

# **NAMIBIAN CHEETAH CONSERVATION STRATEGY**

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**Submitted to the Ministry of Environment and Tourism, Govt. Of Namibia  
June 30 1996 and adopted that same year**

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## Acknowledgments

The author thanks a number of people whose input into this strategy was crucial. Most notable are the two nongovernmental organizations committed to improving cheetah conservation in Namibia: the Cheetah Conservation Fund and Africat. The directors, Laurie Marker and Lise Hanssen, took the time to provide unpublished information about their activities and to give their views on how cooperation with MET towards the common goal of conserving cheetahs on private lands could best be carried out. Also thanks to Dan Kraus, Wayne Hanssen, Axel Hartmann, Mark Jago and Heiko Theiss. The Namibian Professional Hunter's Association, and particularly their Rare Species coordinator, Jöchen Hein, as well as their secretary, Barbara Röschlau, also provided information and input into this strategy.

Within MET, Malan Lindeque is to be thanked for initiating the project. Peter Erb at the Etosha Ecological Institute put considerable time into designing and refining the deterministic population model used in this strategy. Dieter Morsbach, whose earlier studies on farmland cheetahs provided a basis of knowledge for design of appropriate management strategies, made many useful comments. Philip Stander provided unpublished data on cheetahs from his Bushmanland study, as well as critical input into modeling and design of population monitoring survey techniques. Pauline Lindeque provided information from MET's permit office. Johan LeRoux solved a variety of computer-related snags during preparation of this document. MET staff and volunteer researchers who worked on the Etosha cheetah study from 1992-1995 are also acknowledged for their contributions toward understanding this species' biology and ecology. EEI volunteer Delia Davies expertly translated Dieter Morsbach's cheetah studies from Afrikaans to English.

Safari Club International Louisiana chapter provided most of the funding necessary to carry out this project, largely due to the enthusiastic support of John Jackson III. The Namibian Nature Foundation, and particularly Tessa Marwick, adroitly administered the project.

The Namibian Cheetah and Lion Population and Habitat Viability Analysis, a workshop held by the IUCN/SSC Conservation Breeding Specialist Group in Otjiwarango in February 1996, provided a useful launching point for a detailed MET cheetah conservation policy.

My husband Tom Preisser made all the hard work possible.

## Executive Summary

### Part 1. Introduction to the cheetah and current domestic and international legislation and policy

#### *Purpose of the Namibian Cheetah Conservation Strategy*

**1. Importance of Namibia's cheetah population.** Namibia is believed to hold one of the largest national populations of cheetah throughout the species' range. This is a highly significant population of one of the

world's more endangered big cats. MET wants to ensure that this population is viable and effectively conserved.

**2. Cooperation with private sector.** However, it is not because the cheetah is in need of urgent recovery effort that this strategy was developed. The main reason is that, although cheetahs are a species under government protection, they occur mainly on Namibia's commercial farmland, where they are considered problem animals. Large numbers of cheetah have been removed from the population by farmers seeking to prevent predation on their livestock and game. Two nongovernmental organizations, Africat and the Cheetah Conservation Fund, are working with farmers to try to help reduce their losses. This situation warrants a close degree of MET cooperation with the private sector, and this strategy has been drawn up to structure a linkage between MET goals and private sector initiative.

### *The cheetah*

**3. Distribution and status, physiology, behavior and ecology.** The cheetah is probably the most specialized member of the cat family, in terms of both physiology and behavior. The cheetah has an extraordinary lack of genetic variation in comparison to other animals, but the conservation consequences of this are not clear. The cheetah is an arid-adapted cat which appears to have evolved to follow migrating antelope herds. The cheetah has very large home ranges in comparison to other cats, and its mating system is also different. The cheetah's use of large, prominent "play trees" for intraspecific communication and finding mates has made it vulnerable to trapping. Farmers set box traps near these trees. While the cheetah is roughly of the same vulnerability status as the lion, according to the IUCN/SSC Cat Specialist Group's Cat Action Plan, its situation is very much different. The lion's stronghold is the protected area network of Africa, but cheetahs tend to occur at low densities where lion numbers are high, so that conservation of cheetah outside protected areas is of key importance to conserving viable populations of the species.

### *Legislation and policy on the cheetah*

**4. International.** There is no international law mandating protection - that is, prohibiting hunting or fencing off habitat - for endangered species. It is up to each individual nation to determine how it wants to protect any endangered species occurring within its borders. The only aspect of endangered species conservation where an international treaty plays a major role is in international trade, which is governed by CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora. The cheetah has been listed on CITES Appendix I since 1975, and probably will remain there under newly developed listing criteria. Appendix I listing prohibits commercial trade in the cheetah. When Namibia joined CITES in 1992, other member nations voted to allocate a special export quota for Namibian cheetahs, allowing 150 live animals and/or sport hunting trophies to be exported every year. Namibia has not yet used its full quota, exporting only 42 cheetahs in 1994 (25 live animals and 17 hunting trophies). However, at least 150 cheetahs were removed from the Namibian population that year, primarily by commercial farmers seeking to protect their livestock and game.

**5. National.** The cheetah is classified as "protected game" under the Nature Conservation Ordinance of 1975. It is prohibited to hunt cheetahs without a MET permit except "in defense of a human life or to prevent a human being from being injured or protect the life of any livestock, poultry or domestic animal of such owner, lessee or occupier whilst the life of such livestock, poultry or domestic animal is actually being threatened." People who kill or capture cheetahs under such circumstances are required to report to MET within ten days. It is also forbidden to keep or transport cheetahs without a permit from MET. Import or export without a CITES permit is also prohibited.

**6. Recent MET policy on the cheetah.** In practice, the stricture that cheetahs may only be hunted to protect human life or while actually threatening livestock has been ignored. Many farmers have over the years shot or removed cheetahs from their land on a precautionary principle, viewing them as a potential threat to life or livestock. Some farmers have taken more than 100 cheetahs from their property over a decade (Myers 1975, Marker-Kraus et al. 1996, Africat unpubl. data). MET has not challenged their right to do so, as it would be practically impossible to stop farmers from removing cheetahs if they want to, and MET conflict with farmers over cheetahs would quite possibly harm the cause of predator conservation.

**7. Trophy hunting.** Believing that enhancing the economic value of cheetahs is the best incentive to encourage farmers to tolerate cheetahs on their land, MET initiated a trophy hunting policy for cheetahs in 1982. At present, MET is cooperating with the Namibian Association of Professional Hunters (NAPHA) by incorporating their “Cheetah Compact” into its trophy hunting program. Farmers signing the NAPHA Compact agree to conserve cheetahs on their farm, and if one is trophy hunted, to donate N\$1,000 of the trophy fee to a fund for cheetah conservation. The MET permit office has helped to link farmers reporting cheetah problems to professional hunters with clients seeking cheetah trophies.

**8. Ownership of huntable game.** The cheetah has also been affected by other MET wildlife policies. Transfer of ownership of certain huntable game species (including the kudu and gemsbok) from the State to private land owners in 1967 helped lead to a huge increase in ungulate populations on the commercial farmlands, providing a substantial prey base for the cheetah population. Farmers now consider wild game on their farms to be an economic asset, whereas in the early 1960s farmers considered game as competition for livestock graze, and aimed to keep their farms “game-free”. Game farming is becoming a significant sector of the national economy, but the cheetah’s predation on game is unlikely to be tolerated by farmers unless the cheetah has some value to compensate for its costs.

**9. Conservancies.** MET encourages farms and communities to form conservancies - associations which cooperate in the management of their wildlife. Larger units are more ecologically appropriate for an arid country like Namibia. The conservancy structure is also more appropriate for cheetah conservation, as the home range of a cheetah typically covers 10-20 farms. Conservancy-type wildlife management should also benefit the cheetah’s ungulate prey base.

## **Part 2. Conservation of a viable cheetah population**

### *Introduction*

**10. Definition of a minimum viable population (MVP).** A minimum viable population is defined as a minimum number of animals which can be predicted to persist over at least several hundred years in a population of sufficient size to conserve genetic diversity and buffer unpredictable demographic or environmental fluctuations. MVP size is usually calculated based on genetics. The cheetah’s extreme genetic homogeneity leads to uncertainty over whether MVP size should be large (3,360 cheetahs) or small (160 cheetahs: calculations in Appendix 3). Non-biological factors also influence identification of a target population size. Factors which favor a smaller population include the following: the need to reduce conflicts with land owners over the loss of livestock and game to cheetah; that the Namibian cheetah population is not isolated from the Botswanan population, and thus the population will always be effectively larger than any Namibian population estimate; and that over 95% of the world’s captive cheetahs are descended from wild-caught Namibian animals, and could be used for population replenishment if the need arises. Factors which favor a larger population include the need to protect the population from potentially unsustainable rates of offtake by land owners, and that Namibia holds one of the largest, if not the largest, cheetah populations in the world, making it an important stronghold for the species as a whole. Also, 500 is often considered an acceptable MVP size for long-term viability, and the Namibian cheetah population certainly exceeds this number.

### *Population estimates*

**11. Environmental change.** The environment of central Namibia has changed greatly since pre-colonial times. What was formerly large expanses of waterless grassland has been criss-crossed by fences, watered by boreholes, and thickly covered with bush. Because these changes have actually benefited many ungulate species, leading to an increase in their number, the cheetah has benefited as well. The fact that large competing predators such as the lion and spotted hyena have been kept from populating the farms probably also benefits the cheetah by increasing cub survival.

**12. Early 1900s.** A survey of district magistrates in Southwest Africa in 1926 produced a population estimate of 3,010 cheetahs. While this has low reliability as a number, it indicates that the cheetah was widespread in Namibia at that time, and relatively abundant compared to lions and hyenas. Being an arid-adapted species capable of satisfying its moisture requirements from its prey, the cheetah was able to live in waterless stretches of country where more moisture-dependent predators could not.

