one farmer was undecided whether he would trophy hunt cheetah given the opportunity. Six (21%) of the farmers were responsible for all ten of the cheetah that were trophy hunted during the study period. Figure 11 shows the proportion of farmers removing cheetah in the various removal ranges during the 1990's as compared with the 1980's. In this study no correlation could be found between the number of cheetah removed and the number of livestock lost per year ($r = 0.000$, $p = 1{,}000$) or the number of sightings of cheetah per year ($r = 0{,}091$, $p = 0.634$). Marker *et al.* (2001) found that observation of cheetah (tracks and direct sightings) correlated with cheetah removals ($r = 0.385$, $p = < 0.001$).

In this study it was found that farmers with large farms removed on average higher numbers (8.8 cheetah per large farm) of cheetah than farmers with medium (5.8 cheetah per medium farm) or small farms (2.6 cheetah per small farm). Marker-Kraus *et al.* (1996) also found this to be case in the original survey.

Table 15 *The number of cheetah (N) removed by the number of farmer (N^1), also expressed as a percentage (%) of the total N removed and the methods used to remove these cheetah, between 1991 and 2001, and between 1980 and 1991.*

	1991 - 2000	1980 – 1991
Method of removal	N (%) N^1	N (%) N^1
a) Trophy hunted.	10 (5) 6	11 (3) 3
b) Shot or killed (non trophy)	79 (40) 24	*
c) Removed by non lethal methods	107 (53) 7	*
Total	196 (100)	438 (16) 28

n = 31Some farmers use a combination of methods (Table 16)
*numbers for each method of removal are not given except for trophy hunting in the CCF survey (1980 to 1991).

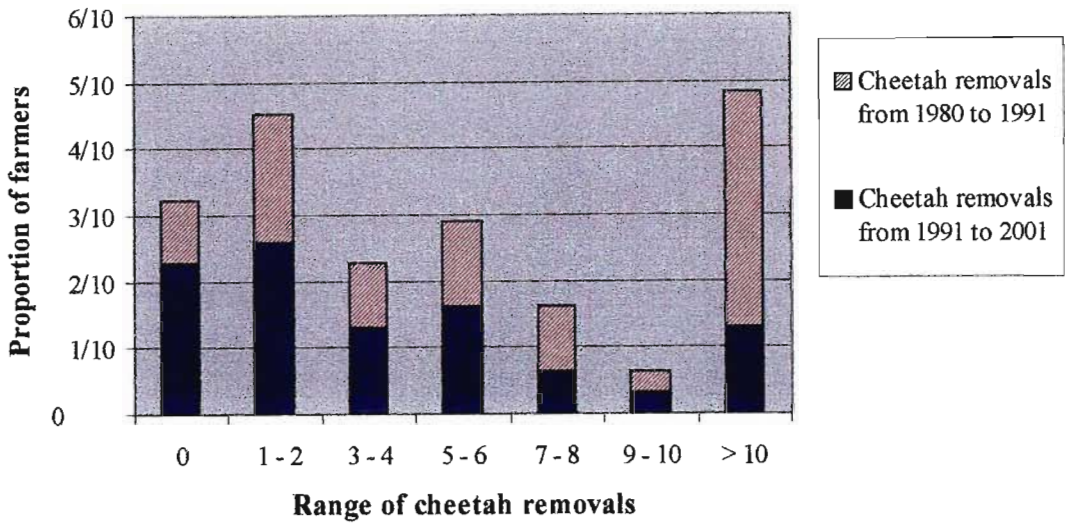


Figure 11 *The proportion of farmers removing cheetah in the various ranges of cheetah removals from 1980 to 1991 and from 1991 to 2001.*

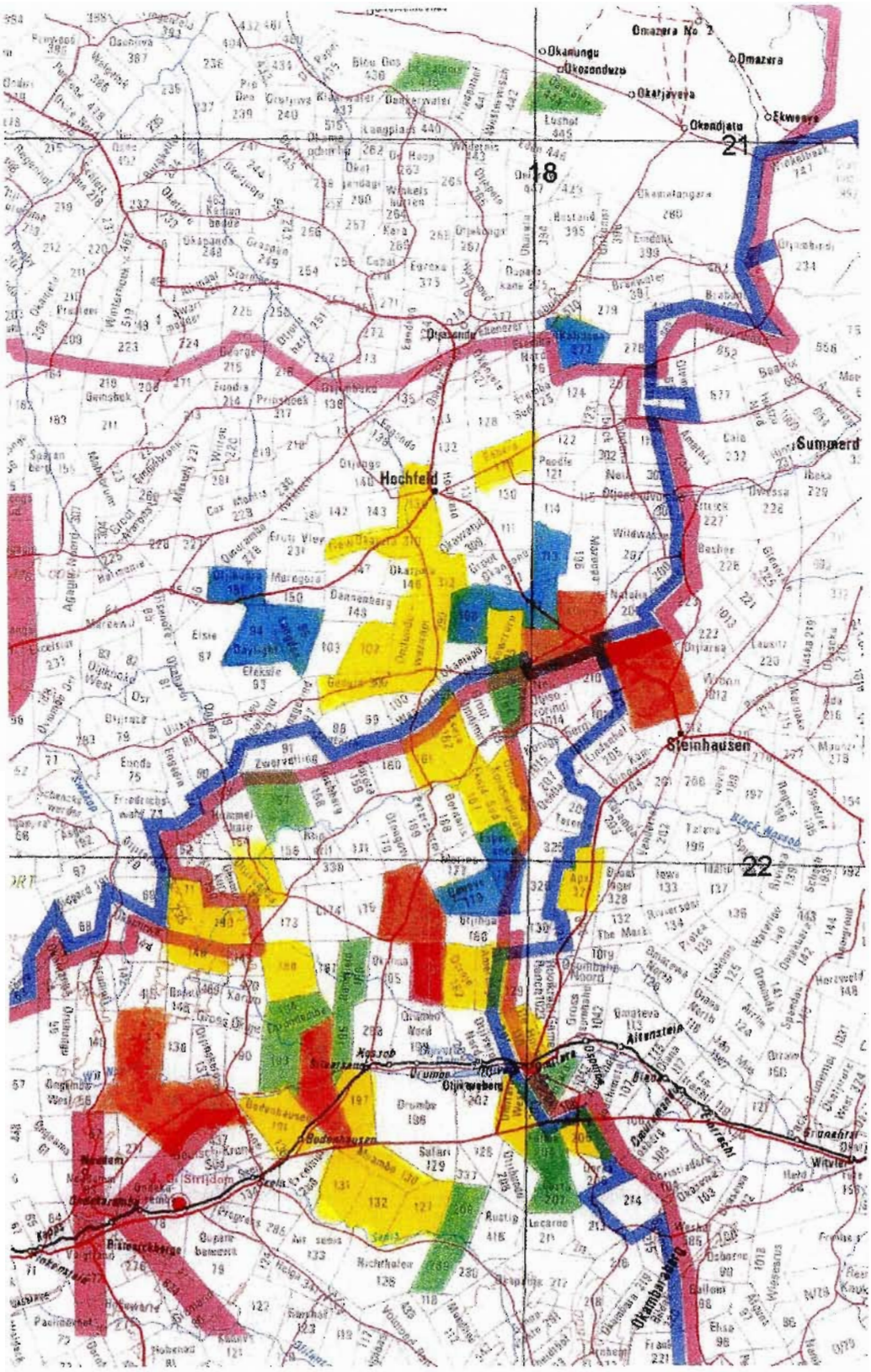
6.7.2 Methods and Types of Removal of Cheetah

