The Status of the Cheetah in South Africa

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The distribution of cheetahs *Acinonyx jubatus* in South Africa appears to have increased over the past 25 years. This is due to a change in land use from cattle ranching to wildlife ranching. The largest part of the cheetah population occurs outside conservation areas on privately owned ranch land. The Kruger National Park and the Kgalagadi Transfrontier Park are the two most important conservation areas for cheetahs due to their large size and pristine habitat. The main threats to cheetahs are focused outside conservation areas and are the illegal trade, unregulated captive breeding and persecution. International trade in cheetahs is regulated by CITES and there is no quota for hunting of cheetahs. However, hunting trophies originating from the wild and captivity have been exported with CITES permits. Several programmes are in place aiming at conserving cheetah. Research is done both inside National Parks and on ranch lands. The National Cheetah Conservation Forum of South Africa (NCCF-SA) is an active forum with members from various organisations involved in cheetahs from conservation organisations, government departments, captive breeders, biologists, hunters and landowners. There is a relocation programme in place where cheetahs are relocated from ranch land to enclosed reserves to form a metapopulation. The most important steps to conserving cheetahs in South Africa have been identified as: metapopulation management, regulation and formalisation of the captive breeding industry, curbing the illegal trade, addressing persecution and conflict management and further research on cheetahs.

Historical Distribution

Early historical records of cheetah distribution in South Africa are not comprehensive. However, it has been suggested that cheetahs were widely distributed through Africa in all suitable habitats from the Cape of Good Hope to the Mediterranean (Marker 1998).

More specifically, there have been several historical reports of cheetahs from the Beaufort West area in the Western Cape province. Jackson reported in 1919 that five cheetahs were killed in the Beaufort West district in the 1860's (Skinner & Smithers 1990). Additionally, the Zoological Society of London purchased a young live male aberrant cheetah that originated from the Beaufort West area and lived in the Zoological Gardens for many years (Sclater 1877).

Cheetahs were recorded at Goodhouse on the Orange river in the Northern Cape province in 1840 (Backhouse 1844), where they were said to be locally common (Skead 1980). Cheetahs were also recorded in the Bushmanland and Kenhardt districts (Shortridge 1942).

Myers (1975) recorded a sighting of cheetahs near the Brak river in the Zoutpansberg region of the Limpopo province (formerly Northern Transvaal) in 1966. Several reports of skins and sightings of king cheetahs were also received from the Limpopo province (formerly Northern Transvaal) and Mpumalanga (formerly eastern Transvaal) areas (Hills & Smithers 1980).

Cheetahs were reportedly exterminated from the Kwa-Zulu Natal province by the 1930's, but were reintroduced from Namibia to several reserves in the province during the 1960's and 1970's (Skinner & Smithers 1990).

Current distribution and population trend

Distribution

The most recent and accurate published distribution map in the Red Data Book (Friedmann & Daly 2004) shows cheetahs occurring throughout the northern part of South Africa from the Northern Cape, North West province and into Limpopo (Fig. 1). Approximately 125,150 km^2 of land are suitable cheetah habitat in South Africa (Boitani et al. 1999) of which approximately 55,654 km^2 are under formal conservation including the Kruger National Park and surrounding reserves, Pilanesberg National Park, Hluhluwe-Umfolozi Park, Phinda Resource Reserve and Kgalagadi Transfrontier Park (Friedmann & Daly 2004). Formal conservation areas account for 44.5% of the area that is suitable for cheetahs in South Africa.

Recent field studies by the De Wildt Wild Cheetah Project have been used to produce an updated distribution map for cheetahs (Fig. 1). These data were collected by questionnaire surveys, complaint records and informal reports of cheetah sightings.

This distribution map only includes cheetahs which occur naturally and are free roaming and not confined in small reserves. There have been cheetah relocations into several reserves in various parts of South Africa where they were previously extinct. While many of these cheetahs have bred and can be regarded as being successful re-introductions, these cheetahs need to be managed intensively for genetic reasons by means of a metapopulation management plan in order to ensure their long term viability. The locations of these isolated relocated populations are shown in Figure 1.

Trends in cheetah population

The general feeling among wildlife ranchers and field workers is that there has been an increase in cheetah numbers in recent years which has been attributed to a recovery of prey populations due to the increase in wildlife ranching . Today, cheetah sightings are not uncommon in the Limpopo province (formerly Northern Transvaal), where in the 1960s and 1970s observations were rare.

The wildlife ranching industry appears to have reached capacity and development of new ranches has slowed considerably over the past five years. Anecdotal information from the De

Wildt Wild Cheetah Project as well as the National Cheetah Conservation Forum of South Africa (NCCF-SA) suggests an increase in tolerance levels towards cheetahs on wildlife ranches and a subsequent decrease in complaints about cheetah predation.