**13. 1970s.** Two estimates of the number of cheetahs put forward in 1975 differed by as much as a factor of four. Norman Myers, conducting a pan-African cheetah survey, estimated the Namibian population at 1,500 with a maximum of 3,000, and feared it was declining under pressure of an international market for live animals. The Department of Nature Conservation (DNC, now the Ministry of Environment and Tourism) carried out a massive farm survey which led to an estimate of 5,000-6,252 cheetahs, and officials considered the cheetah population to be increasing under the prevailing conditions of good rains and abundant graze for its ungulate prey base. However, this population estimate probably included cubs, and should be reduced to 2,500-3,500 to count only adults and sub-adults.

**14. 1980s.** Conflict between cheetahs and livestock farmers increased, and farmers removed up to 1,000 cheetahs per year in the early 1980s. The DNC carried out a radio telemetry study of farmland cheetahs in one of the conflict hot spots, and researcher Dieter Morsbach, based on the resulting density estimate, put the number of cheetahs in Namibia in the mid-1980s at 2,000-3,000. He believed the population to be declining due to the high level of removals by farmers.

**15. 1990s.** MET carried out another farm survey in 1992 which produces a population estimate of cheetahs of 4,688. Subtracting for cubs as above reduces this estimate to 2,350. MET research projects in Etosha National Park and former eastern Bushmanland also produced local density estimates. These local estimates were combined with Dieter Morsbach's to obtain a maximum likely cheetah population in Namibia of 2,905 adult and sub-adult cheetahs.

**16. Summary of population estimates.** All of the various population estimates have their flaws. A figure between 2,000 to 3,000 adult and sub-adult cheetahs in Namibia is probably appropriate.

#### *Factors affecting population viability*

**17. Cheetah removals.** Cheetahs are removed from the population largely by commercial farmers seeking to protect their livestock and game. Most of the cheetahs are killed, but some are kept in captivity or exported live. Some are trophy hunted. According to records from the MET permit office, from 1978-1995 an average of 419 cheetahs were killed each year in defense of livestock, 98 were captured live, and 20 were trophy hunted. Annual removals averaged 533, and altogether over 18 years at least 9,500 cheetahs were removed from the population. In addition, anecdotal reports suggest that cheetah removals in the 1960s and early 1970s ranged from 200 up to 700-800 per year. There has been a very strong male bias in the offtake, with adult and sub-adult males making up to 90% of the total "harvest" in some years.

**18. Under-reporting of removals.** There are indications that removals have been and still are under-reported to the MET permit office. If only 50-70% of removals are reported, as many as 10,000-15,000 cheetahs could have been killed by livestock owners over the past 20 years.

**19. Decreasing trend in cheetah removals.** From the mid-1970s to the mid-1980s, an average of 827 cheetahs were removed annually, declining by a factor of nearly three to 297 cheetahs per year from the mid-1980s to the mid-1990s.

**20. Adequacy of the cheetah's prey base.** An analysis of the farmland cheetah's prey base was carried out based on game population estimates and cheetah predation rates from the MET research in Etosha National Park. The wild prey base appears adequate to support about 2,000 adult and sub-adult cheetahs.

**21. Decreasing trend in cheetah predation on livestock.** Livestock appears to comprise a minor but not insignificant component of the farmland cheetah's diet. Cheetahs could take up to ten head of livestock per farm per year according to farmers surveyed by the Cheetah Conservation Fund, but records of the Department of Veterinary Services (Ministry of Agriculture, Water and Rural Development) indicate a much lower level of cheetah predation. Livestock losses to cheetahs have shown a decreasing trend from the mid-1980s to the mid-1990s.

**22. Habitat loss and modification.** The Namibian cheetah population is not suffered much from habitat loss compared to other big cat populations around the world. In fact, environmental change brought about

by the livestock industry has probably benefited the cheetah population because it has led to an increase in game populations.

**23. Natural catastrophes: drought and disease.** Drought is a natural feature of the arid Namibian environment, and given the large estimated size of the Namibian cheetah population it cannot be considered a major threat, although in its initial phases it can lead to population declines when the wild prey is reduced. Because of their genetic homogeneity, it has been suggested that cheetahs are exceptionally vulnerable to disease. In theory, a disease that can get past the immune system of one cheetah can infect them all. However, the only disease which is known to have caused high mortality in the wild is anthrax in Etosha National Park. This susceptibility derives from the cheetah's lack of scavenging behavior rather than its genes. Cattle are vaccinated against anthrax on the farms, which has probably led to a reduction of viable spores in the environment, so anthrax is probably not an important cause of mortality for farmland cheetahs. A major disease outbreak which severely reduces the cheetah's wild prey base, such as the early 1980s rabies epidemic in kudu, could lead to a cheetah population decline if cheetah predation on livestock increases and farmers intensify their trapping efforts.

**24. The major factor affecting population viability is the level of removals by farmers.**

#### *Modeling the viability of the Namibian cheetah population*

**25. Evidence for a declining population?** Based on the declining number of cheetah removals and the disparity between the estimate of 5,000-6,000 in 1975 and 2,000-3,000 in 1987, it is often said that the Namibian cheetah population is declining. Yet cheetah predation on livestock has also declined, while game numbers have greatly increased since the early 1980s. While the number of cheetahs shot in protection of livestock has declined 3.5 times since the early 1980s, the number captured live has declined by only 1/3. Likewise, the number of cheetahs reported removed to the Cheetah Conservation Fund in their farm survey declined by only 1/3. Finally, if the 1975 estimate is reduced to subtract for the inclusion of cubs, the two population estimates are roughly the same.

**26. Cheetah population model predicts decline in the early 1980s.** A cheetah population model was developed for this document with the assistance of K.P Erb at the Etosha Ecological Institute. It was developed specifically to examine quantitatively how the reported cheetah removals could have affected population dynamics. The model is described in detail in Appendix 4. The model suggests that the high levels of removals in the early 1980s could have caused the population to decline by nearly half, from 3,700 in 1970 to 2,000 adult and sub-adult cheetahs in 1985. During the early 1980s, the model suggests that up to half of the male population was removed each year, and up to 10% of the females.

**27. Evidence for an increasing population?** However, the model also suggests that the lower removals in the 1990s could have allowed the cheetah population to have increased from its mid-1980s low to 2,500 in 1996. Because the cheetah is adapted to have a high reproductive rate in comparison to other big cats, the population should be relatively resilient to high offtakes and mortality.

**28. Sustainable removal levels.** The population model suggests that annual removal of up to 20% of the male population (adults + sub-adults) and 5% of the female population is sustainable and should not lead to population declines. It is suggested that MET endeavor to keep annual removals on the order of 200 cheetahs per year, and consider ceasing to issue permits if the offtake approaches 300 in any year. The sex-age composition of the removals is an important component of ensuring sustainability, and MET should make sex and age a reporting requirement when issuing cheetah permits in the future.

**29. Probability of extinction.** A Population and Habitat Viability Analysis for the Namibian cheetah and lion was held in February 1996 in Otjiwarango. The Vortex population model was used to predict the effects of stochastic events on the cheetah population. A low cheetah population size of 2,500 including cubs (=1,370 adults + sub-adults) was used. The workshop found that the probability of cheetah extinction in the next 100 years was very low unless frequent catastrophes occur (e.g., a disease outbreak with high morbidity) or adult mortality rates consistently exceed 30%. Despite the fact that the cheetah has been described as a species suffering from inbreeding depression as evidenced by its lack of genetic variation, the workshop chose not to model the effects of inbreeding depression because the cheetah population is of sufficient size so that inbreeding effects should be minimal.

### *A suggested viable population size for the Namibian cheetah*

**30. MET should aim to conserve a population of 2,500 cheetahs.** It is suggested that MET adopt a figure of 2,500 cheetahs as its target viable population size. This number is probably close to the current population size, should be of sufficient size and productivity to sustain current levels of removals (mid-1990s), and appears capable of being sustained by the wild prey base. This population size is large enough so that intensive management measures should not be required, but not so large as to lead to a high degree of conflict with livestock and game owners. It is important that farmers support predator conservation efforts, or otherwise they are unlikely to be successful. Ideally, conservation of this population should require minimal management effort on the part of MET. Both commercial and communal farmers are taking increasing responsibility for the management of wildlife on their lands. MET should work closely with the private sector in its cheetah conservation program for increased efficiency and maximal impact.

### *Recommendations*

It is recommended that MET undertake the following actions:

- 31. Cooperate with NGOs on research into cheetah density to refine estimation of total population size.**
- 32. Improve monitoring of cheetah removals.**
- 33. Ensure sustainability of removals.**
- 34. Monitor population trend through multiple indices in cooperation with private sector.**

### **Part 3. Improving MET coordination with the private sector to achieve effective cheetah conservation**

**35. MET role in wildlife conservation on private lands.** The major role that the Ministry has to play in the conservation of wildlife on private lands is to ensure that wildlife utilization is sustainable. Because most of the Namibian cheetah population occurs on commercial farmland, it will be necessary for MET to cooperate actively with the private sector in order to achieve its goal of conserving a viable cheetah population.

**36. Cheetah NGOs.** Two local nongovernmental organizations were established in Namibia in the early 1990s to promote cheetah conservation on Namibian farmlands: the Cheetah Conservation Fund and Africat. They work closely with farmers to advise them on management techniques to reduce their losses to predators. They have helped to raise the profile of cheetah conservation, and their work has helped lead to a reduction in the number of cheetahs killed by farmers in the 1990s.

**37. Cheetah releases and translocations.** Thanks in large part to the efforts of the cheetah NGOs to promote cheetah conservation, many farmers who capture cheetahs on their property are now reluctant to shoot them, and they increasingly contact MET or the NGOs to ask them to take the animals off their hands. MET has no program or facilities to engage in cheetah “rescues”, but translocation and release of cheetahs captured by farmers is a major activity of both the Cheetah Conservation Fund and Africat. They encourage farmers to re-release cheetahs where they were captured, on the grounds that the vacant territory will attract new cheetahs and possibly increase predation problems. The effects of these cheetah releases and translocations are largely unknown, and closer MET supervision through the permit process is warranted. This activity should be supported by MET unless it can be shown to have harmful effects.

**38. Improving MET and NGO cooperation and communication.** An administrative framework is recommended for making cheetah conservation more efficient by improving information sharing among the major parties involved. It is recommended that MET appoint a Predator Coordinator to facilitate cooperation and communication, and establish a Cheetah Conservation Committee for strategic planning.