In order to identify the area of land where cheetah are removed or not and the type of removals, farmers were asked about cheetah removal methods and types. Table 16 shows the number of farmers using the various methods to remove cheetah and the area in which this is taking place. This table shows that since 1991 there has been an increase by four (13%) in the number of farmers not removing cheetah. The area of land where cheetah were not persecuted (Table 16, categories a), b) and c) during the ten-year study period (1991 to 2001) was 126 981ha (37%). This was compared to the period from 1980 to 1991 and during that ten year period the area where cheetah were not persecuted was found to be 36 085ha (11%). Figure 12 spatially represents the farmers' behaviour towards cheetah on a 1:100 000 map of the farms in the study site.

Table 16 *The number of farmers (N) who removed cheetah or not, by various types and methods of removal during the study periods, the area of land (ha) on which this occurred and this is expressed as a percentage of the total area surveyed.*

		1991 - 2001		*1980 - 1991*
Removals type and method	**N**	**(%)**	**ha (%)**	*N (%)*
a) Not removing cheetah by any methods	7	(23)	65 781 (19)	*3 (10)*
b) Discriminate removal via lethal methods	1	(3)	4 700 (1)	-
c) Trophy hunting only	4	(13)	56 500 (15)	-
d) Indiscriminate removal via non lethal methods	4	(13)	40 468 (12)	-
e) Trophy hunting and indiscriminate removal via non lethal methods	1	(3)	11 400 (3)	*1 (3)*
f) Indiscriminate removal via non lethal and lethal methods	1	(3)	8 200 (2)	*20 (65)*
g) Indiscriminate removal via lethal methods	12	(39)	142 304 (41)	*5 (16)*
h) Trophy hunting and indiscriminate removal via lethal and non lethal methods	1	(3)	17 800 (5)	*2 (6)*

n = 31 for both surveys



Source: Republic of Namibia 1994 1:1000 000 © Office of the Surveyor General, Windhoek

Figure 12 *The farms surveyed, colour coded for type and methods of cheetah removal from 1991 to 2001. Green = No cheetah removals, orange = Trophy hunting/discriminate removals only blue = Indiscriminate removals using non-lethal methods only, yellow = Indiscriminate removals using lethal and non-lethal methods.*

6.7.3 Removal of Cheetah in Relation to Attitude

Of the seven (23%) farmers who reported not removing cheetah in the past 10 years, four (57%) reported liking having cheetah on their farmers and the other three were indifferent to having cheetah on their farms. The farmer (game farmer) who indiscriminately removed the most cheetahs 70 (65%) in the past 10 years used non-lethal methods and reported a strong disliking to having cheetah on the farm. The farmer (cattle/smallstock farmer) who killed the most cheetahs 19 (21%) in the past 10 years reported being indifferent to having cheetah on the farm. The farmer (cattle/game farmer) who killed the second highest number of cheetahs 12 (13.6%) in the past 10 years reported disliking having cheetah on his farm. The farmer (cattle/game farm) who killed the third highest number of animals 10 (11.4%) reported liking having cheetah on the farm. Four (13%) farmers were responsible for the indiscriminate removal by lethal methods (shot) of 49 cheetah (this represents 46% of the cheetah removed by lethal methods) cheetah, and 100 cheetah (representing 93% of the cheetah removed by non-lethal methods) were indiscriminately removed by four other farmers. Game farmers removed a total of 92 cheetah (an average of eight cheetah each) and livestock farmers removed 104 (an average of five each) from 1991 to 2001.

6.8 LIVESTOCK MANAGEMENT

A number of livestock management practices are recognised as being effective in reducing and/or preventing predation on livestock by predators, allowing for co-existence of predators and livestock farming (Errington 1969, Savoury 1991, Bothma 1996, Marker 2001, Schnieder-Waterberg 2000). Table 17 shows the cattle management practices that were used by the farmers to reduce and/or prevent predation on calves by predators including cheetah during the ten-year study period compared with the practices used in 1991. Table 18 shows the smallstock management strategies used by the farmers to prevent predation during the ten-year study period; no data for these farmers was available for the previous ten-year period.

6.8.1 Cattle Management

Seventeen (65%) farmers who breed cattle reported using management practices that are believed to reduce and or prevent predation. Fourteen (54%) of the farmers used the following cattle management practices: a) daily monitoring of cows that are due to calf and cows with calves; and b) culling of cows that lose calves to predators including

cheetah. Both these methods have benefits to the farmer other than preventing predation and are not solely implemented to prevent predation. The theory behind culling cows that lose their calves to predation is that only cows that are inadequate mothers lose their calves to predators since a cow is believed to be usually capable of protecting her calf from predation by cheetah and/or leopard. Three (16%) of the 19 farmers responding to Question B12 (*c.f.* Appendix One) stated making changes to their livestock management practices to prevent predation during the study period as a result of the ideas that the CCF had given them on how to prevent predation, the rest said they had not made any changes. Fourteen (54%) of the farmers either did nothing or used only one method to prevent predation by cheetah on calves. There was a positive correlation between the attitude of the farmers towards having cheetah on their farms and the number of management strategies used by the farmer that are believed to protect calves from predation($r = 0.403$, $p = 0.021$).

Table 17 *Comparison of management practices used by the number of farmers (N) to protect cattle from predation between the current (2001) and initial survey (1991), also expressed as a percentage (%) of the total N responding.*

	2001		***1991***
Preventative technique	**N**	**(%)**	***N (%)***
a) Calving camp (often near the homestead)	**4**	**(15)**	*7 (32)*
b) Daily monitoring	**7**	**(27)**	*1 (5)*
c) Random monitoring	**6**	**(23)**	*1 (5)*
d) Other techniques	**9**	**(34)**	*8 (36)*
e) Do nothing	**3**	**(12)**	*5 (23)*
Break down of 'other techniques'			
a) Calves kept in a kraal until 3 months	**2**	**(7)**	-
b) Keep donkeys with calving cows and calves	**5**	**(22)**	*4*
c) Cull cows that lose calves to predation	**7**	**(27)**	-
d) Increase stock density of calving herd (safety in numbers)	**2**	**(7)**	*1*
e) Cows are not dehorned	**2**	**(7)**	-

n = 26 out of 26 cattle breeders. The CCF survey of the same farmers n = 22 out of 31 cattle breeders. Some farmers used a combination of these techniques. In this study 12 (46%) farmers used a combination of techniques.