Situation in conservation areas

Kruger National Park is South Africa's largest protected area covering approximately 20,000 km^2 of woodland savanna, with a further contiguous 2,000 km^2 of private reserve along its western border. Pienaar (1963) reported that cheetahs were never abundant in the Lowveld in historical times. His assessment of numbers was 219 (Southern District 81, Central District 93, Northern District 45). In a later publication (Pienaar 1969) he wrote "the latest estimates of numbers (1964) indicated that there were no more than 263 of these sleek and graceful carnivores in the whole Park." This estimate, and presumably the first one mentioned above as well, were reportedly made from a register system whereby accurate records were kept of all sightings by rangers of the species. A predator log was kept and the sight records pin-pointed on a special grid-map to indicate numbers and distribution patterns. It is however impossible to verify the accuracy of these early assessments.

The next attempt to count the number of cheetahs in the Kruger National Park was by Bowland & Mills (1994) using photographs taken by tourists to identify individuals. Between October 1990 and November 1991, 172 individuals were identified, made up of 82 in the Southern District, 60 in the Central District and 30 in the Northern District and giving an overall density of 0.88 cheetahs /100 km^2 Home range size for 18 cheetah groups varied between 104 and 1,848 km². In male coalitions there appeared to be an inverse relationship between group size and home range size while in female groups the relationship appeared to be direct. Some male ranges overlapped extensively whereas others were more exclusive.

In a similar study, but of shorter duration between October 2004 and April 2005 by Kemp & Mills (2005), only 103 cheetahs were identified, 34 in the Southern District, 54 in the Central District and 14 in the Northern District. Rarefaction analysis of these data showed that not enough animals were "captured" for a satisfactory population estimate and the figure given should be regarded as a minimum number. Evidently a longer study period is required in order to obtain a sufficient number of individuals to estimate population size.

Fig. 1. The distribution of free roaming cheetahs in South Africa. Red polygons show the latest published distribution map from the Red Data Book while the green area shows the updated distribution map from the De Wildt Wild Cheetah Project field records. Locations of enclosed reserves that have re-introduced cheetahs are also shown.

Kgalagadi Transfrontier park covers an area of 36,000 km^2 in South Africa and Botswana, of which 9,600 km^2 are in South Africa. It is an arid savanna region. Mills (1990) thought that there were about 60 cheetahs on the South African side. A photographic survey similar to that in Kruger between June 1998 and July 1999 identified 80 individuals made up of 31 males, 19 females, 4 unknown and 26 cubs (Knight 1999). These animals were nearly all recorded along the two dry river-beds that run through the area and where tourist activity and springbok are concentrated. Both sexes range widely and appear to be attracted to the riverbeds. An intensive 5-year study has recently been initiated by Mills (2006) which will look at aspects of the behavioural ecology and conservation of the cheetah in the park. Because of its large size and pristine nature, the Kgagaladi Transfrontier park is also a very important cheetah area with a viable population living in a natural ecosystem.

*Marakele National Park (*502 km^2) is in the Limpopo province near the town of Thabazimbi. The size and structure of resident population is unknown but it was supplemented during 2003. Cheetahs are frequently sighted and it is thought that the cheetah population in the park is stable.

Mapungubwe National Park (53 km^2) is not surrounded by predator proof fence. Cheetahs do occur naturally in that area, these free roaming cheetahs move freely in and out of the park, but little is known about the population.

Other Parks: Several national parks in the arid zone of South Africa, in particular Karoo (831 km^2), Mountain Zebra (284 km^2), Richtersveld (1,624 km^2) and Addo Elephant (16,423 km^2) are suitable areas for cheetah and are generally expanding in size. SANParks is considering reintroducing cheetahs into at least some of these parks, with the expanded Mountain Zebra Park receiving cheetahs late in 2007. A metapopulation management program whereby all subpopulations can be managed as a single population has to be developed for these parks and all other smaller reserves that have cheetahs.

Habitat

Cheetahs occur almost exclusively in the Savanna Biome (Low & Rebelo 1998). This biome is the largest in southern Africa and covers almost one third of the area of South Africa (Low & Rebelo 1998). A grassy ground layer and distinctive upper layer of

Table 1. The provincial distribution and extent of wildlife production units WPUs in 2001. Source: Bothma (2005).

Province	No of fenced WPUs	% of WPUs	Size (km^2)	% of size	Mean size WPUs (km^2)
Gauteng	72	1.42	821	0.8	11.40
Western Cape	82	1.62	2,652	2.6	32.34
Kwa Zulu-Natal	90	1.78	1,688	1.6	18.76
Free State	180	3.56	1,477	1.4	8.21
Mpumalanga	205	4.05	2,760	2.7	13.46
North West	340	6.72	3,649	3.5	10.73
Eastern Cape	624	12.33	8,816	8.5	14.13
Northern Cape	986	19.48	48,521	46.8	49.21
Limpopo	2,482	49.04	33,257	32.1	13.40
TOTAL	5,061	100%	103,642	100%	Nat mean 20.47

woody plants characterise the biome. Where the woody upper layer is near the ground, the vegetation is described as shrubveld (Fig. 2), where it is more dense it is referred to as woodland and the intermediate stage is locally referred to as bushveld.