**39. Enhancing the economic value of cheetahs.** Cheetahs have more cost than value, and are seen as a liability because of their predation on livestock and game. Land owners may be more willing to tolerate the

presence of cheetahs on their property if the potential value of the animals mitigates their potential cost. The main economic value of cheetahs is for trophy hunting. Although it is a small industry, it is set up to have wider benefits to cheetah conservation beyond encouraging the tolerance of individual farmers, through the NAPHA Cheetah Compact which allocates a portion of the trophy fee to a fund for cheetah conservation. It is also recommended that MET cooperate with the private sector to increase the tourism value of cheetahs on private land. Training on the use of radio telemetry should be offered to game farmers who want to give tourists an unparalleled opportunity to observe wild cheetahs with a research perspective.

### *Recommendations*

It is recommended that MET undertake the following actions:

- 40. Appoint a Predator Coordinator to the Directorate: Specialist Support Services.**
- 41. Increase MET-NGO cooperation and communication by forming a Cheetah Conservation Committee.**
- 42 Support enhanced economic values for cheetahs as a conservation incentive.**

Recommendations are summarized into a list of MET actions to be taken in Part 4.

## **Part 1. Introduction to the cheetah and current international and domestic legislation and policy**

### **1.1. Purpose of the Namibian Cheetah Conservation Strategy**

The purpose of the Namibian Cheetah Conservation Strategy is to provide a policy framework for the Ministry of Environment and Tourism's approach to cheetah conservation. MET has drawn up several conservation strategies and management plans for individual species, including the elephant and black rhino. Although the Ministry does not believe the cheetah to be in imminent danger of extinction and therefore not requiring any urgent recovery effort, it was thought advisable to develop a MET strategy for cheetah conservation.

This is not only because the cheetah is one of the world's rarer big carnivores, and the fact that Namibia holds one of the largest national population of cheetahs within the species' range. It is also because, although the cheetah is a protected species in Namibia, and thus all cheetahs are property of the State, most cheetahs are found on private rather than State land. They are considered problem animals by livestock farmers. This warrants a different approach to cheetah conservation than, for example, rhinos, which occur mainly on State land and for which management is thus more straightforward. Two nongovernmental organizations have been set up specifically to work with livestock farmers and promote cheetah conservation - the Cheetah Conservation Fund and Africat, both based in Otjiwarango. Although the protection, utilization and conservation of wildlife has traditionally been almost exclusively prescribed by the government of Namibia, it is likely that the role of NGOs will grow in importance, as it has elsewhere around the world. This conservation strategy explores ways that the MET can cooperate with the private sector in cheetah conservation for greatest efficiency, and may help to serve as a model for the Ministry in its dealings with other conservation-oriented NGOs.

This document is organized into four parts. This first part introduces the cheetah, and past and present conservation policy and legislation pertinent to the species. The second focuses on the primary goal of the cheetah conservation strategy: conservation of a viable cheetah population. The third puts forward an administrative framework for improving MET cooperation with the private sector in order to achieve this goal. The fourth is a summary of actions to be taken by MET.

A primary recommendation of this strategy is the appointment of a Carnivore Coordinator to the MET Division of Specialist Support Services (Recommendation 3.7.1), a post similar in function to the recently created position of Rhino Coordinator. This official will be responsible for coordinating research and management efforts on predators nationwide, and will serve as the Ministry liaison with the concerned private sector. This document will help to prepare the Carnivore Coordinator for dealing with the Namibian cheetah, by pulling together and analyzing all available information on its conservation status and problems, population distribution and demographics, and economic costs and values.

This strategy will also serve to educate other interested parties about the situation of the cheetah in Namibia. The US Fish and Wildlife Service has been requested to allow American hunters to import Namibian cheetah trophies. They suggested that a national conservation strategy for the cheetah in Namibia would help them to evaluate the request by providing information on population viability and management, and by showing that American trophy imports would actually help support cheetah conservation. In addition, a Population and Habitat Viability Analysis evaluated the status and conservation of Namibian cheetahs in Otjiwarango in February 1996. MET can offer this National Cheetah Conservation Strategy as a framework for other organizations and individuals seeking involvement with this species' conservation.

## **1.2. The Cheetah**

### **1.2.1. Distribution and Status**

The cheetah, *Acinonyx jubatus* Schreber 1776, inhabits primarily the drier parts of sub-Saharan Africa (range map from Cat SG Cat Action Plan). It formerly occurred through north Africa and southwest Asia east to India and north to Turkmenistan. In southwest Asia the cheetah is highly endangered, holding out only in eastern Iran and perhaps Baluchistan, and it has become rare also in the Saharan region. The two largest concentrations of cheetah are found in east and southern Africa. The cheetah is quite scarce in the Sahelian and Sudanian semi-arid zones - although originally optimal habitat, much of it is now very degraded under human population pressures.

The total world population of cheetahs has been variously estimated at 15,000 (Myers 1975), 25,000 (Frame 1984), and 9-12,000 (Kraus and Marker-Kraus 1991). Namibia is likely to hold one of the largest national populations. Being an arid country, this is a rare event for a non-endemic species - the African black rhino is the only other large African mammal for which Namibia takes this honor. The Cheetah Conservation Fund calls the country "the cheetah capital of the world".

The cheetah is listed as "Vulnerable" in the 1995 IUCN Red List of Threatened Animals - not "Endangered" or "Critically Endangered", but then again also not "Near Threatened" or "Of Least Concern". In comparison to other members of the family Felidae, the cheetah is ranked in the IUCN Cat Specialist Group's Cat Action Plan among the more vulnerable cat species - not as endangered as the tiger or snow leopard, but more so than the leopard, jaguar or puma, and roughly in the same category of vulnerability as the lion (Nowell and Jackson 1996).

However, the status of the lion and cheetah is different in one important respect. The stronghold of lion distribution is the protected area network of Africa. However, where lions and spotted hyaenas are present - that is, in most African protected areas - cheetahs occur at comparatively low densities. In the Serengeti, lion densities have reached 30 animals per 100 km<sup>2</sup> following an increase in blue wildebeest numbers, while cheetah density is roughly one per 100 km<sup>2</sup> (Table 1; Caro 1994). On the other hand, cheetahs have often persisted on ranchland outside protected areas, where lion and hyaena have been practically eliminated, and are sometimes found there in higher densities. For example, Burney (1980) found that cheetah density was twice as high in pastoral areas outside Kenya's Masai Mara National Reserve (the northern extension of Tanzania's Serengeti grasslands) as inside the reserve itself. In Namibia, at least 90% of the cheetah population is found on private lands, principally the commercial farms in the north-central regions of the country.

Because most research on cheetahs has been carried out in the Serengeti, cheetahs are often considered to be creatures of the open plains. Actually, cheetahs are found throughout the miombo woodlands which make up much of central and east Africa; since they have never been studied in such habitat, it's not known

to what degree infrequency of sightings reflects patchy distribution or just the difficulty of making observations (Eaton 1974: 25-26). In Namibia, cheetahs do quite well in areas which have become heavily bush-encroached, where it is not only easier to stalk prey than on the open plains, but also easier to hide from human hunters. The high densities in Table 1 reported for the Serengeti plains, compared to density estimates from southern Africa, probably have more to do with higher rainfall and prey biomass than with the open grassland ecosystem.

**Table 1. Cheetah densities**

Area	No. adults./100 km <sup>2</sup>	Methodology	Source
<b>East Africa</b>			
Serengeti prime season*	40.0	Visual count on plains	Schaller (1972) <sup>1</sup>
Serengeti prime season*	16.6	Count known invls	Frame (1977)
Serengeti plains	5.1	Count known invls	Caro (1994: 400)
Serengeti average 1.0		Woodland encounter rates	Caro (1994: 376)
Masai Mara	1.49**	Count known invls	Burney (1980)
Outside Masai Mara	3.45**	Count known invls	Burney (1980)
Nairobi NP	25.0	Count known invls	Eaton (1974: 28-29)
<b>South Africa</b>			
Kruger NP	1.35	Unknown	de Pienaar (1969)
Kruger NP	0.52	Invls counted fm tourist photos	Bowland (1993)
<b>Namibia</b>			
Farmland, Hochfeld	2.0	Count known invls	Morsbach (1986, 1987)
“ “ including transients	3.45	All invls present in study area	Morsbach (1986)
Etosha NP, plains only	1.2	Count known invls	Nowell et al (in prep.)
Kaudom GR	0.06	Spoor transect	Stander et al. (1994)
Bushmanland	0.12	Spoor transect	Stander et al. (1994)

\* = dry season concentration along plains/woodland edge following migrating Thomson's gazelles

\*\* Overestimate as includes cubs over 3 mos old

<sup>1</sup> Caro (1994: 35) calculated from Schaller's data

### 1.2.2. Physiology

The cheetah is probably the most specialized member of the cat family. It is adapted morphologically for sprinting after gazelle prey, and in the wild it has been reliably clocked at speeds up to 90 kph. Its legs are proportionately longer than those of other big cats, and its elongated spine flexes as the cheetah gains speed to increase its stride. The cheetah's claws remain exposed, lacking the skin sheaths found in other cats, and provide additional traction like a sprinter's cleats. The foot shows several other divergences from the typical feline model. The toe pads are extremely hard and pointed at the front, possibly as an adaption to sudden braking, and the main foot pads bear a pair of longitudinal ridges instead of the more usual slight depressions - the functional equivalent of tire treads, serving as anti-skid devices. The prominent dew claws are used as hooks to trip up fast-running prey. The long tail helps the cheetah's balance as it swerves during a chase. The canine teeth are small compared to other big cats, because a reduction in the size of the roots of the upper canines permits the cheetah a larger nasal opening for increased air intake. This is critical for the cheetah to breathe properly and cool itself after its sprint while it throttles its prey with jaws clamped tightly around the windpipe. Finally, the cheetah has enlarged lungs, bronchial tubes, heart and adrenals.