6.8.2 Smallstock Management

Six (33%) out of 18 farmers reported losses of smallstock to cheetah predation during the ten-year study period (Table 9). Table 18 shows methods used by the farmers to protect their smallstock from predation. In this study the type of dogs used to guard smallstock varied, with no particular breed being used by the farmers. The CCF encourages farmers to use a breed of dog known as Anatolian Shepherds to guard smallstock. These dogs have been selectively breed to guard smallstock and are believed to have inherent characteristics necessary for guarding smallstock, such as trustworthiness viz. the absence of predatory behaviour (Bowland *et al.* 1994). These dogs are available to farmers from the CCF, none of the farmers interviewed owned or used one of these dogs for guarding and only one farmer said that he was interested in obtaining one of these dogs from the CCF.

CCF Data on smallstock management strategies to prevent predation was available for only three of these farmers for the ten-year period before 1991, thus comparisons could not be made.

Table 18 *The number of farmers (N), also expressed as a percentage (%) of the total N responding, using various management practices to protect smallstock from predation during the ten-year study period (1991 – 2001).*

Preventative technique	**N**	**(%)**
a) Full time shepherd	6	(33)
b) Guard dog	4	(22)
c) Both a shepherd and a guard dog	2	(11)
d) Neither guard dog or full time shepherd	6	(33)
e) Smallstock is kept in a kraal at night to prevent predation	18	(100)

n = 18 out of 19 smallstock owners for this study.

CHAPTER SEVEN

DISCUSSION

The survival of the cheetah on commercial farms of central Namibia is dependent on many interconnected factors, *inter alia* suitable habitat with an adequate prey base and a considerable reduction in persecution by farmers (Eaton 1974, Marker-Kraus *et al.* 1996, Marker *et al.* 2001). Persecution predominately takes the form of indiscriminately removing cheetah by trapping them and then either relocating or killing them. To find solutions to this problem, the CCF attempts to integrate farming activities with cheetah conservation objectives. This involved, initially, gaining an understanding of farmer-related threats to cheetah through an in-depth survey of commercial farmers in central Namibia by the CCF. The information gathered by the CCF led to the implementation of a long-term awareness-raising programme amongst the farmers interviewed. This programme attempts to influence the farmers to:

a) desist from persecuting the cheetah by influencing farmers attitudes towards greater understanding and tolerance of cheetah;

b) maintain the cheetah's natural habitat and prey base and;

c) implement livestock management strategies that avoid conflicts between farmers and cheetah over livestock.

To identify successful conservation strategies, regular monitoring of the effectiveness of these strategies is necessary (Kleiman *et al.* 2000, Sutherland 2000). The ultimate aims of long-term conservation programmes usually cannot be reached for decades and measuring for success in terms of the goals of the programme requires monitoring throughout the course of the programme (Kleiman *et al.* 2000). It is the aim of this mini-dissertation to identify if there have been changes in farmer-related threats to cheetah survival with regard to specific commercial farmers in central Namibia, subsequent to conservation awareness-raising efforts amongst these farmers. The results of this study suggests that over the last ten years (1991 to 2001) there have been changes in farmer-related threats to cheetah survival amongst the 31 farmers interviewed. These changes include land use by these farmers, their attitudes and behaviour towards cheetah and their cattle management strategies.

Changes in land use

Bourn and Bench (1999) estimate that 10 to 20% of commercial Namibian farms are involved in game farming. This study found that six (19%) of the farmers interviewed derived their total or a high proportion of their income from their farms through game farming activities. Prior to 1991 all 31(100%) farmers derived their main source of income from their farms from livestock farming. Furthermore, it was found that since the original survey three (10%) farmers have converted their entire farms from livestock farms into game farms.

Game farmers have been shown to remove a greater proportion of cheetah than livestock farmers and as such represent a greater threat to cheetah survival than do the commercial livestock farmers of central Namibia (Marker-Kraus *et al.* 1996, Marker 2001). Game farmers, representing 25% of the 241 commercial farmers surveyed by the CCF, perceived the cheetah to be a pest that is incompatible with game farming and reported being responsible for removing 1 270 (48%) of the cheetah removed between 1980 and 1993 (Marker-Kraus *et al.* 1996, Marker 2001). This finding was corroborated by this study which found that of the farmers interviewed, five (16%) game farmers removed 92 (47%) cheetah between 1991 and 2001. This removal rate was on average 11 more cheetah removed per game farmer than per livestock farmer over the ten-year study period. Combined with the direct threat to cheetah survival from game farmers, this study found that there has been an increase in game fencing to restrict the movement of game to specific areas for management and utilisation objectives. The farmers reported that 65km of jumping game fencing had been constructed between 1991 and 2001. Marker (2001) found that there was a correlation between the presence of game fencing and cheetah removals ($p < .001$). Since game farmers have been found to be a greater threat to cheetah survival than livestock farmers in central Namibia, an increase in game farming is of concern for cheetah conservation on these farms in the future.

Combined with the increase in land use for game farming, there has been an attendant increase in the species (i.e. lechwe and black faced impala) and total numbers of exotic antelope species occurring on the farms surveyed (*c.f.* Table 4). Despite the increment in the number of exotic species on the farms, the actual herd sizes of these species remain small and confined to small areas. Bothma (1996) points out that due to direct competition with farmers over game, large predators are problematic in small game

fenced areas particularly where attempts are being made to establish game herds from small breeding nuclei of valuable game species. Marker (2001) has found that exotic game species, in particular blesbok (*Damiliscus dorcas sp.*), suffer the greatest losses from cheetah predation on commercial Namibian game farms.

Locally exotic species like roan and black-faced impala have an increased commercial trophy hunting value in relation to common indigenous species such as springbok and kudu (NAPHA 2001). This situation acts as an economic incentive for game farmers to keep exotic species, thereby encouraging the establishment of alien species on game farms in Namibia. Including the threat to cheetah survival associated with farmers' reactions to cheetah predation on exotic game species, there are sufficient long-term ecological and economic reasons for discouraging the establishment of alien species in Namibia ecosystems. For example, alien subspecies can result in the loss of indigenous subspecies through genetic pollution, which is associated with a decline in economic value of these hybrids. The black faced-impala (*Aepyceros melanmpus petersi*) that is indigenous to northern Namibia is such a species. It is valued at 26 times the value of the common introduced impala (*A. melampus melampus*), with which it readily hybridises (Barnard 1998). Furthermore, the introduction of alien game species runs contrary to Namibian policy, which is to eliminate alien species from natural habitats and to restrict the introduction of species (Barnard 1998).