Most vegetation types that make up this biome are utilized for cattle and wildlife ranching. Urbanisation is not a threat, probably because the hot climate and diseases historically hindered urban development (Low & Rebelo 1998). Due to the presence of the large Kruger National Park and Kgalagadi Transfrontier Park, the biome is adequately conserved, however while this is a large area, half the vegetation types in the Savanna biome are not adequately conserved with less than 5 % of their area in reserves (Low & Rebelo 1998).

However, most of this biome is utilised for wildlife ranching, and to a lesser extent for cattle ranching. Thus, if sustainable stocking levels are maintained on private ranches, this biome can be considered secure. This highlights the importance of the role of the private landowner in the long term conservation of the free roaming cheetah population is South Africa. It is estimated that currently over 17 million hectares of land in South Africa are used for wildlife production (Bothma 2005).

Fig. 2. The Thabazimbi district in the Limpopo province lies in the Savanna biome and the main vegetation type is mixed bushveld. The main land use is wildlife ranching. (Photo K. Marnewick).

Land use changes

Outside conservation areas, most of South Africa's free roaming cheetahs occur in the Limpopo province. Over the past 20 years, there has been a shift from cattle to wildlife ranching in this province. This is reflected in the number of new exemption permits issued annually by the provincial nature conservation authority these increased from 1983, when only four new permits were issued, to a peak of 207 permits in 1991 (Van der Waal & Dekker 2000). It is estimated that conversion from livestock to wildlife ranching takes place at a rate of 2 - 2.5% per annum (Bothma 2005). This shift in land-use practice is due to the ecological and economic advantages of multi-species wildlife production systems in this semi-arid savanna area (Bothma 2002, Van der Waal & Dekker 2000).

In 2001 there were 5,061 wildlife ranches in South Africa covering an area of 103,642 km^2 (Table 1, Bothma 2005). The Limpopo province contains 2,482 of these wildlife ranches covering an area of 33,257 km^2 (Bothma 2005). As a result of the change from cattle to wildlife ranching, most of the ranches have been surrounded with game fencing (Fig. 3) and are being stocked with wildlife for the main purpose of hunting and live sale. With the exception of cheetahs, brown hyaenas *Parahyaena brunnea* and leopards *Panthera pardus*, no free-roaming large carnivores occur on these ranches. This lack of intra-guild competition is perceived by some authors to be a situation that could benefit cheetah survival (McVittie 1979, Laurenson *et al*. 1995). However, these ranches are kept for economic gain from the wildlife. This means that cheetahs preying on the antelope represent an economic loss to the landowner and conflict occurs.

Generally, South Africa's National Parks have increased in size over the past 15 years and will probably increase in the future too. This is due to the formation of trans-boundary protected areas e.g. Kruger and Kgalagadi as well as the amalgamation of private reserves into National Parks. However, human populations on the borders of parks are increasing rapidly, this could put pressure on parks for resources and increase conflict with humans and wildlife on park boundaries.

Diet

In the Kruger National Park, Pienaar (1969) listed 2,527 cheetah kills recorded by park rangers between 1936 and 1946 and 1954 and 1966 of which 68% were impala *Aepyceros melampus*, but reedbuck *Redunca arundinum* were found to be taken preferentially taking into account overall abundance. In a more intensive study of radio collared individuals in the south east of the park, Mills et al. (2004) recorded impala as making up 45% of the kills with smaller species such as steenbok *Raphicerus campestris* being utilized by females and the young of larger species such as kudu *Tragelaphus strepsiceros* being taken by males.

In Kgalagadi, Mills (1990) recorded that 86.9% of 229 cheetah kills were springbok *Antidorcus marsupialis*, although these data were mainly from rangers' observations and were biased towards the river-beds. Labuschagne (1979) and more recently Mills (personal observations) covering more representative habitats have recorded a wider diet with gemsbok *Oryx gazella* calves, steenbok and springhares *Pedetes capensis* (hunted at night) making up a larger proportion of kills than recorded by Mills (1990).

Outside conservation areas, little information is available on cheetah diet. This is due to the elusive nature of cheetahs and the thick bush. Wilson (2005) did a small study on scat content collected on wildlife ranches in the Thabazimbi district and found that 49% (n=19) of the scats contained duiker *Silvicapra grimmia* hair and 24% (n=9) of the scats contained impala hair (Fig. 4).