### 1.2.3. Behavior and ecology

The cheetah appears to be adapted for a migratory antelope prey base by having very large, overlapping home ranges up to 1,500 km<sup>2</sup> in size (Table 2), following a very different territorial strategy than all other cats. Leopards, for example, have small home ranges on the order of 15 - 50 km<sup>2</sup>, which they patrol

**Table 2. Cheetah home ranges**

Cheetah sex/age	Average size (number of animals)	Range	Source
<b>East Africa - Serengeti</b>			
Adult female	833.0 km <sup>2</sup> (19)	394.5-1,269.5 km <sup>2</sup>	Caro 1994: 394-5
Territorial male coalitions	37.4 km <sup>2</sup> ( 9)	up to 74.8 km <sup>2</sup>	Caro 1994: 396-7
Non-territorial single males	777.2 km <sup>2</sup> ( 9)	up to 1,892.6 km <sup>2</sup>	Caro 1994: 222
<b>East Africa - Nairobi NP</b>			
Adult female	79 km <sup>2</sup> ( 2)	76-82 km <sup>2</sup>	McLaughlin 1970
Pair of adult males	102 km <sup>2</sup> ( 1)	N/A	McLaughlin 1970
<b>South Africa - Kruger NP<sup>1</sup></b>			
Adult female	770 km <sup>2</sup> ( 8)	210-1,820 km <sup>2</sup>	Bowland 1993
Adult male	500 km <sup>2</sup> (10)	75-1,320 km <sup>2</sup>	“ “ + Mills 1989
Groups of 3 adult males	193 km <sup>2</sup> ( 4)	75-400 km <sup>2</sup>	Bowland + Mills
<b>Namibia</b>			
<i>Farmland - animals monitored for 5-23 months</i>			
Adult male (single)	932 km <sup>2</sup> ( 2)	653 - 1,210 km <sup>2</sup>	Morsbach (1986)
Pair of adult males	651 km <sup>2</sup> ( 1)	N/A	Morsbach (1986)
Adult female	1,522 km <sup>2</sup> ( 4)	1,324-1,658 km <sup>2</sup>	Morsbach (1986)
<i>Bushmanland - animal monitored for 6 months</i>			
Adult female	1,069 km <sup>2</sup> ( 1)	N/A	Stander (unpubl.)

<sup>1</sup> Bowland's (1993) methodology was to identify individual cheetahs by spot patterns in photos submitted by tourists during a cheetah photo survey. Home ranges were calculated for cheetahs groups with at least seven different photo-locations. The average adult male range given includes groups of 3. Mills (1989) estimate of 175 km<sup>2</sup> for a group of three adult males (not any of the ones covered by the photo survey) was added in, as it falls within the range of estimate. Bowland's home range sizes had to be estimated from a bar graph (Bowland 1993: Fig. 3), with the exact sizes given only for a few cheetah groups in the text.

regularly, defend against same-sex intruders, and mark with urine and dung. Cheetahs, on the other hand, range widely, and in the Serengeti have been observed to concentrate in areas with seasonally high densities of Thomson's gazelle (Durant et al. 1988). This ecological strategy is linked to the cheetah's relatively high degree of social behavior - unlike all other cats except lions, male cheetah brothers often remain together throughout their lives, and non-littermate males occasionally join forces. Although male cheetahs have been observed to fight, sometimes to the death, with other strange males in order to maintain small seasonal territories where females visit (Caro 1994), females sometimes readily associate with other females and their cubs, and thus large groups of up to 18 animals have been seen together (Graham 1966, McVittie 1979, Caro 1994, Marker-Kraus et al. 1996).

Small territories defended by single males or groups of males do not seem to be found outside the Serengeti, probably because there are no small resource-rich areas with sufficient prey to sustain a male cheetah group in drier, less productive environments. The so-called "play trees" in Namibia probably serve the same function for cheetah reproduction as Serengeti male cheetah territories: places for wandering females to visit to look for mates. Serengeti territories were heavily marked with feces and urine; so are Namibian play trees. The fact that so many cheetah in Namibia are trapped at play trees lends credence to this assumption.

It is also possible that home range data from Namibia has not been sufficiently analyzed to look for small male territories. While males were described by Morsbach (1986) as "territorial" in comparison to females, their home ranges were still close to 1,000 km<sup>2</sup> in size (Table 2), and thus are not comparable to the small

male territories described in the Serengeti. Serengeti territories were usually centered around a prominent landscape feature such as a kopje. In Namibian flatlands, a play tree could serve the same landmark function. Caro (1994: 249) found that some males moved either sequentially from one small territory to another, or moved back and forth between two. Morsbach (1986) did note that “males have ‘concentrated areas’ within their home ranges and it is possible that these areas can move from season to season or from year to year.” The frequency of marking behavior (scats and urine) is also an important clue to defining a male territory (Caro 1994). If radio locations are taken at infrequent intervals and from remote locations (from a hill or from an airplane) and the behavior of the study animal is not observed, territoriality in males will be difficult to detect.

The drawback to the cheetah’s evolutionary strategy is that, being lightly built for speed, they are vulnerable to other large competing predators. Cheetahs are the only big cats which are active mainly during the daytime, rather than at night, when other large predators are active. They have a large litter size compared to other big cats (average 3.7 in captivity as compared to the lion’s 2.9), and several researchers have suggested that this is a reproductive strategy to offset high cub mortality. Cheetah mothers do not have dens for their cubs, such as underground burrows or rocky crevices, where they would be vulnerable to leopards or other predators; instead, cubs are stashed in thickets, where they are still frequently found and killed by predators (Laurenson 1994). Unlike lions, cheetahs are not obligate drinkers, and thus can avoid water sources where other large predators may cluster. Cheetahs drink the blood of their prey for moisture. Cheetahs often lose their kills to lions and hyaenas (and sometimes even jackals and vultures), and only rarely scavenge or return to a previously abandoned kill. Other big cats will stash carcasses of large kills, and feed off them for several days, but it would seem to be dangerous for cheetahs to remain in the vicinity of their kills. Their lack of scavenging behavior and preference for antelope prey leads to cheetahs having a high ungulate kill rate compared to other big cats: while a female cheetah killed a springbok on average every 2.5 days in Etosha National Park (Nowell et al. in prep.), average ungulate kill intervals for African leopards are on the order of 1-2 weeks (Bailey 1993).

#### ***1.2.4. Genetics***

The genetic makeup of the cheetah has received a great deal of attention. Cheetahs from east and southern Africa have been found to have very little variation in their nuclear DNA, so little so that they are said to resemble deliberately inbred strains of laboratory mice (O’Brien et al. 1983, 1985, 1987). The geneticists who discovered this have postulated that the cheetah went through a series of severe population bottlenecks beginning around 10,000 years ago, when many large mammals in Asia and the Americas went extinct (Menotti-Raymond and O’Brien 1993). It is difficult to imagine how the cheetah population on this continent could have declined so drastically, and so far no one has made a serious attempt to come up with a plausible scenario. Alternatively, it has been suggested that the cheetah’s lack of genetic diversity may be an adaptive feature of its specialization (see review in Caro 1994), that it may be linked to its breeding strategy (Pimm et al. 1989), or that in fact the cheetah’s apparent genetic impoverishment is not so unusual for a carnivore (Merola 1994), or that it is invalid even to compare genetic diversity between species.

The causes of the cheetah’s lack of genetic polymorphism are not clear, and neither are the implications for conservation of the species. O’Brien and his colleagues have argued that “the species as a whole is suffering from the effects of what we call inbreeding depression” (O’Brien 1991), and that the cheetah’s lack of variation has reduced its ability to cope with environmental change and rendered it exceptionally vulnerable to extinction. Most population geneticists agree in theory that genetic variation is “good”, being linked to fitness and evolutionary potential. However, in an influential overview of the state of the field of conservation biology, Caughley (1994) questions not only the conclusion that the cheetah is suffering because of its genetic makeup, but also the evidence produced in support of it, as well as the methodology used to derive the evidence.

Theoretically, the cheetah is highly susceptible to infectious disease, because a pathogen that manages to successfully evade one cheetah’s immune defenses will be able to successfully infect them all. However, while there have been high mortalities of cheetahs to infectious disease in captivity (where vulnerability to disease is heightened due to a variety of factors, including animal proximity), so far there has been no documented high disease mortality in the wild. An outbreak of infectious canine distemper virus in the Serengeti in 1995 killed nearly 1/3 of the lion population, yet cheetahs were little affected (M. Roelke and T. Caro pers. comm. 1996, 1997). Moreover, wild dogs have completely disappeared from the Serengeti,

with disease thought to have been a primary cause (Dye 1996). The only exception is the vulnerability of cheetahs in Etosha National Park to anthrax, where all seven radiocollared study animals died of the disease. However, in this case genetics does not appear to play a role. Rather, it is the cheetah's lack of scavenging behavior. Other predators in the park are resistant to anthrax, having built up immunity through long years of feeding off anthrax carcasses. Cheetahs have no resistance, and when they kill and consume an ungulate in the terminal stages of anthrax it is fatal (Lindeque et al. 1998).

While theory suggests that a viable population of cheetahs should be extraordinarily large, in order to conserve what little genetic variation remains in the species, it also indicates that, if cheetahs have in fact passed through several historic bottlenecks, they are likely to be less vulnerable to future bottlenecks than other more genetically heterogeneous species, because any lethal mutations which survived the past bottleneck will have been already purged (Frankel and Soulé 1981). In this sense, then, the cheetah's lack of genetic variation may be seen as an advantage where populations are declining.

Both wild and captive cheetahs have been found to have high levels of abnormal sperm, which could impede reproduction (Wildt et al. 1987). However, while some zoos have had difficulty breeding cheetahs, others have been very successful, and there is no evidence from the wild that cheetahs have a lower reproductive rate than other big cats (Wielebnowski 1996). In fact, wild cheetahs reproduce well, and a recent population modeling exercise led by the IUCN/SSC Conservation Breeding Specialist Group found that the Namibian cheetah population is capable of doubling every 5-7 years, if not for other limiting factors (CBSG 1996).

Cheetahs from elsewhere in the species range, including Iran and the Saharan region, have not been subjected to molecular analysis, and it is possible that they may harbor important genetic differences.