Marker *et al.* (2001) point out that due to the nature of the cheetah's diet and the cheetah's ability to penetrate non-electrified game fencing, it is more difficult to protect game from predation by cheetah. The farmers in this study stated that cheetah could not be excluded from game fenced areas by standard game fencing, because cheetah climb over, through and/or under game fencing. This exacerbates the problem of finding solutions to game-farmer related threats to cheetah survival. A possible solution could be the use of electric fencing (Marker-Kraus *et al.* 1996). Electric fencing if correctly installed and maintained can reduce predation on stock by preventing predators from entering fenced off areas (Bowland, Mills & Lawson 1994, Bothma 1996). The CCF encourages game farmers to use electric fencing to protect valuable game, but only one game farmer of those interviewed had electric fencing. The exclusion of cheetah from game fenced areas is a short-term solution and although preferable to the elimination of individuals, it may threaten the species survival in the long term. If adequate prey and

habitat is not available outside of game fenced areas, cheetah will be forced to enter game fence areas where they face increased chances of persecution (Marker *et al.* 2001). The exclusion of predators from farms also disregards evidence that predators are of ecological and economic importance (Bowland *et al.* 1994, Bothma 1996). The fragmentation of ecological communities by, for example, fencing off pockets of habitat, blocks interactions between these communities and there is evidence that this type of disruption may jeopardise species survival in the long term (Leakey & Lewin 1996, Perrings 2000, Sutherland 2000). Game losses to large predators are adequately compensated for by the ecological and economic value of these predators, but the size of the game farm and the herds of game play an important role in establishing harmonious relations between the farmer and the large predators (Bothma 1996).

Returning to the availability of prey to cheetah outside of game fenced areas, Marker *et al.* (2001) conclude that if cheetah are deterred from entering game fenced areas and have adequate prey populations outside of these areas, losses within game fenced areas are reduced. This study suggests that of the four common indigenous antelope species (viz. gemsbok, hartebeest, kudu and springbok) occurring in the study site, the number free ranging on these farms has declined by almost 40 % and the density at which they occur outside of the game fenced areas in the study sight has declined by 17 % since 1991(*c.f.* Figure 5 and Figure 6). What is of greater concern is that farmers believe that this decline is a result of overexploitation (hunting and live capture). If this is indeed the case, and in light of evidence that these four species are common cheetah prey (Marker-Kraus *et al.* 1996), this is a change in farmer-related threats to cheetah survival that may have negative consequences for cheetah survival on these Namibian farms. However, the diet of the cheetah in Namibia is extremely varied and it is possible that these four species are opportunistically replaced by other prey species found on farms in Namibia, such as ground dwelling birds, hares and rodents.

Conservancies

The formation of conservancies can potentially alleviate some of the threats to cheetah associated with game farming activities (Marker *et al.* 2001). This study showed that since the original survey the majority of farmers (20 (66%)) interviewed have joined recently formed conservancies (*c.f.* Figure 7). Conservancies on commercial farms in Namibia are intended to develop co-operative management strategies between adjacent

farms with one of the main objectives being to develop management strategies that are sensitive to the farmland ecosystems, with particular reference to game species management (Barnard 1998, Marker-Kraus *et al.* 1996, Marker *et al.* 2001). These conservancies have the potential to become vast privately owned protected areas capable of supporting abundant wildlife and a variety of long term livelihood strategies for example, eco-tourism. However, the findings in this study suggest that membership of a conservancies has thus far not been effective in preventing members from fencing off pockets of habitat for game farming. Thus causing habitat fragmentation and the isolation of species. This practice runs contrary to the evidence that shows the importance of maintaining the integrity of ecological communities for the continuation of natural processes and species conservation (Leakey & Lewin 1996, Perrings 2000, Sutherland 2000).

A possible solution to competition between game farmers and cheetah is to maintain a large number of buffer prey species (e.g. springbok) and this is only possible if there is enough food and space (Bothma 1996). Considering the extremely variable rainfall and that the average size of the game fenced areas on the farms within the study area is 6 900ha, it is unlikely that these areas are of adequate size to support large herds of game over time. Fenced off areas could exacerbate predation problems by increasing cheetah predation success rates. Both the author and farmers have observed cheetah catching game against fences. The ineffective nature of the conservancies to avoid habitat fragmentation combined with the finding that only one conservancy in the study area had any policy related to cheetah conservation, suggests that currently conservancies have little to offer toward cheetah survival on the farmlands. The successful modification in farmer-related threats to cheetah survival including attitude and behaviour, discussed below, may be thwarted if solutions to threats to cheetah survival arising from changes in land use are not sought.

Bush encroachment

It has been argued that bush encroachment may not be a threat to cheetah survival for a number of reasons. For example, an increased in kudu (common cheetah prey) numbers is associated with bush encroachment and dense bush may enable cheetah to remain concealed from persecutors (Barnard 1998, Marker pers. comm. 2001). The majority (57%) of farmers reporting stated that bush encroachment had increased. This in itself

may not be a threat to cheetah, but it is possibly one of the economic incentives behind the change in land use from livestock to game farming. The decline in the cattle carrying capacity of the commercial cattle farms in central Namibia, due to the loss of grazing from bush encroachment has had a significant economic cost, leading to alternative uses of the land, for example, game farming (Richardson 1998). This could make bush encroachment an indirect longer term threat to cheetah survival due to the potential for game farming to increase in bush encroached areas.

Changes in the persecution of cheetah

The cheetah is a non-aggressive predator, which poses no threat to human life (Eaton 1974, Marker-Kraus *et al.* 1996). They are known to predate on livestock and in particular on smallstock (Bowland *et al.* 1994, Marker-Kraus *et al.* 1996). Studies in the United States of America have shown that farmers exaggerate the number of livestock lost to predators (Newton 1979, Wagner 1988). This did not appear to be the case with regard to reported cheetah predation by the farmers interviewed in this study. Marker-Kraus *et al.* 1996 found that on commercial farms in central Namibia the reported range of livestock losses to cheetah predation varied widely from 0 to 100 head per year but, 90% of cattle farmers reported cattle losses from 0 - 11 head per year and 83% of smallstock farmers reported losses of 0 - 11 head per year. In further research from 1993 to 1999 Marker *et al.* (2001) found the mean reported predation rates for livestock to be low, ranging from 1.1 to 9.0 per year, with the mean loss for the seven-year period being 3.9 per year for cattle and 1.7 per year for smallstock.