Wildlife ranchers report high rates of predation on blesbok *Damaliscus dorcas phillipsi*, in the Limpopo province (De Wildt Wild Cheetah Project). Many wildlife ranches do not stock blesbok anymore as they report losing entire herds over a period of as little as two years. There is no hard evidence that cheetahs are solely responsible for this predation, and other predators and disease may also have an impact. In addition, blesbok do not occur naturally in this area and were introduced for the purpose of hunting, which may explain their poor survival. More recently ranchers are reporting losses to ostrich *Struthio camelus* populations.

Fig. 3. Cheetah photographed using a TrailMaster camera trap on the ranch Merriepan in the Thabazimbi district of the Limpopo province. The typical game fence, gates and dense vegetation are evident. (Photo K. Marnewick).

Predation on livestock does occur, but is not common. In the Thabazimbi district, one domestic calf has been confirmed as killed by cheetah and one cheetah was trapped at a goat kraal. In Lephalale, one landowner with a permit, shot a cheetah in a kraal and another in Alldays reported loosing sheep in the kraal (De Wildt Wild Cheetah Project). Very few reports of predation on livestock have been positively confirmed since 2000.

Health

In the wild

As part of the De Wildt Wild Cheetah Project gastric biopsies have been taken from wild caught cheetahs kept in captivity briefly before being relocated to develop a database of health status of free-ranging cheetahs. Full necropsy examinations and disease evaluations of free-ranging cheetahs are done where possible and a database on disease in free-ranging cheetahs is maintained at the Zoological Pathology and Research program of the National Zoological Gardens, Pretoria.

In captivity

An annual evaluation is done of the health of adult cheetahs at De Wildt Cheetah Centre and Cango Wildlife Ranch. This includes routine haematology and renal function biochemistry, as well as gastritis scoring using endoscopic biopsies. A comparison of disease prevalence between cheetahs housed at several different southern African institutions, including De Wildt Cheetah Centre, Cango Wildlife Ranch, Hoedspruit Centre for Endangered Species, assorted small cheetah breeding centres, and Cheetah Conservation Botswana is ongoing. A study using Polymerase Chain Reaction (PCR) for detection and sequencing of Coronavirus in cheetah faeces is conducted as part of a worldwide study of Corona virus in cheetahs.

Tremendous variation exists in the prevalence of gastritis and other diseases between institutions keeping captive cheetahs and between cheetahs housed in southern Africa and those in America and Europe. Individual susceptibility to gastritis, progression of gastritis and response to treatment for gastritis is also highly variable (Lane *et al*. 2004). Additionally, the incidence of clinical renal disease appears to reduce dramatically if severe (Grade 3) gastritis cases are treated annually with standard triple therapy combinations. The mean age of death

Fig. 4. Little is known about the diet of cheetahs outside conservation areas. It seems that the impala is one of the main prey species in the Thabazimbi district. (Photo L. Strugnell).

due to gastritis and gastritis associated renal disease drops dramatically if severe (Grade 3) gastritis cases are treated.

Preliminary results of the nutritional trial at De Wildt Cheetah Centre indicate that cheetahs fed a horse and chicken meat diet supplemented with a vitamin and mineral mix develop gastritis sooner than those fed a commercial diet formulated for domestic cats with renal disease. Commercial feline diets for renal or intestinal disease improve clinical status of at least some cheetahs with renal disease and/or gastritis.

Genetics

A *National Genetic Database* for cheetah has been established at the Agricultural Research Council (ARC). In this central database all information on captive and wild cheetahs in South Africa (including Namibia, Botswana and other countries) is recorded. The success of this Database is fully dependent on the co-operation of all breeders, keepers and conservationists of cheetah in South Africa. Information stored in the Database includes the following:

• Individual information such as unique animal identification numbers, birth date, sex, age, parents, place of birth, numbers born, population of origin, transponder number, etc.
• DNA profiles of captive and wild cheetah in South Africa using microsatellites and other genetic markers.

This information will provide the following valuable outputs:

• Overall statistics such as group DNA reports, genetic variation estimates for breeding populations (inbreeding values, homo- and heterozygosity values, genetic distances among breeding populations).
• Information for cheetah from all breeders in one central genetic database will be important for assistance in breeding plans and strategies.
• Full pedigrees to assist with breeding strategies.
• National survey of cheetah numbers.

Samples have been obtained for 360 wild and captive bred animals. At present, microsatellite genotyping with 16 markers have been completed. Although the three genetic studies may each include additional markers, a panel of 12 microsatellite loci, originally described from the domestic cat genome, has been selected to ensure comparable data between the South African studies as well as between the local studies and ongoing international studies.

This research is being conducted at the National Zoological Gardens (NZG), Ms Karen Ehlers (UFS) and Prof Paul Grobler (University of Limpopo). The ARC (Genetics Division) will be responsible for the long-term maintenance of the database.