### **1.3. Legislation and policy on the cheetah**

There is no international law mandating protection - that is, prohibiting hunting or fencing off habitat - for endangered species. It is up to each individual nation to determine how it wants to protect any endangered species occurring within its borders. The only aspect of endangered species conservation where an international treaty plays a major role is international trade, which is governed by CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

#### **1.3.1. CITES**

Most of the world's nations are party to CITES, Namibia included. This means that they have signed and ratified the convention, and enacted domestic legislation which implements the terms of the treaty. A recent review and analysis of national laws for implementation of CITES was presented at the 1994 meeting in the USA (CITES parties meet every two years). The report found that only about 18% of member nations had implemented national legislation that generally meets all the CITES requirements, while the national laws of about 35% of the member countries do not implement CITES requirements at all. CITES has been in existence since 1975 and while the actual text of the treaty is only a few pages, it is fine-tuned by thousands of pages of additional resolutions approved at the bi-annual convention of the parties, with titles like "The interpretation and application of quotas," a successful resolution introduced at the 1994 meeting by Namibia. Several guides to CITES have been published to help countries sort out all the details. It is no surprise that many developing countries have not yet built up the sophisticated government wildlife agencies and policies demanded by the convention.

The Appendices comprise a key aspect of CITES, identifying the species for which international commercial trade is prohibited or regulated. There are thousands of taxa (includes genera, families, species and subspecies) listed on the CITES appendices. It is up to individual countries to determine how they wish to control international trade in species that are not listed.

According to the new criteria for amending the appendices adopted at the November 1994 meeting, a species should be listed on CITES Appendix I if it "is or may be affected by trade", and meets at least one of four the following four criteria:

A. Population Size. The wild population is small, and is characterized by at least one of the following:

- an observed, inferred or projected decline in the number of individuals or the area and quality of habitat; or
- each sub-population being very small; or
- a majority of individuals, during one or more life-history phases, being concentrated in one sub-population; or
- large short-term fluctuations in the number of individuals; or
- a high vulnerability due to the species' biology or behavior (including migration).

B. Population Distribution. The wild population has a restricted area of distribution and is characterized by at least one of the following:

- fragmentation or occurrence at very few locations; or
- large fluctuations in the area of distribution or the number of sub-populations; or
- a high vulnerability due to the species' biology or behavior (including migration); or
- an observed, inferred or projected decrease in any one of the following:
  - the area of distribution; or
  - the number of sub-populations; or
  - the number of individuals; or
  - the area or quality of habitat; or
  - reproductive potential.

C. Population Rate of Decline. A decline in the number of individuals in the wild, which has been either:

- observed as ongoing or as having occurred in the past (but with a potential to resume); or
- inferred or projected on the basis of any one of the following:
  - a decrease in area or quality of habitat; or
  - levels or patterns of exploitation; or
  - threats from extrinsic factors such as the effects of pathogens, competitors, parasites, predators, hybridization, introduced species and the effects of toxins and pollutants; or
  - decreasing reproductive potential.

D. The status of the species is such that if the species is not included in Appendix I, it is likely to satisfy one or more of the above criteria within a period of five years.

A species should be listed on CITES Appendix II if it is "known, inferred or projected" that NOT to include it would result in the species soon meeting the biological criteria for listing in Appendix I; or if the harvesting of the species in the wild for international trade has or may have a detrimental impact by either exceeding, over an extended period, the level that can be continued in perpetuity, or reducing it to a population level at which its survival would be threatened by other influences. No Appendix I species may be removed from the appendices without first being included in Appendix II for the purposes of monitoring. In addition, even if a species does not meet the biological criteria, it should be retained in Appendix I if certain conditions to ensure adequate management (such as export quotas) are not met. CITES parties can unilaterally list a native species on Appendix III, which includes "all species which any Party identifies as being subject to regulation within its jurisdiction for the purpose of preventing or restricting exploitation, and as needing the cooperation of other parties in the control of trade." For practical purposes, though, Appendices I and II comprise the heart of CITES, and the most controversial CITES issues concern which of these appendices a particular species - such as the African elephant - is listed on.

The management consequences of the appendices are as follows. Trade in Appendix I species is prohibited except under certain essentially non-commercial circumstances (zoological exchange, scientific study, movement of personal effects or legitimately taken hunting trophies, etc. - with the exception of certified captive-bred specimens, which can be traded commercially). In order for the transaction to take place, CITES permits must be issued first by the exporting country, and then by the importing country. Commercial trade in Appendix II species is permitted, but subject to regulation and monitoring under a permit system. Trade in Appendix II and III species requires export permits only. The African elephant is the best example of the differing management consequences engendered by the CITES appendices: its transfer from Appendix II to Appendix I in 1989, by majority vote of the CITES parties, resulted in an international ivory trade ban.

The cheetah has been listed on Appendix I since 1975, and probably will continue to be under the new criteria. It qualifies for Appendix I listing under criterion C(ii): an inferred decrease in its area and quality of habitat, as the human population in Africa continues to expand and game populations are reduced in favor of domestic livestock. It should be noted that many species would qualify for inclusion in Appendix I under this criterion. It is questionable, however, whether the cheetah “is or may be affected by trade”. In the 1960s and 1970s, cheetah skins were used in the fur trade, and live cheetahs were traded because of poor breeding in captivity. Neither of these is a major factor in the species’ conservation today, but that is largely because of the cheetah’s Appendix I listing. It is possible that commercial trade would resume if the cheetah were downlisted to Appendix II.

CITES parties are required to designate both a Management and a Scientific Authority. The Management Authority is the government agency usually responsible for issuing CITES export and import permits. The Scientific Authority (often the same agency or a different department within the same agency [as with the U.S. Fish and Wildlife Service, which has established an Office of the Scientific Authority], but sometimes a research institute) guides the Management Authority by having the responsibility to determine that any permits issued will not be allowing trade which is “detrimental to the survival of the species”. This includes both export and import permits.

Namibia joined CITES in 1991, and officials from the Ministry of Environment and Tourism (which serves as both the Scientific and Management Authority) attended their first CITES meeting in 1992. At that meeting, they submitted a proposal to transfer the cheetah populations of Botswana, Malawi, Namibia, Zambia and Zimbabwe from Appendix I to Appendix II, subject to export quotas, arguing that:

“In Namibia the cheetah is viewed as the single most important predator on livestock on both commercial and communal farms...Trophy hunting and export of live cheetah have been encouraged in Namibia in an attempt to curb the number of cheetah shot as predators of livestock, and to change the attitude of the farmers toward the cheetah from ‘kill at all cost’ to one where cheetah would be tolerated and accepted. By providing some form of financial return for the losses caused, farmers are now encouraged to utilize the cheetah on a sustainable basis, rather than implement total eradication....The cheetah population in southern Africa is not in danger of extinction...It is vitally important to state very clearly that no further national or international protection laws will or can have any effect on the actual conservation status of this species on farmland in southern Africa.” (Govt. of Namibia 1992).

Due to a technicality, the proposal was not considered because the supporting statement quoted from above was not submitted in time. Moreover, it was unlikely to succeed, there being a strong sentiment within CITES against downlisting spotted cats, fearing resurgence of the luxury fur trade that was the initial impetus for listing all spotted cats on CITES Appendix I back in 1975. However, the proposal was refashioned into a resolution for “Quotas in trade in specimens of cheetah” which was adopted by unanimous vote of the parties (CITES 1994). It established an Appendix I quota system for the cheetah modeled on that of the African leopard established in 1983. The leopard is also listed on Appendix I, and proposals by southern Africa range states to downlist it, allowing regulated commercial trade in skins, have been defeated.

The cheetah resolution established an export quota of 150 cheetahs per year from Namibia. Cheetahs may be exported live (for legitimate captive breeding or to otherwise support conservation of the species) or as hunting trophy skins. Skins are for personal use only and not for resale, and the owner may import no more than two in any calendar year. The full text of the resolution appears in Appendix 2 of this document.

Namibia has been an active force within CITES despite its brief period of membership. In another issue relevant to the cheetah, Namibia introduced a resolution to the 1994 meeting which was approved after amendments in a working group. Titled “The interpretation and application of quotas,” it replaces an earlier resolution on the subject. Of direct relevance to the cheetah, the resolution states that when the parties approve an export quota for an Appendix I species, the required non-detrimental finding by a Scientific Authority has been met, so that the purpose of the importation will not be detrimental to the survival of the species, provided that the quota is not exceeded and no new information indicates that the quota is unsustainable. This is relevant to the cheetah because some potential importing countries have national legislation which prohibits all imports, and they do not necessarily recognize that the Appendix I quota system for the cheetah warrants an exception.

### **1.3.2. Namibian national legislation on the cheetah**

The cheetah is classified as “Protected Game” in Namibia according to the main body of legislation pertaining to wildlife, the Nature Conservation Ordinance of 1975. “Game” refers specifically to species classified as Specially Protected, Protected, Hunttable or Exotic, whereas “wild animal” refers to any non-domestic wild vertebrate (Art. 1). The Nature Conservation Ordinance does not address habitat conservation for specially protected or protected species, but protects them through controls on their hunting.

**Hunting of protected game:** According to Article 27.1, protected game species may not be hunted without a permit from the Ministry of Environment and Tourism. However, there is an important exception relevant to predators, and particularly the cheetah [Article 27.5(a-c)]:

“(a) No provision contained in this section shall prohibit the owner or lessee of land or the occupier of communal land from killing protected game on such land in defense of a human life or to prevent a human being from being injured or protect the life of any livestock, poultry or domestic animal of such owner, lessee or occupier whilst the life of such livestock, poultry or domestic animal is actually being threatened.

“(b) Any person who kills protected game in terms of the provision of this subsection shall report it in writing to the nearest nature conservator or at the nearest police office within ten days thereafter.

“(c) Any person who fails or neglects to comply with the provisions of paragraph (b) shall be guilty of an offense.”

Other provisions of the Nature Conservation Ordinance are also relevant to the cheetah:

**Killing, capturing and keeping of game and wild animals:** Article 40 prohibits the killing (“by any means other than by shooting with a firearm”), capture (“by means of a snare, pitfall, trap, springtrap, net, birdlime, drug or any other device or means whatsoever or by any method whatsoever”), or keeping of any game or wild animal without a MET permit or a game dealer’s license. Article 41 prohibits the capture, transport or keeping of wild animals for commercial purposes except for licensed game dealers or for the holder of a MET permit issued under Article 40.