The farmers interviewed in this study reported lower overall losses than those reported by Marker *et al.* (2001). The mean loss for the ten-year period was 0.6 per year for cattle calves and 0.9 per year for smallstock. These losses also represent a low proportion of the total number of smallstock and cattle calves owned by the farmers. Sixteen (76%) farmers reporting losses, experienced cattle calf losses of less than one percent per year. Five (83%) farmers reporting smallstock losses, experienced losses of under three percent per year. Nonetheless, livestock predation by cheetah, albeit sporadic and at a low level; combined with negative attitudes towards predators, culminates in the persecution of cheetah on farms in Namibia (Marker-Kraus *et al.* 1996). This study showed that cheetah continue to be persecuted by 19 (61%) of the farmers interviewed (*c.f.* Table 16). However, significantly fewer by nine (29%) farmers, indiscriminately removed cheetah

and there was a marked reduction by 243 (55%) cheetah removed between 1991 and 2001. This occurred despite nine (31%) more farmers stating they had a 'problem' with cheetah at the time of this study when compared to 1991. The majority of farmers (17 (68%)) stated that they would tolerate some livestock losses to cheetah before they would consider taking action against cheetah (*c.f.* Table 14). Whether this tolerance and the reduction in the number of cheetah removed was due to changes in the attitudes of farmers towards having cheetah on their farms is less evident, but changes in attitude appear to be at least partly the reason for a decline in the number of farmers persecuting cheetah and the number of cheetah removed.

Changes in the attitude and behaviour of the farmers towards cheetah

Human attitudes tend to remain fixed throughout life and behaviour is influenced by many factors (Gray 1993, Hayes 1993). The behaviour of the farmers towards cheetah may be influenced by attitudes other than the farmers' attitude towards liking or disliking having cheetah on their farms. For example, a farmer in this study expressed a positive attitude towards cheetah (i.e. liked having cheetah on the farm) and an enjoyment of hunting predators. This indicates that the attitude of liking cheetah is not necessarily linked with behaviour that favours cheetah survival, which may account for the continued persecution of cheetah by this farmer. However, the other seven (23%) farmers who expressed a favourable attitude towards cheetah presence on their farms also did not indiscriminately remove cheetah. This suggests that amongst these farmers, a favourable attitude towards cheetah presence is linked to behaviour that favours cheetah survival with respect to persecution of cheetah.

Changes in attitude

All the attitude changes that were reported were in a positive direction on the attitude scale used in this study. These changes where statistically significantly different in favour of cheetah at the level of $p = .024$. There was an increase by four (16%) farmers whose attitude changed to 'liking' the presence of cheetah on their farms (*c.f.* Figure 10), since the beginning of awareness raising efforts by the CCF in 1991. These four farmers attributed their change in attitude towards cheetah, to the CCF awareness raising efforts, which they explained had changed the way, they 'saw' the cheetah (*c.f.* Chapter Six: 6.6.2).

Changes in attitude towards cheetah are of no benefit to conservation of the species if this change in attitude is not accompanied by changes in behaviour with regard to cheetah removals, maintenance of their prey base and habitat, and improved livestock husbandry (management), to prevent predation by cheetah. Although the link between human attitude and behaviour is not always clear, the farmers stated attitudes were compared with their actual behaviour in order to establish whether attitudinal changes were accompanied by behavioural changes. The CCF data shows that from 1980 to 1991, 28 (90%) of the farmers indiscriminately removed cheetah. In this study the number of farmers indiscriminately removing cheetah was found to be 19 (61%). This represents a 32% change in farmers' behaviour in favour of cheetah survival.

Farmers also ascribed their perceived increased in cheetah numbers to increased awareness of cheetah conservation needs and decreased persecution. Apart from one, all the farmers who had a positive attitude toward cheetah (i.e. liked having cheetah on their farm) did not indiscriminately remove cheetah and acknowledged their responsibility in reducing predation on livestock by cheetah through adequate livestock husbandry or accepted losses to cheetah. The positive correlation ($p = .021$) observed between farmers' attitudes towards cheetah and the implementation of livestock management strategies that are believed to protect livestock from predation is also an indication that there are links between attitude and behaviour with respect to these farmers and cheetah. The following statements highlight how changes in the farmers' attitude affected subsequent actions towards cheetah. A cattle and smallstock farmer who had previously indiscriminately removed cheetah and reported strongly disliking having cheetah on the farm before 1991 stated:

> "We learnt a great deal about the cheetah crisis from the CCF and became aware that they (cheetah) weren't a problem. We thought they were a problem and shot 20 cheetahs in five years. In the past 10 years we only removed one cheetah that killed three goats in the kraal. We definitely had a different way of seeing them. Before we would shoot them when we saw them, now we enjoy watching them and so do our guests."

A cattle and smallstock farmer who previously strongly disliked having cheetah on the farm and had removed two cheetah prior to 1991, but currently (2001) does not mind having cheetah and believed he had learnt a little from the CCF about cheetah stated:

> "Earlier I thought they caused damage, but they don't, I saw that they don't cause damage. I have removed no cheetah in the past ten years"

A game farmer who had removed five cheetah between 1980 and 1991 stated:

> "I learnt a great deal from the CCF and became interested in cheetah. I started to look after them (cheetah) and realised we need all types of game. Before, if we saw them (cheetah), we shot them, but we never really saw them until recently. In the past year I have seen up to five sub adults together. I like having them on the farm before I disliked them. They maybe becoming a problem due to predation on black faced impala but I am moving the impala into a secured camp near the house."

A second game farmer stated:

> I learnt a great deal about cheetah. Although I still strongly dislike having cheetah on the farm because they kill game, especially springbok, blesbok and impala, I am more tolerant and do not catch as many as I used to. In 1989 we caught 60."

Changes in behaviour

The majority (72%) of farmers in this study stated they had seen more cheetah in the study period than prior to 1991 and this led them to concluded that cheetah numbers have increased during the past ten years and in particular in the past two years. There is currently no research evidence to support this perception. To the contrary Morsbach (1987) reported that the cheetah population probably declined from 6 000 to 3 000 animals in central Namibia during the 1980's with the current estimate at approximately 2 500 individuals, representing a further decline in recent years (Marker 2000). All the farmers reporting an increase in cheetah sightings stated that the majority of sightings occurred within the past year (September 2000 to September 2001). The possibility that cheetah numbers have increased in the study site cannot be dismissed. Anderson (1984) and Nowell (1996) point out that cheetah numbers can rapidly increase within a five to seven year period if conditions are suitable. It may be that the recent increase in sightings could be related to a rapid increase in cheetah numbers due to more favourable environmental conditions for cheetah following higher than average rainfall during 1999/2000 in the study area.