Scatology as a non-invasive conservation tool for the cheetah in South Africa

Non-invasive methods for gathering genetic information are vital for the study of species that are elusive, nocturnal, wide ranging or highly endangered because they can be implemented without having to capture or harm the animal or cause it any unnecessary stress (Creel *et al*. 2003, Gottelli *et al*. 2007). The aim of this project is to determine the accuracy and reliability of scatology as a non-invasive tool for the conservation of cheetah in South Africa by comparing blood and faeces obtained from corresponding animals. This will facilitate population management decisions by providing useful genetic information on the cheetah found at specific localities.

Onderstepoort Genetics Laboratory Cheetah Genetics Project

The main objective of the South African Cheetah Conservation Genetics Project is to share resources and expertise to address several priority questions for the conservation of cheetah in the country. The genetic information gained from these projects will be used as a tool for the establishment of active conservation management strategies for both wild and captive bred cheetah.

The human population

South Africa's human population is

growing at a rate of 2.2% per year which is higher than the 1.3% per year for the rest of the world and above the 1.6% per year for other developing countries (Cincotta et al. 2000). There is a tendency for human population densities to be particularly high in areas surrounding current reserves, and hence pressure on reserves is expected to increase in the future (Harcourt, Parks and Woodroffe 2001), resulting in increased conflict between humans and wildlife. There have been some land claims on properties owned by white commercial farmers. Such land claims have occurred in specific isolated areas and have as yet had very little impact on any of the cheetah range areas. The main threat to cheetahs would come from a change in land use practices, either by fragmentation of habitat or loss of prey species.

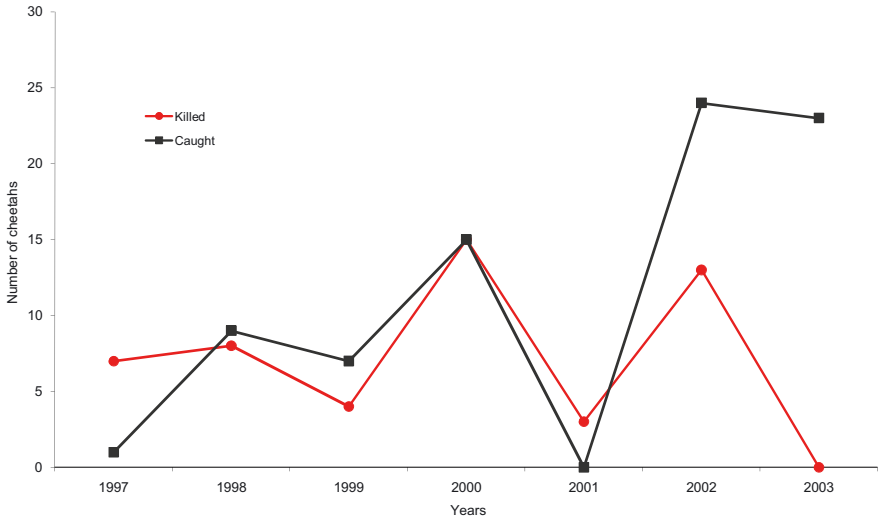

Fig. 5. Caught and killed cheetahs from properties in the Molopo area from 1997-2003.

Threats

The illegal trade in cheetahs

Current legislation in South Africa allows for the commercial breeding of predators including cheetahs. Several species of predator are bred by some landowners for sport hunting, this type of hunting is often referred to as 'canned' hunting. This practice can provide a substantial source of income. Currently large predators such as lion and leopard as well as some of the smaller cat species can legally be hunted in South Africa.

Most of the above mentioned captive breeders who breed predators for commercial purposes also breed cheetahs. These facilities often obtain their cheetah breeding stock from the wild free roaming population which occurs on ranchlands in the North West, Northern Cape and Limpopo Provinces. These cheetahs are generally illegally captured and sold by landowners. Additionally, cheetahs are not only captured in South Africa but also in Botswana and Namibia.

In Botswana, cheetahs are reportedly captured by locals and sold to ranchers in South Africa who in turn sell the cheetahs to captive facilities (Klein 2007). This takes place mostly in the Bray/McCarthysrest area of the North West Province. Here the border between the two countries is a dry river bed with a cattle fence and gates, making it easy to smuggle cheetahs into South Africa without going through any border post. It is reported by reliable sources that these cheetahs end up in captive facilities in the Eastern Cape, Western Cape and Free State Provinces. Generally, wild cheetahs do not make successful breeding animals, resulting in these wild cheetahs being exported as captive bred animals . This is done by microchipping the cheetah and claiming that it is captive bred. A CITES permit is then issued and the cheetah is able to leave the country legally. There are currently no laws that demand DNA certificates to prove parentage.

Cheetah cubs are also reported to be smuggled into South Africa from Namibia by animal traders who then export wild born cubs as captive born cheetahs to zoos and safari parks. The main culprits involved here are the larger animal and bird traders in South Africa. Cheetahs are also reportedly trapped in South Africa and smuggled into Namibia where they are 'canned hunted' on the Namibian CITES quota. Reliable sources estimate that approximately 60 cheetahs are traded illegally each year.