**Donation, sale and transport of game and game meat:** Articles 46-48 prohibit the donation, sale, transport or purchase of any game or game skins unless the donor, seller, or transporter holds a MET permit to do so, or is a licensed game dealer.

**Import and export of game and wild animals and their skins:** Article 49 is the clause which effectively implements CITES requirements: no person may import or export “any game or wild animal or the raw skin or raw meat of any game or wild animal” without a MET permit. The article also grants MET the authority to place a prohibition on the import or export “of the prepared or tanned skin, or any product manufactured therefrom, of any species of game or wild animal, or impose the conditions which it may in its discretion determine”.

**Possession of skins of specially protected and protected game:** Article 50A prohibits the possession of any raw skin of specially protected or protected game without a MET permit.

**Problem animals:** Article 53 authorizes the MET to declare any wild animal species a problem animal throughout the country or in part or parts thereof. Officially declared problem animals may be hunted by land owners or lessees without a MET permit (Article 54). MET may issue special permits for research in connection with the control of problem animals which allows the researcher (whether MET staff or any other person) to capture, kill or hunt problem animals, and to enter upon any land without the consent of the owner or lessee, provided that whenever possible prior notice shall have been given (Article 62). The cheetah has not been proclaimed a problem animal, so these provisions are not currently relevant, but at various times in the past the MET has considered doing so, and certainly the prevailing perception among the livestock-keeping public is that the cheetah is a *de facto* problem animal.

**Powers, functions and duties of nature conservators:** MET may appoint honorary nature conservators, subject to Cabinet approval, which have the same powers as MET staff nature conservators (Articles 79 and 80). These powers include the authority to conduct investigations and inspections to look for illegal capture, trade, transport, keeping or hunting of wild animals. Nature conservators have police powers “in so far as offenses in terms of this Ordinance are concerned”. Nature conservators are authorized to “hunt, capture or keep any game or wild animal...whenever it is necessary for the proper exercise of his powers, or for the proper performance of his functions or duties, and whether for scientific or any other purposes” (Article 81).

With regard to **permits**, Article 83.1 states that, “No person shall be entitled to claim that he has a right to obtain any permit, license, registration, approval, permission or exemption which is required or may be issued or granted in terms of this Ordinance and [MET] shall not be obliged to furnish any reasons for the refusal by it to grant or issue any such permit...” MET is authorized to withdraw, amend or further restrict conditions on any permit issued by it (Article 83.5). After government rationalisation, the MET’s Permit Office was moved from the Directorate: Resource Management to the Directorate: Specialist Support Services, which houses all agencies having national jurisdiction over resource management.

Article 84.1 authorizes the MET to make **regulations** in regard to the following activities of relevance to cheetah conservation:

(d) “the circumstances under which any permit, license, registration, approval permission or exemption shall be granted...in terms of this Ordinance and the form in which any such permit, license, registration, approval, permission or exemption shall be issued;

(e) “the keeping of registers relating to the obtaining, processing, sale or export of the skins of game or wild animals by licensed game dealers, dealers dealing in skins or game or wild animals, tanneries and other persons or bodies interested in the obtaining, processing, sale or export of the skins of game or wild animals” (game dealers, skin dealers and trophy manufacturers are required by No. 240 of 1976 and No. 41 of 1982 to keep detailed registers regarding the particulars of each transaction);

(g) “the keeping in captivity, transport or removal from one place to another of any game or wild animal”;

(w) control over a variety of aspects of trophy hunting, including hunting seasons, registration and operation of hunting farms, registration of professional hunters and guides and their training;

and finally, (x), any special regulations may be issued in regard to “the preservation of game, wild animals, fish and indigenous plants in general or any species of game, wild animal, fish or indigenous plant”.

The Ordinance states explicitly that “the power to make regulations in relation to any matter mentioned in subsection (1) shall include the power to prohibit anything, either absolutely or conditionally, in connection with that matter” (Art. 84.3). Regulations are applicable throughout the country unless specific notice is published in the Official Gazette regarding specific application to part or parts of the country (Art. 84.4).

With regard to **penalties**, the punishment for illegally hunting a cheetah is a fine not exceeding N\$4,000 or imprisonment not exceeding four years or both (Art. 27). All other offenses concerning a cheetah are considered a general offense, liable on conviction to “a fine not exceeding N\$250 or to imprisonment for a period not exceeding three months or to both such fine and such imprisonment if a person has not been previously convicted of such offense” (Art. 87[a]); or to a fine not exceeding N\$500 or to imprisonment for a period not exceeding six months or to both such fine and such imprisonment if such a person has previously been convicted of an offense referred to in paragraph [a]” (Art. 87[b]). “Any person convicted of an offense in terms of this Ordinance who after such conviction persists in the conduct or omission constituting such offense shall be guilty of a continuous offense and liable on conviction to a fine not exceeding N\$10 in respect of every day he so persists” (Art. 88). Any animal, animal part or product, weapon or vehicle involved in the offense may be forfeited to the State by the convicting court (Art. 89).

### ***1.3.3. MET policy on the cheetah***

Until now, there has been no specific MET policy on the cheetah. The way in which the Nature Conservation Ordinance of 1975 has been enforced and implemented in regard to the cheetah constitutes the MET's *de facto* cheetah policy to date.

In practice, the stricture that cheetahs may only be hunted to protect human life or while actually threatening livestock has been ignored. Many farmers have over the years shot or removed cheetahs from their land on a precautionary principle, viewing them as a potential threat to life or livestock. (The IUCN Cat Specialist Group has not been able to document any cases of wild cheetahs killing humans: Nowell and Jackson 1996 p. 194). Some farmers have taken more than 100 cheetahs from their property over a decade (Myers 1975, Marker-Kraus et al. 1996). MET has not challenged their right to do so.

In addition, MET does not strictly enforce the law's provision that land owners report the killing of a cheetah within ten days. In practice, of course, it is difficult to imagine how the government ever being able to do this. Rather, it is the perception of MET officials that land owners report killing a cheetah only if they desire to keep or sell the skin (Article 50A requires a permit for possession of the raw skin of protected game). It is standard practice for MET to issue a permit for the possession of a cheetah skin when its killing in defense of livestock has been reported.

The cheetah's protected status would appear to rule out trophy hunting, but in 1982 it was decided to allow trophy hunting of both cheetah and leopard (also a protected species in Namibia) because of the wide extent of the livestock predation problem, and in the hope that an increase in the value of the cheetah would encourage farmers to stop killing so many (C.J.V. Roché, Secretary Dept. Agriculture and Nature Conservation in litt. to R. Jachowski, Chief, Office of the Scientific Authority, U.S. Fish and Wildlife Service, 1983).

MET is considering a new policy approach that will be discussed in greater detail in Part 3: working with the Namibian Association of Professional Hunters (NAPHA) to inform them of farmers' complaints of problem cheetahs. Professional hunters with a client coming in who wants to shoot cheetahs can then make arrangements to go to the farm and hunt the problem animal. Thus trophy hunting would more specifically target problem animals and perhaps be more effective at deterring indiscriminate killing of cheetah by farmers. A "Cheetah Compact" developed with Safari Club International (Teer 1994) is being circulated among professional hunters by NAPHA (Appendix 6). Members who sign it agree to provide a substantial fraction of the cheetah trophy hunting fee paid by the client to the farmer on whose land the cheetah was hunted, and also to provide N\$1,000 of the fee to a fund for cheetah conservation projects administered by the Namibian Nature Foundation.

Regarding the capture, sale, transport or keeping of cheetahs by private individuals (not licensed game dealers), MET will generally issue the required permit to a land owner upon request.

Two other key MET policies are relevant to the cheetah.

**Ownership of huntable game:** Since 1967, owners of adequately fenced land are legally the owners of unprotected wild species or game classified as "huntable". Huntable game species currently include bushpig, buffalo, gemsbok, kudu, springbok and warthog, and these may be utilized by their owners throughout the year for their own consumption without restriction. Hunting by others may be allowed by the land owners only during the appropriate hunting season, and where the land is larger than 1,000 ha and enclosed by a game-proof fence. Prospective hunters under such circumstances negotiate their permission and their price directly with the land owner rather than with the MET. Commercial hunting of huntable game is often permitted by MET after application by a land owner, survey of the land, and negotiation. Protected and specially protected antelopes are also frequently permitted to be hunted on private land after such a process. This is of significance for cheetahs as an example of MET policy which encourages private land owners to conserve and benefit from wildlife on their property. According to the latest MET farm survey, the numbers of huntable game species have increased strongly on commercial farms since the 1970s, and their increase has been stronger than many protected species of antelope (Barnes and de Jager in press).

**Conservancies:** The latest MET policy initiative, supported by 1996 amendments to the Nature Conservation Ordinance, to encourage wildlife conservation is the formulation of the conservancy. A

conservancy is a group of farms or communities which pool their resources for the purpose of conserving and utilizing wildlife on their combined properties. They have a constitution and legal status as a corporate body. Conservancy members practice their normal farming operations in combination with wildlife, including its utilization. The principal reason for forming a conservancy is to improve or maintain the status and variety of wildlife, and particularly game species whose movements are not restricted by livestock fences. MET officials are members of each conservancy's management committee and help to guide its actions during meetings. Game offtake is regulated for sustainability through the MET permit system. Conservancies are relevant to cheetah conservation because cheetahs have large home ranges, and the pooled knowledge of the conservancy is more appropriate for cheetah population monitoring than the limited knowledge of individual land holders. Also, it is likely that conservation appreciation and sophistication with regard to wildlife management will increase among the public as a result of the conservancy program. Conservancy-type management should benefit the cheetah's ungulate prey base.

As a protected species, all cheetahs are legally owned by the State. Yet it is clear from its policies that the Ministry of Environment and Tourism explicitly encourages sustainable utilization of even State-owned wildlife on private lands as an incentive to its conservation, while controlling and monitoring such utilization through the permit system.