Since 1991, and more particularly, 1995, more farmers in the study area were relying on trophy hunting as a source of income. This may influence the number of cheetah sightings that are made by the farmers. The nature of trophy hunting on these farms causes farmers to be out in the veld (without making much disturbance), especially in the early morning and late evening. These times coincide with periods of increased activity in cheetah.

Regardless of actual cheetah numbers, the farmers' behaviour towards cheetah is influenced by their perceptions (Marker 2000, Marker *et al.* 2001). These finding suggest that perceived increases in cheetah numbers by farmers is a threat to cheetah survival, irrespective of the facts.

Marker *et al.* (2001) also found a positive correlation between cheetah sightings and cheetah removals by farmers ($p < .001$). These correlations were not found in this study. Despite no correlation being found in this study the combination of perceived increases in cheetah numbers and more farmers owning small herds of valuable ungulate species in small fenced off areas may encourage negative behaviour towards cheetah by farmers. These reactions are likely to involve the removal of cheetah to 'prevent' predation by cheetah on game within these areas in the future. In support of this more than half the game farmers in this study indicated that cheetah predation on specific game species (*viz.* black faced impala, blesbok and springbok) in game fenced areas was becoming a problem. These farmers indicated that they would consider removing cheetah should the problem not resolve itself in the near future.

These farmers may be justified in their behaviour, with respect to short term economic objectives, because it has been reported by Caro (1994) that a rapid increase in cheetah numbers in two game fenced protected areas in South Africa was associated with greatly reduced ungulate numbers with respect to certain species (*viz.* blesbok, springbok and waterbuck) as a direct result of cheetah predation. If solutions to game farmer-related threats to cheetah survival are not found then these threats will impact negatively on the survival of the cheetah on the farms surveyed.

This study shows that amongst the farmers interviewed, three (10%) more farmers' trophy hunted cheetah during the study period than in the previous ten-year period. The high price, ±DM 3 000 (NAPHA 2001), that farmers can receive for trophy-hunted cheetah is theoretically a strong economic incentive to discourage indiscriminate removal of cheetah (Marker 2000). The incentive may be great but the ethical trophy hunting of cheetah is extremely difficult as they are elusive animals and only seen fortuitously. This may account for the low number of trophy hunted cheetah compared with those trapped during the study period, even though more farmers were involved in game farming for trophy hunting than prior to 1991.

The decrease in the overall number of cheetah removed by the farmers in the study period compared with the CCF survey, may be related to the prohibition of selling live caught cheetah, rather than to a change in the attitude and behaviour of farmers. The Namibian Ministry of Environment and Tourism has stopped the sale of live-trapped cheetah. They no longer issue permits for export, without which cheetah cannot be legally traded. During the 1970's and 80's many farmers legally sold live cheetah via game dealers (Eaton 1974, Marker-Kraus *et al.* 1996, Marker pers. comm. 2001).

During the 1980's and 1990's a severe drought was experienced in the study site, accompanied by the culling and later capture of large numbers of game including kudu and hartebeest. A rabies epidemic also reduced kudu numbers. These factors possibly resulted in a decline in the cheetah prey base (Marker-Kraus *et al.* 1996), which may have had a negative impact on cheetah cub survival. In addition, prior to this study, a large number of cheetah were removed from the study area. The combination of these factors may have resulted in reduced cheetah numbers during the 1990's with a subsequent reduction in removals of cheetah by farmers. There were possibly just fewer cheetahs 'available' to be persecuted. This could be the major reason for the reduced number of cheetah removed rather than improvements in the attitude and behaviour of the farmers towards cheetah during the study period. However, the circumstantial evidence that there have been changes in farmers' attitudes and behaviour is compelling, particularly the finding in this study that the proportion of farmers removing cheetah in the lower ranges of cheetah removal categories illustrated by Figure 11, suggests that, regardless of cheetah numbers, the farmers are indeed removing less cheetah than before 1991.

Changes in livestock management

The major reason farmers gave for the ongoing persecution of cheetah was an attempt to protect game and livestock from predation. Marker *et al.* (2001) point out that farmers may be efficient at eliminating predators but this does not necessarily result in the effective prevention of predation. The understanding of predator behaviour and the protection of livestock through improved husbandry techniques can be more economically beneficial and achievable than attempting to control or manage predators. For example, by increased monitoring of cows at calving, sub fertile cows can be weeded

out leading to improved calving percentages and this can significantly outweighing sporadic losses to predation (Schneider-Waterberg 2000).

The calving percentage on commercial farms in Namibia varies between 51%-78% (van der Merwe pers. comm. 2001). Common sense would support the notion that an increase in calving percentages combined with adequate calf protection at the vulnerable phase (up to six months) could result in actual economic benefits for farmers when compared to the theoretical economic benefits resulting from cheetah control efforts. Objective assessment of the economic and numerical loss of livestock to predators is problematic and separating proximate from ultimate causes of livestock loss, such as disease or accident, is notably difficult (Bowland *et al.* 1994, Oli, Taylor & Rogers 1994).

Newton (1979) and Wagner (1988) found that farmers tend to attribute livestock losses to predators regardless of the actual cause of death. The majority (12 (76%)) of farmers who removed cheetah continued to hold cheetah responsible for killing livestock if cheetah or their tracks were located near the carcass of a dead animal. The sighting of predators and the identification of particular predators' tracks around or near a carcass is inadequate evidence to conclude livestock predation by that predator species, or that predation actually took place (Bowland *et al* 1994, Bothma 1996, Marker-Kraus *et al.* 1996). This is because many predators that occur in the study sight are opportunistic scavengers, including cheetah (Skinner and Smithers 1990, Caro 1994, Marker-Kraus *et al.* 1996).

It is possible that cheetah on farmlands may scavenge more regularly than has been observed in reserves due to reduced competition with other large predators for carcasses. Supporting this, Caro (1994) points out that scavenging by cheetah is thought to occur infrequently in areas with high densities of other predators such as lion (*Panthera leo)* and spotted hyena (*Crocuta crocuta)* possibly because these predators reduce the chances of cheetah encountering a carcass fortuitously and they pose a danger to cheetah.

In contrast to many alternative livestock management strategies to reduce predation problems, the indiscriminate removal of cheetah by Namibian farmers may be ineffective in reducing predation (Marker *et al.* 2001). Farmers who removed high numbers of cheetah also reported greater problems with other predators and despite removing cheetah, livestock losses were still incurred (Marker-Kraus *et al.* 1996, and Marker 2001).

This study was not able to elucidate why some farmers do not implement livestock management strategies to prevent predation on livestock. Minimal livestock losses to predators may be a reason behind their behaviour although farmers did not mention this in the study. It could be that alternative livestock management strategies are not very easy to implement and cause additional problems for farmers.