The current permitting system in South Africa simply requires that a cheetah has to be fitted with a microchip and this is the only proof required to export cheetahs as captive bred animals from South Africa. Captive breeding facilities in South Africa are not required to be members of ISIS (International Species Information System, www.isis.org) or any other recognized studbook.

The National Cheetah Conservation Forum of South Africa lobbying for compulsory membership to an international studbook as well as a regional DNA database for captive facilities in South Africa. The NCCF-SA is also requesting that no cheetahs be exported from South Africa, or moved inside South Africa without genetic proof of its origin.

Persecution and retaliatory killings

Because most of South Africa's cheetah population occurs outside conservation areas on privately owned cattle and wildlife ranches, conflict is widespread. The most common method used is to shoot on sight, however reports of running over with vehicles, trapping then shooting, gin traps, snares and poisoning have been received (De Wildt Wild Cheetah Project, Wilson 2005). Quantifying the extent of these killings is difficult as it is illegal to kill cheetahs. In a survey in the Thabazimbi district of the Limpopo province, Wilson (2005) reported that 71% of respondents (n=199) perceived cheetahs to be a liability and reported of 19 male and seven female cheetahs being killed over a period of three years from 1999 to 2001.

In 2004, the De Wildt Wild Cheetah Project conducted a questionnaire survey of landowners in the north western part of the Limpopo province. Here, 161 landowners were interviewed, 72 in the Vhembe and 89 in the Lephalale district, supplying information for 299 different ranches. Of these respondents, 56.5% had seen cheetahs on their properties. In the Lephalale district 48.6% of the

landowners who had cheetahs on their property perceived cheetahs as a liability while 25.7% felt cheetahs were an asset, the remainder either had no strong feeling or would not comment. In the Vhembe district, 34.4% of the respondents felt that cheetahs were a liability while 28% felt they were an asset and the remaining respondents once again did not comment or had no strong opinion.

In a survey in the Bray area of the North West Province Wilson (report to DW), reported 88% of the respondents perceived cheetahs as a liability and that 50% had removed cheetahs from their property. With the help of the local farmers union, the following graph was produced showing the trends in cheetah removals from properties in the Molopo area from 1997-2003. The increase in the number of cheetahs removed live is a reflection of the increased demand for live cheetahs on the black market (Fig. 5).

In contrast, in the Bela-Bela (formerly Warmbaths) area of the Limpopo province, 57% of respondents felt that cheetahs were an asset to them. This reflects the fact that ecotourism is one of the main land uses in the area and hunting is less popular than in the other study areas.

Unregulated captive breeding

In South Africa more than 500 cheetahs are kept in captive breeding facilities (see captive breeding section and Supporting Online Material SOM Table T1). Permits are required from the provincial conservation authority to hold cheetahs. However these permits are the only requirement and have very few conditions attached. There is at present no legislation enforcing membership of a stud book, accurate data bases, breeding records or a co-ordinated conservation plan. This means that most cheetahs in captivity are not contributing to a healthy, sustainable captive population. Additionally many facilities source their cheetahs from the wild, either legally or illegally, which impacts on the wild cheetah population. Some facilities even supplement their captive population with wild animals for genetic purposes. The captive breeding industry is often used as a cover for the black market trade. Hence current estimates of the number of cheetahs in captivity is not accurate.

Solutions

NCCF- advisory forum.

The De Wildt Wild Cheetah Project addresses conflict directly by responding to complaints from landowners. This involves visiting landowners on their properties, discussing their problems and possible solutions and showing the landowner how to correctly identify spoor and killing methods of the various predators. Capture is only used as a last resort where the landowner cannot be convinced to either leave the cheetah on the property or to collar and release it for monitoring purposes.

Workshops are organised by the De Wildt Wild Cheetah Project in collaboration with other organisations where the attendees are given presentations not only on cheetahs, but also other predators, poison, birds, bush control, veld management, government policy and anything else pertinent to wildlife and cattle ranching. Updates are also given on research findings of cheetahs on ranch lands. These workshops are generally ended with an informal meal and some lucky draws.

'Cheetah Friendly' is an initiative developed by the NCCF-SA that promotes the formation of predator 'safe areas'. Landowners sign a pledge with very basic criteria to be Cheetah Friendly. In return the landowner gets a sign for his gate and a certificate for his lodge. This concept can be developed further to include marketing opportunities for the landowner as well as by educating consumers to use Cheetah Friendly areas for their hunting trips and holidays.

Research

In order to better conserve cheetah outside protected areas, information is needed on their status, range use and potential impact on wildlife ranching. The De Wildt Wild Cheetah Project is running an intensive study of cheetahs outside conservation areas with the core study area in the Thabazimbi district of the Limpopo province. Questionnaire surveys, capture-recapture sampling using camera traps and range use studies are being done.