#### **1.4. Summary of problems in cheetah conservation**

The following factors must then be kept in mind when developing a cheetah conservation strategy:

- The cheetah is among the rarer big cats of the world, and Namibia holds one of the largest national populations. Namibia has an annual CITES quota allowing non-commercial exports of 150 cheetahs (bona fide sport hunting trophies or live animals for conservation or breeding purposes).
- Although the cheetah is a protected species and thus State property, most of the Namibian cheetah population is found on private lands.
- Livestock farming is the major land use in this country, and most farmers view the cheetah as a problem animal. They are legally permitted to kill cheetahs on their property which they feel constitute a threat to their livestock.
- The Ministry of Environment and Tourism encourages sustainable utilization of wildlife on private lands as an incentive to its conservation, and many land owners protect wild game on their property and even purchase additional game, sometimes at great cost. Game farming is a growing industry which supplements income from livestock farming. The cheetah is also considered a problem animal because of its high rate of predation on game. Game farmers are even less likely to tolerate cheetahs than livestock farmers.

From the above, it should be clear that the Ministry of Environment and Tourism must cooperate closely with the private sector in order to achieve the primary goal of this strategy, conservation of a viable cheetah population.

## Part 2. Conservation of a Viable Cheetah Population

### 2.1. What is a viable cheetah population?

A minimum viable population (MVP) is defined as a minimum number of animals which can be predicted to persist over at least several hundred years in a population of sufficient size to conserve genetic diversity and buffer unpredictable demographic or environmental fluctuations. Viable populations are based on the concept of effective population size ( $N_e$ ): the number of breeding animals in a population required to conserve species genetic diversity by keeping the inbreeding rate at a maximum of 1% per generation. The oft-quoted theoretical minimum viable population size of 50 is based on this idea (Franklin 1980, Soulé 1980, Lehmkuhl 1984).

The actual census population size ( $N$ ) will be larger than the effective population size ( $N_e$ ) of 50 if: 1) not all animals in the population breed; 2) breeding male: female sex ratios are not equal; 3) there is variation in the number of young produced by each cheetah family and 4) animals breed more than once in their lifetime. All of these are true for the cheetah, indicating that a minimum viable population of cheetahs will be larger than its calculated effective population size.

However, the rule-of-thumb number  $N_e = 50$  may well be unnecessarily high for the cheetah because of its markedly reduced genetic variation, discussed in Section 1. As stated by Lehmkuhl (1984: 170): “Species or populations with high levels of [genetic] heterozygosity may have a large load of deleterious genes and be more susceptible to inbreeding depression than homozygous populations that have lower genetic loads as a result of previous bottlenecks in population size, isolation, or natural inbreeding strategies. For the more susceptible populations, an MVP of 50 may be too low, and for the less susceptible species it may be too high.”

Further, a population size sufficient to mitigate against environmental and catastrophic uncertainty (habitat change, or an epidemic or natural disaster) should be considerably larger than one required only to conserve genetic diversity (Shaffer 1987, Lande 1988).

However, Lehmkuhl (1984) provides a formula for calculating MVP size which takes the four factors enumerated above into account, as well as historic population fluctuations as a measure of expected environmental and catastrophic uncertainty. If  $N_e = 50$  is assumed for the cheetah, it works out that at least 3,360 cheetahs are needed to achieve long-term persistence in Namibia (for details of calculation, see Appendix 3). This is in agreement with the expectations of most theoreticians and managers that viable populations should number several thousand animals (Lehmkuhl 1984, Belovsky 1987, Soulé 1987). This order of population size is equivalent to the largest national populations of cheetah that most range states would be capable of sustaining.

However, Lehmkuhl (1984) also states that “an alternative to the proposed rule-of-thumb [ $N_e = 50$ ] is to measure populations for genetic variability and base MVP estimates and management on the variability observed in each species.” Cheetahs have 39 times less average genetic heterozygosity than four other species of African felid (lion, leopard, serval, caracal: O’Brien et al. 1983, 1987). If it is thus assumed that their effective population size would be 39 times smaller than the rule-of-thumb and the same calculation is run through, then it would appear that only 160 cheetahs are needed for long-term persistence in Namibia (again, see Appendix 3 for calculation details). This population size is equivalent to the largest protected area population of cheetah that most range states would be capable of sustaining.

This exercise highlights the magnitude of uncertainty which can be involved if managers are to base their target viable population size chiefly on genetic considerations - particularly for a genetic oddball like the cheetah.

For the Namibian cheetah, there are several other factors which need to be taken account when defining a target viable population size (most of them not biological). Some of them favor the low range of the viable population size calculation, while others favor the high.

The first is that it is unrealistic to base a conservation policy only on the conservation requirements of the cheetah. The needs of Namibian citizens must also be taken into account, and many of them, most

importantly the commercial farmers on whose land the majority of the cheetah population lives, consider the cheetah to be a problem animal whose presence on their land leads to significant financial loss. Many farmers would probably prefer to see their government aim to conserve a cheetah population closer to 160 than to 3,360.

The second is that the border fence between Namibia and Botswana does not effectively isolate cheetahs. Namibia is not a cheetah island as long as cheetahs do not become extinct in Botswana and cross-border connectivity is sustained. Therefore, MET need not set the goal of conserving the highest possible number of cheetahs.

The third consideration is that both Namibian and Botswanan farmers remove large numbers of cheetahs from the population every year, at rates which are potentially unsustainable. The impact of these removals of the population needs to be evaluated. If the level is found to be unsustainable, and thus leading to a population decline, this implies that active management measures need to be taken, or that the highest possible number of cheetahs should be conserved in order to sustain the offtake.

A fourth consideration is that over 95% of the world's cheetahs in captivity are derived from wild-caught Namibian animals, and that breeding of cheetahs in captivity has become much more successful in recent years (Marker-Kraus and Grisham 1993). If MET chooses to consider captive animals as part of its cheetah "meta-population" and to supplement the wild population with animals from captivity (an approach which is promoted by the IUCN/SSC's Conservation Breeding Specialist Group), it will be in a better position than most wildlife managers, since most captive animals are of Namibian origin and thus of appropriate genetic makeup for reintroduction. In addition, the Namibian cheetah probably has one of the largest "genome resource banks" of any national species population, thanks to the efforts of the Cheetah Conservation Fund in collecting and exporting serum and sperm samples, so assisted reproduction is also an option. Such a management strategy implies that a minimum viable population would be low rather than high.

Fifth, Namibia probably holds one of the largest national cheetah populations remaining within the species range. Cheetahs have largely disappeared over the last century from much of their North African and Asian range. This suggests that Namibia should maintain a high cheetah population for species conservation. It also suggests that MET management measures for the cheetah will be the focus of international attention.

And finally, the number 500 is often quoted as an acceptable MVP size for long-term viability. Few contiguous populations of the rarer big cats reach even this size, and the Namibian cheetah population certainly exceeds this number.

Before offering a definition of the target cheetah viable population size which takes into account all the factors discussed above, data on the historic abundance of the cheetah in this country is first reviewed, and the size of the current cheetah population is estimated.

## **2.2. Review of information on the historical distribution and abundance of cheetah in Namibia**

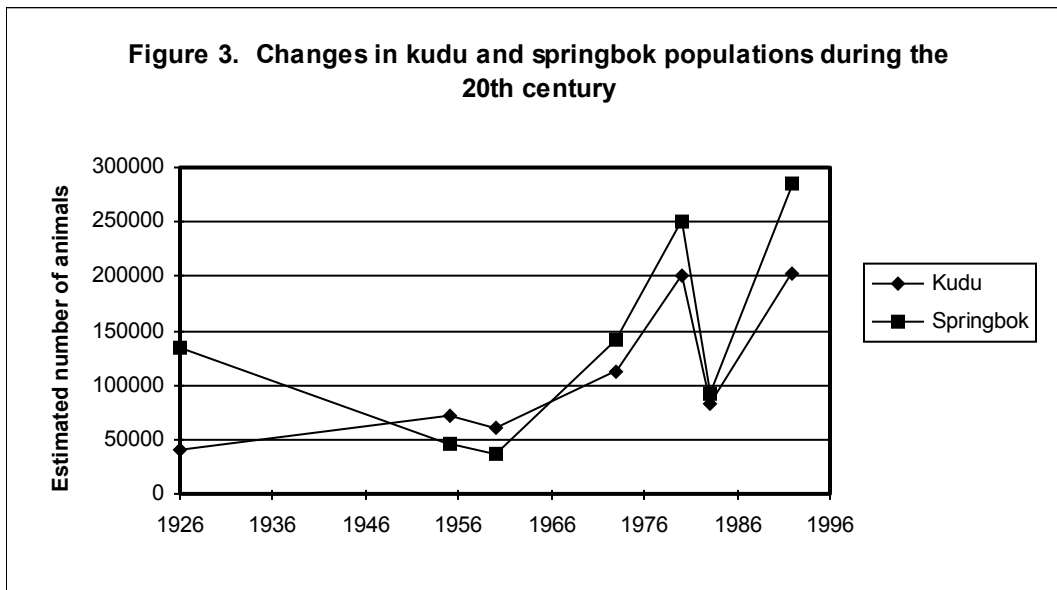
In wanting to conserve a viable cheetah population, it should be borne in mind that the environment in which the cheetah currently lives is markedly different in several important respects from the situation 150 years ago, at the beginning of colonization of Namibia. It is worth asking how these environmental changes have affected the cheetah population, and whether the situation of the population today is better or worse than it was in precolonial times.

### ***2.2.1. Environmental changes brought about by colonization***

In the late 1800s through the early parts of the 19th century, apart from the perennial rivers in the extreme north and south of the country, there were few natural fountains in Namibia. Thus, for most of the year, little surface water available for game populations, which were correspondingly highly migratory. The predominant habitat type south of the northern woodlands was open grassland savanna. Colonization brought fences, boreholes, guns and high numbers of domestic hoofstock as large areas of Namibia were converted into commercial farms. Subsequent overgrazing and fire control has led to bush encroachment,

particularly in the north-central regions of the country which now form the cheetah's stronghold (Erkkila and Siiskonen 1992).