The livestock management practice of locating calving camps near the homestead is used in Namibia by farmers for a number of reasons including the prevention of predation. However, this may not be the farmer's primary motivation for the implementing the strategy. In this study it was found that the use of this management practice by the farmers interviewed had declined in use by four (17%) farmers, since 1991. The use of calving camps near the homestead, posed certain problems for some farmers in this study. For example, some farmers stated that it was problematic to have large numbers of cows calving near the homestead as the area became overgrazed, did not contain the best grazing or have an adequate supply of water. Therefore these farmers did not implement this husbandry measure.

Donkeys are believed to be aggressive towards predators and are placed in the cow herd to 'guard' calves by chasing off predators. Three farmers, who had tried this method since 1991, felt that it did not work as a preventive measure. These farmers had still experienced livestock losses. One farmer assumed that this method worked because less livestock losses had taken place since putting donkeys with calving cows.

Although 21 (88%) of the cattle farmers experienced calf losses attributed to predation by cheetah, the majority (73%) of these farmers used none or only one known technique to prevent predation. This is unfortunate as it exposes them to conflicts with predators including cheetah. However, only six (33%) smallstock farmers reported losses to cheetah predation and 16 (88%) of smallstock farmers implemented more than one strategy to prevent predation. This may indicate that these two smallstock management strategies are relatively effective in preventing predation.

Marker-Kraus *et al.* (1996) and Bowland *et al.* (1994) point out that farming methods can create livestock losses. Practising adequate husbandry to prevent predation can allow harmonious co-existence with predators on livestock farms regardless of predator

population dynamics (Errington 1969, Savoury 1991, Bothma 1996, Marker-Kraus *et al.* 1996, Schneider-Waterberg 2000).

CHAPTER EIGHT

CONCLUSION AND RECOMMENDATIONS

8.1 CONCLUSION

The findings of this mini-dissertation suggest that changes by some farmers to farmer-related threats to cheetah survival, on specific commercial farms in central Namibia, have taken place since 1991. These changes are both positive and negative in terms of cheetah survival on these farms.

Although it was found that cheetah continued to be persecuted by the majority of farmers interviewed, the margin of this majority has reduced since 1991. The evidence that there has been a marked decline in the number of farmers persecuting cheetah and that more farmers like having cheetah on their farms than those who do not, engenders hope for the persistence of cheetah on these farms. There is qualitative and circumstantial evidence to suggest that changes in attitude in favour of cheetah and a decline in persecution levels of cheetah by some farmers can be attributed to the awareness raising efforts of the CCF.

On the down side of the research findings there is an increase in land use for game farming. This may thwart the gains made in the improvement of cheetah survival outlined above, since game farming has been found to be positively associated with increased persecution of cheetah on commercial farms in central Namibia.

8.2 RECOMMENDATIONS

Survey sample

The scope of this study did not allow for the survey of a large sub-sample of the original farmers surveyed. It would be useful to resurvey all the farmers originally surveyed by the CCF to establish if there are any trends in changes to known farmer-related threats to cheetah survival.

Conservancies

The use of conservancies as a vehicle for integrating cheetah conservation and farming activities needs to be investigated.

Game farming

Since the early 1970's authors have stated that game farming is a significant threat to cheetah survival and there appears to be an increase in game farming on commercial farms in Namibia. Research into ways in which to best influence game farmers to tolerate cheetah and the circumstances that possibly influence game farmers to remove cheetah, e.g. game farm size, game species and herd sizes, the type of game farm (e.g. trophy hunting, eco-tourism), could make a useful contribution to cheetah survival.

Livestock farming

Progress appears to have been made in moderating livestock farmer-related threats to cheetah survival, but continued conservation efforts to improve farmer- cheetah relations are vital to build on the progress that has been made to date. A sense of pride that the farmers who do not persecute cheetah could feel, knowing that their farming activities are in harmony with cheetah survival could be fostered by conservation organisations.

The efficacy of livestock management strategies to avoid predation on calves needs to be investigated as well as the reasons and circumstances under which farmers implement strategies to prevent predation.

Changing land ownership

The tendency for private land to change ownership over time, requires that for the continuation of cheetah conservation, new farmers need to be included in cheetah conservation awareness-raising programmes. Ways of making sure that this happens needs to be investigated.

CCF conservation efforts

The CCF would be prudent in continuing to support and acknowledge farmers who favour cheetah survival. These farmers could influence other farmers to take a like-minded approach towards cheetah on their farms. Research into what types of awareness raising efforts are effective in changing farmers' attitudes and behaviour would be useful.

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PERSONAL COMMUNICATIONS

Laurie Marker, Executive Director of the Cheetah Conservation Fund, Namibia. A vice-chair for The IUCN Cat Specialist Group, April and September 2001.

Jaco van der Merwer, Meat Board of Namibia, Windhoek, Namibia, November 2001.

Gerhardt Verdoorn, Deputy Director of the Endangered Wildlife Trust, Chairperson: Posion Working Group, Endangered Wildlife Trust, Johannesburg South Africa, October 2001.

APPENDIX ONE

f/b

FOLLOW UP QUESTIONNAIRE

SECTION A

1. Farmer's surname and initials
2. Postal Address
3. Telephone numbers
4. Farm name
5. Farm number

   Size of farm
6. *Have you bought additional land adjoining this farm or sold any in the past 10 years if so how many hectares?*
7. *Are you part of a conservancy? Y / N If yes, which one?*
8. *If any what are the conservancies rules/guiding principles regarding cheetah, please explain*
9. Type of farm,

   livestock farm,

   cattle

   goats Y / N...numbers.....

   Sheep Y / N ....numbers.....

   Horses Y/ N ...numbers.....

   livestock and game hunting farm

   livestock and guest farm with no hunting

   game farm (hunting and guest farm / guest farm only / hunting farm only)

   Has this changed in the last 10 years? Describe

   If cattle farm. How many cattle on average over the past 10 years have you kept per year..... How many of these cattle are of these are cows.....

   Did you reduce the number of cattle you had during the drought years Y /N. If yes how many cattle did you keep during the drought years?

   Do you have a calving season Y / N Give details

   Oct/Dec

   June/Aust

Other

11. A) Do you have a game camp Y / N

    Have you game fenced the farm in the last 10 years? Y / N If yes How many hectares is game fenced?

    Is the game fence electrified? Y / N

    Do cheetah get into the game camp? Y / N give details if possible(numbers and sex and age and dates)

    b)How do you prevent cheetah from getting into the game camp/

    c)What do you do if cheetah get into the game camp?

    d)Do you think there is more bush, less or stayed the same in the past 10 years?

    e) Do you think the bush has increased/decreased or stayed the same in the past 10 years?