NCCF- advisory forum

In 2000 the National Cheetah Management Programme (NCMP) was formed. This programme was initiated by a group of landowners who were concerned about the free roaming cheetah on cattle and wildlife ranches. They approached the De Wildt Cheetah and Wildlife Trust looking for solutions to the conflict in ranching areas. The landowners and De Wildt organised a meeting with conservation authorities, landowners, conservation organisations and any other party with an interest in cheetah conservation. This meeting

Fig. 6. Trap set to capture cheetahs. Cheetahs identified as problem animals on cattle and wildlife ranches are trapped and relocated. The landowner is compensated. (Photo K. Marnewick).

formed the NCMP and established the compensation – relocation programme. The NCMP evolved with time to become the National Cheetah Conservation Forum of South Africa (NCCF-SA) which is a consultatory forum for all issues surrounding cheetah conservation. The NCCF-SA and its members are also actively involved in the guidance of government policy, development of best practice protocols and promotion of ethical practices.

Compensation Scheme

At the inaugural NCCF-SA meeting, it was decided that a compensation scheme was needed for damage causing cheetahs. This scheme was unique in that it was decided to compensate landowners for capturing live cheetahs (Fig. 6). These cheetahs would then be relocated into conservation areas where they are unable to escape and would be monitored. The financial aspect of the scheme was designed to be self-sustaining. The landowner is given R10 000 for the cheetah and the relocation venue gives a minimum donation of R15 000.00 for the cheetah. The R 5 000 balance covers the veterinary requirements of the cheetah in holding before relocation. The holding facility sources any other funds required for feeding, staff, transport, etc.

This scheme was well received by the landowners. South Africa is unique in that the wildlife industry is strongly driven by economics and therefore an economic incentive helped attract the attention and cooperation of landowners. However, this still remains a controversial programme both within and outside South Africa.

The De Wildt Cheetah and Wildlife Trust houses and administers this fund on behalf of the NCCF-SA. The compensation scheme has its own bank account and is managed independently. No cash payments are made for cheetahs, only electronic transfers are made and only after approval by the provincial conservation authority. Wild caught cheetahs are held in a dedicated holding facility which is separate and remote from any captive cheetahs.

Relocation Programme

Cheetahs that are received through the compensation scheme are kept in holding for a period of approximately three months. This allows the cheetah to have a veterinary check up, be fitted with a collar for subsequent monitoring and to become habituated to people and vehicles. This is necessary as relocation venues are usually eco tourism based and the cheetahs will need to be viewed by tourists.

Relocation venues are required to submit a management plan which must show that the reserve is ecologically able to hold cheetahs in a free-roaming situation for a minimum of two years without supplementing the prey population. A monitoring programme is compulsory.

From 2000 until the end of 2006, 136 cheetahs had been received of which 20 had to be placed in captivity as they were too young to be released (unweaned cubs), or were injured and deemed unfit for release (e.g. badly broken limbs, broken jaws, etc). Marnewick *et al*. (in prep.) have investigated the survival of relocated cheetahs onto 27 enclosed reserves in South Africa. Data for 186 cheetahs of which 92 were adults and 94 were cubs born on reserves were analysed using Kaplan-Meier estimator (product limit estimator) with staggered entry (Pollock *et al*. 1989). The mean annual survival of cheetahs was 77 % over a five year period. The main cause of death of relocated cheetahs was due to conflict with lions, leopards and other cheetahs. The challenge now is to develop an effective metapopulation management plan for these cheetahs. Removing cheetahs from ranch lands cannot continue indefinitely and in the longer term other solutions need to be investigated to maintain cheetahs on ranch lands.

Fig. 7. Anatolian guard dogs are used to protect small livestock. Trials have now started using guard dogs to protect cattle (Photo L. Strugnell).

Education and Outreach

In South Africa 'cheetah ambassadors' have been used to educate and transform the opinions of young African learners. The cheetah is used as a learning tool in the natural science curriculum and the programme is in line with the Outcomes Based Education Curriculum. Well trained cheetahs are taken into classrooms and following a visit, teachers are presented with a Natural Science Resource kit. The kit includes posters and lessons for learners and incorporates themes such as water conservation, anti-litter campaigns, creation of vegetable gardens and protection of habitats. The De Wild Cheetah and Wildlife Trust and Cheetah Outreach both deliver outreach programmes to local community schools and together reach approximately 36,000 learners annually.