12. What game species do you have in the game fenced area and how many do you estimate of each type?

    Hartebeest

    Kudu

    Gemsbok

    springbok

    Warthog

    ostrich

    Blesbok

    Wildebeest blue

    Wildebeest black

    Eland

    Steenbok

    Giraffe

    Others: give details please

13. What game species do you on the farm and can you estimate how many of each species

    Hartebeest

    Kudu

    Gemsbok

    springbok

    Warthog

ostrich

Blesbok

Wildebeest blue

Wildebeest black

Eland

Steenbok

Giraffe

Others: give details please

Have the numbers of each game species decreased / stayed the same/ increased during the past 10 years, can you give details of which species and by how many?

Why do you think this has happened?

14. How many stock losses have you had in the past 10 years due to cheetah?

calves age under 1 /2 /3/4 months old or other age

goats

sheep

other(name)

game (if yes which species)?

How do you tell that the loss is due to cheetah? Please give details

15. How many stock losses have you had in the past 10 years due to leopards?

calves age

goats

sheep

#other (name)

How do you know when stock is lost to leopard? Please give details

16. How many stock losses have you had in the past 10 years due to other predators which are these?

calves age

goats

sheep

#other (name)

17. a) During the past 10 years has the number of cheetah on your farm increased / decreased or stayed the same (I /D /same)

b) What makes you think this?

Increase or decrease of stock losses,

More or less sightings?

More tracks

More trapped

More shot

Other reasons?

c)Why do you think this has happened?

Decreased persecution of cheetah due to awareness that cheetah are not really a problem for livestock farmers, laziness, conservation efforts

More prey

Increased awareness of the value of cheetah for trophy hunting

No market for live captured cheetah

Other reasons

18 *How many cheetah have you actually seen in the past 10 years. Please give detail if possible*

Cheetah numbers Ages (cubs/ adults Date (month / year)

Where do you see the cheetah?

How often do you see cheetah tracks

19. Do you think you have a cheetah problem? (yes/no)? Please can you give details, why / why not and what the problem is?

20. *During the past 10 years would you consider your cheetah problem to be : greater/ lesser / no problem*

21. During the past 10 years has the number of leopard on your farm increased / decreased stayed the same

What makes you think this?

More or less sightings

More/less spoor?

Other reasons?

Why do you think this has happened?

22. Do you think you have a leopard problem? (yes/no)? Please can you give details, why / why not and what the problem is?

23. Do you have problems with other predators, which are these and what is the problem?

24. During the past 10 years would you consider your leopard problem to be greater, less, no problem?

25. Do you have a leopard problem?(yes/no) why/why not
26. Please list problems you have had with other predators the 10 years

    Jackal

    Lynx

    Baboon

    Domestic dog

    Other
27. Do you use poison to kill predators on your farm Y/ N If yes please can you give details?
28. During the past 10 years how many cheetah (age and sex) did you remove?

    # cheetah trapped age sex date

    # shot

    #other methods(name)

    During the past 10 years how many cheetah have you found dead on the farm? What do you think was the cause of death?

    During the past 10 years how many leopard (age and sex) did you remove

    # leopard trapped age sex date

    # poisoned

    # shot

    #other methods (name)
29. *Do you think predators play an important role in the farmland ecosystem? Explain why/why not?*
30. Do you trophy hunt cheetah? Y/N

    If yes how many have you trophy hunted in the past 10 years? Please give details

    Males

    Females

    Cubs

    If no would you like to trophy hunt them?

    What price do they fetch as a trophy?

    Between 0 and 5000 between 5000 and 10 000

    Have you signed the Cheetah Compact?
31. How much livestock loss per year from cheetah would you tolerate before you would consider doing anything about the cheetah. What would you do if the losses became intolerable?

32. Do you have cheetah playtrees on your farm? Y / N If yes how many?

SECTION B

1. *How much did you learn about cheetah from the CCF nothing □/ a little □/ a great deal □? Can you give some details.*
2. *Did the information change what you knew about cheetah a great deal □/very little □/not at all □? Can you explain*
3. *Do you like □/ dislike □/ don't mind □/ strongly dislike □ having cheetah on the farm. Please can you explain*
4. *Do you think your attitude has changed over the past 10 years towards having cheetah on the farm, did you like □/didn't mind □/ disliked □/strongly disliked □. Can you explain why this happened and how your attitude changed*
5. *Do you still receive the CCF newsletter? Y□/N□*

   If no? Have you ever received it, would you like to receive it again? Y □/ N □

   If yes, do you think the information is

   useful, □

   very useful □

   not useful□

   If no what to you suggest they provide information on?
7. *Do you think the CCF has the farmers interests in mind? Y□/ N□*

   If no? who's interest do they have in mind and why?
8. *If yes? How does CCF demonstrate this?*
9. *Have you contacted CCF with cheetah problems? Y□/N□*

   If yes what was the problem and what was their response

   Were you satisfied with their response? Y□/ N □

   If no? what do you wish they had done?

   If you have a cheetah problem would you contact the CCF? Y □/N □

   If you trapped cheetah would you contact the CCF Y □/N □

   If no would you contact anyone else? Y □ / N □ Whom?
10. *Has the CCF helped provided you with livestock or game management ideas to prevent cheetah predation? Y□/N□ Please give details*
11. *What do you do to prevent cheetah predation on livestock.*

    Shoot cheetah □

    Trap cheetah □

Make sure young calves are kept in the kraal ☐

Cows with young calves are kept close to the homestead☐

A cowherd guards the calves ☐

Keep donkeys with the cattle☐

Keep cattle that are protective which type ☐

Which type are those………………………………………….

Cull cows that have lost calves to cheetah ☐

Smallstock have a shepherd with them at all times ☐

Smallstock have a guard dog with ☐

Other methods please give details

12. *Have you always managed your livestock in these ways. Y /N If no what changes did you make over the past 10 years and why. Please give some detail.*

13. *Do you know about the CCF guard dog programme? Y*☐ */ N* ☐

    How did you find out about it?

14. *Do you have an Anatolian dog from CCF? Y* ☐*/ N* ☐

    If no would you like one? Y ☐ */ N* ☐

15. *What would you do if cheetah became a problem (please tick all the options that you use)*

    Do nothing

    Shoot cheetah

    Trap cheetah

    Make sure young calves are kept in the kraal until they are too large to be taken by cheetah … what age is this 3 mths 4 mths other (state age)

    Cows with young calves are kept close to the homestead☐

    Cows with young calves are kept away from cheetah areas☐

    A cowherd(worker) guards the calves☐

    Keep donkeys with the cattle☐

    Keep cattle that are protective, which type are these

    Cull cows that have lost calves to cheetah☐

    Smallstock have a shepherd with them at all times☐

    Smallstock have a guard dog with them☐