Anatolian guard dogs (Adapted from Cheetah Outreach documentation)

As a result of the successful Anatolian guard dog initiative by CCF in Namibia (Fig. 7), a trial programme has been launched by Cheetah Outreach and

the De Wildt Wild Cheetah Project, to introduce the Anatolian to serve landowners of South Africa. To give this trial the best possible chance of success, landowners were carefully selected and given an information booklet, collated from CCF literature and experiences, outlining introduction and management strategies for their dogs, as well as veterinary protocols to ensure health. To promote a good working diet and veterinary care, costs are sponsored by the programme for the first year. There are currently nine dogs working successfully in cheetah range areas in South Africa. Due to the success of the Anatolian guard dog project in South Africa, Cheetah Outreach breeding the Anatolian for placement on ranch land. Trials have also begun on placing dogs with cattle.

National DNA database for captive cheetahs

A national DNA data base for captive cheetahs is managed by the Agricultural Research Council (ARC) Genetics Division. Each cheetah in captivity should be provided with a DNA certificate providing unambiguous and verifiable identification of individuals as well as proof of parentage. Ideally DNA certification should be legally required before any cheetah can be traded to prevent trading in wild under the umbrella of captive breeding. To date, however, it has not been possible yet to get this DNA certificate endorsed by government.

Policy and legislation

In South Africa, the nine provincial nature conservation ordinances and environmental management acts are relevant to cheetahs as well as the National Environmental Management: Biodiversity Act (NEMBA). The provinces can have stricter measures than NEMBA but may not be less restrictive. CITES is the only international treaty relevant to cheetahs in South Africa. New norms and standards for Threatened or Protected Species (TOPS) will be in place early in 2008.

The Red Data Book of the Mammals of South Africa (Friedmann & Daly 2004) classifies cheetahs as vulnerable due to an estimated population size of breeding individuals of just more that 250. However, it was noted that with the available data, cheetahs were close to being classified as endangered. The main threats were identified as direct loss or exploitation, especially outside conservation areas.

Sustainable use

South Africa does not have a CITES or local quota for trophy hunting of cheetahs. However, the CITES records show one hunting trophy of wild origin exported to France in 1997, two cheetah trophies leaving South Africa destined for Norway in 2002 and two more for Peru in 2005. According to the CITES records these cheetahs were hunted in South Africa and they were captive bred. While the hunting of captive bred animals is generally frowned upon for ethical reasons, the CITES criteria for exportation of hunting trophies is a non-detriment finding to the population in the wild. Therefore, hunting a captive bred animal would not, except in extreme cases, have a negative effect on the survival of the wild population, thus such trophies can be permitted.

Legal trade

Legal international trade in cheetahs is done under the CITES convention. A total of 428 specimens have left South Africa from 1996-2005. 399 (93%) of the animals were listed as of captive origin. Most cheetahs were transferred to zoos or other captive facilities abroad. The trade has increased during the past decade and lately some 50 specimens have been traded annually (SOM Table T2).

Captive breeding

In 2004 the NCCF-SA established a Captive Breeding Committee in order to facilitate any issues pertinent to cheetahs in captivity within South Africa. One of the tasks assigned to this group was to establish how many facilities were holding cheetah in captivity and to define the estimated population size. Of the 44 recorded facilities holding cheetah in captivity only eight can be classified as zoological parks, the balance being private reserves, safari parks, rehabilitation centers or breeding operations, all of which maintain cheetah in a controlled captive environment. It was determined that at least 11 of the 44 facilities were actively breeding cheetahs. The total population of 524 cheetahs is regarded as the minimum known animals in captivity at the time of the survey. The extent of the captive breeding industry is difficult to determine accurately due to insufficient records and privacy policies. The lack of sufficient record keeping and regulation makes the captive breeding industry an ideal channel through which the black market trade is operated. Captive breeding facilities need to be well regulated and audited to ensure that they operating legally and ethically.

Important steps for conserving cheetahs in South Africa

1. Regulate the captive breeding of cheetahs in South Africa. This includes an audit of all facilities, a compulsory stud book and DNA data base, development of breeding plans and conservation objectives as well as more effective permitting and control. DNA certificates proving parentage should be compulsory for all cheetah sales and movements.
2. Develop and implement a metapopulation management plan for cheetahs in isolated reserves. Cheetahs in small confined reserves represent a valuable genetic pool, but need genetic management in order to maintain overall genetic diversity of the population.
3. Eliminate the black market trade of cheetahs. This, to a large extent, will be achieved if the captive breeding industry is correctly regulated.
4. Promotion of 'Cheetah Friendly' ranching practices. More than 10,000 km^2 of land are currently Cheetah Friendly, this concept has to be further developed into a marketing tool for the rancher.
5. Continued research on status, range patterns and survival of cheetahs outside conservation areas to obtain long term information on cheetah population trends to guide management and conflict issues. Results of this research must be disseminated to landowners, conservation bodies and government officials.
6. Education of children, landowners and the general public about the role of the cheetah in the ecosystem and the importance of wildlife. This must continue through the outreach programmes, media and workshops for landowners.

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Supporting Online Material SOM

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Tables T1 and T2, Appendices AI to AIV