Bush encroachment and the widespread availability of permanent water at livestock drinking troughs has favored the kudu, which has had a large increase in number. As stated by Joubert and Mostert (1975: 8), the kudu is "one of the classic examples in [Namibia] of a species benefiting from the improvement of their habitat due to human interference." Farmers now consider kudu calves the main prey of cheetahs on the farmlands (Marker-Kraus et al. 1996). On the other hand, springbok, which can be considered the more natural prey of the cheetah, initially declined greatly in number. Springbok were killed for biltong and as grazing competitors with sheep in the south; in addition, their migration routes were blocked by fences which, unlike kudu, they do not jump. However, springbok began to increase again in the late 1960s due to good rains, reductions in their natural predators, and a growing appreciation by the farmers of their value (Joubert and Mostert 1975). In the early 1980s, a severe rabies epidemic coupled with drought conditions generally reduced many game species, especially kudu, but all species have appeared to have recovered strongly. Figure 3 compares national population estimates for kudu and springbok over the 20th century.



### 2.2.2 The cheetah population in the early 1900s

In 1926, the commissioner for Native Affairs in Ovamboland, Cocky Hahn, submitted a detailed report for his region to Courtney Clark, then Secretary of Southwest Africa, with maps showing the distribution of major game species, notes on their behavior and ecology, and estimates of their population sizes. The magistrates of all remaining districts were then asked to undertake a similar exercise.

Although one can expect some wild over- and underestimates, since few actual counts were undertaken and some of the magistrates had seldom traveled outside the district capitals, the results of the 1926 survey are still interesting as they provide baseline data on the relative abundance and distribution of various species (SWA 1926). The magistrates noted that they had consulted widely with farmers and police officers.

Combining all the district population estimates, the total number of cheetah comes out to 3,010, with a district breakdown as shown in Table 3. Estimates for other large predators are also shown in Table 3 for purposes of comparison.

District	Cheetah	Leopard	Lion	Wild Dog	Spotted hyena	Brown hyena
Aroab	60	500	5	0		
Bethanie	50	1,200		300		
Gibeon	200	200	10	500		40
Gobabis	500	500	25	1,500		1,500
Grootfontein	No estimates given for this district					
Karibib		100		100		
Keetmanshoop	100	200		32		100
Luderitz		125		0	125	
Maltahohe		250		50		
Okahandja	200	150		400		55
Omaruru	20	50	40	400		
Otjiwarango	800	1,500	31	520	40	1,100
Outjo			200	8,000		200
Ovamboland	80		10	200	100	200
Swakopmund		0		0		
Warmbad		50		0		
Windhoek	100	100		50		
Namutoni GR*	900	1,000	200	2,000	2,000	2,000
TOTAL	3,010	5,925	521	14,052	2,265	5,195

\* = Etosha National Park

Source: SWA Admin (1926)

It is interesting that the number of cheetahs in Namibia in 1926 was estimated to be much higher than the number of lions and spotted hyenas. At that time, there were around 2,000 farms in the territory (Gordon 1992: 202), compared to nearly 6,000 today. In 1926, few of the farms were fenced, and the number of stock watering points was far lower than it is today (in the north-central farm districts surveyed by the Cheetah Conservation Fund, the average number of permanent water points per farm was found to be about 14, at a density of one water point per 7 km<sup>2</sup> [Marker-Kraus et al. 1996: 23]). Lions and spotted hyenas are far more water dependent than cheetahs, and it is likely that in the past their range was strongly localized around water sources. Cheetahs, on the other hand, are more arid-adapted, and are capable of satisfying their moisture requirements from their prey (farmers in the old days observed cheetahs drinking the blood

of their prey and assumed that, like vampires, cheetahs killed animals by sucking the blood from their necks).

It is often stated that a primary reason why cheetahs appear to be thriving on Namibian farmlands is because other large competing predators, chiefly lion and spotted hyena, have been shot out (e.g., Joubert and Mostert 1975, McVittie 1979, Joubert 1984). Lion predation on cheetah cubs was found to be very high in Tanzania's Serengeti National Park (Laurenson 1995), and researchers there have suggested that protected areas are not sufficient to conserve viable cheetah populations because high populations of lion and hyaena keep cheetahs at low density (Caro and Laurenson 1994).

Yet it appears from the 1926 game estimates that cheetah numbers were originally quite a bit higher than lion and hyaena numbers. Of course, cheetah numbers may have been overestimated, and lion and hyaena numbers underestimated, yet even if the figures for Namutoni Game Reserve (now Etosha National Park) are discounted, the proportion of cheetah to lion remains high. While both settlers and natives hunted lions and hyenas for livestock protection and the process of elimination for these two predators from the farmlands was already under way, nonetheless the number of wild dogs was still very high (even if the unlikely figure of 8,000 in Outjo district is discounted). Comments by the magistrates submitting their game estimates showed that wild dogs were considered a major threat to livestock and that significant efforts were being put into eliminating them (a process which reached its greatest effectiveness in the late 1940s, according to a questionnaire survey by Hines [1990]). Whereas wild dogs were described by the 1926 survey as widespread (the Outjo magistrate reported that they were to be found "on all farms carrying stock"), lion distribution was described as more localized. For example, the magistrate of Otjiwarango reported that "a few of these animals are usually found near the waterholes in the northern section of the Waterberg East Native Reserve," and the magistrate of Omaruru reported that "Lions are met with almost solely along the Ugab River where zebra and kudu are plentiful."

Cheetahs, on the other hand, were generally described as either "fairly plentiful" (Gobabis, Namutoni Game Reserve) or "found throughout the district" (Otjiwarango, Okahandja, Gibeon). Other information from the early 1900s concurs with their general assessments. For example, in 1913, cheetahs were described as "plentiful" in Gobabis, Grootfontein and Outjo districts by the German publication *Jagd and Wildschutz in den Deutschen Kolonien* (Gaerdes 1974), and from 1910 to the early 1930s farmers in the south of the country described cheetahs as numerous (Gaerdes 1974), a time when springbok numbers in that region were still high. In 1934, the naturalist G.C. Shortridge also considered the cheetah "quite plentiful in the eastern sand-veld regions," with "a widely scattered range through South-West Africa."

It would seem that Namibia has always been good country for cheetahs because of its aridity, which naturally limited the abundance of lions and spotted hyenas. Although some of the migratory ungulate species have declined in Namibia since the development of large scale commercial farming (particularly blue wildebeest and Burchell's zebra), others, notably the kudu, have increased. At the same time, farmers have generally prevented lions and spotted hyenas from taking up residence on their property by killing animals which emigrate from Etosha National Park and from Botswana. Contrary to popular perception, bush encroachment probably does not make it more difficult for cheetahs to hunt their prey - Eaton (1974), based on his study in Kenya's Nairobi National Park, considered that cheetahs expend less energy hunting prey in woodland than on open plains which provide little cover for the cheetah to stalk its prey. Following radio-collared cheetah on Namibian farmland, Morsbach (1986) noted several occasions where cheetahs preferred dense bush areas to open pan-type plains, despite the fact that there was game in the open areas. Bush encroachment probably also benefits cheetahs by making it more difficult for farmers to spot them.

It is likely that the changes to the Namibian landscape wrought by modern farming methods have generally benefited the cheetah population, and the current population could well be larger than in precolonial times. However, first the effects of cheetah hunting and removals by farmers must be taken into account.

### **2.3. Recent estimates of cheetah numbers and distribution**

Recent estimates of the size of the cheetah population have varied widely, even when an attempt is made to be quantitative rather than just make educated guesses.

#### **2.3.1. 1970s**

During this period, Norman Myers, who later was appointed Chairman of the Cat Specialist Group of IUCN - the World Conservation Union, visited 38 sub-Saharan African countries to evaluate the status of the cheetah. The impetus for his survey, which was sponsored by the International Fur Trade Federation, was concern over the impact on the species of trade in cheetah skins for fur coats, one of the key issues which led to the development of the Convention on International Trade in Endangered Species (CITES) in that same time period.

In Namibia, Myers (1975: 42) states that he was quoted an “official” population estimate of just 500 cheetah from an un-named Nature Conservation official. He seems to have misplaced a zero, for the official population estimate at that time was not 500 but 5,000, as discussed below.

In the same report, Myers himself estimated the population at between 1,500-3,000, tending toward the lower figure. His estimate was based on a density of one adult cheetah per 150 km<sup>2</sup>, a guesstimated figure he says he derived through discussions with farmers, with Dr. W. Labuschagne, who had studied cheetahs in South Africa’s Kalahari Gemsbok National Park, and also from “off-take figures for cheetah control programmes in the country over the past decade.” (By “cheetah control programmes”, he seems to be referring to removal records kept by individual farmers.) He applied this density estimate to 110,000 km<sup>2</sup> of prime habitat in the north-central commercial farming districts, yielding 750 cheetahs, and then estimated perhaps another 750 in the remainder of the country, for a total of 1,500. He then added, “However, it is of course possible that the total population exceeds 1,500, although it is hard to believe that the figure could be as high as 3,000.”

In the same period of time, the Department of Nature Conservation (DNC - now the Ministry of Environment and Tourism) carried out a questionnaire of commercial farmers, asking them to “record the presence and their estimates of the number of each game species occurring on their properties” (Joubert and Mostert 1975). They mailed 5,388 questionnaires, and had a 61% return rate, with reports for 3,284 farms.

In evaluating the accuracy of game estimates reported by farmers, Joubert and Mostert (1975) conceded that overcounting was a distinct possibility, especially for animals whose home ranges incorporated a number of farms. They also felt that farmers overestimated the numbers of problem animals, such as black-backed jackal and Hartmann’s mountain zebra. However, they also pointed out that farmers are obliged to estimate game numbers on their property as part of their farm planning process, because it influences the carrying capacity for stock. They also felt that those who returned the questionnaires were more likely to have an interest in game, and thus a more accurate picture of its abundance. The cheetah was used as one of three examples of a species for which the estimate derived from farmers’ reports (6,252) compared favorably with a recent Departmental estimate (5,000). How the Department derived its estimate is not stated, but it implies a density average of about one cheetah per 100 km<sup>2</sup> throughout about 2/3s of the country, as shown in Figure 4.

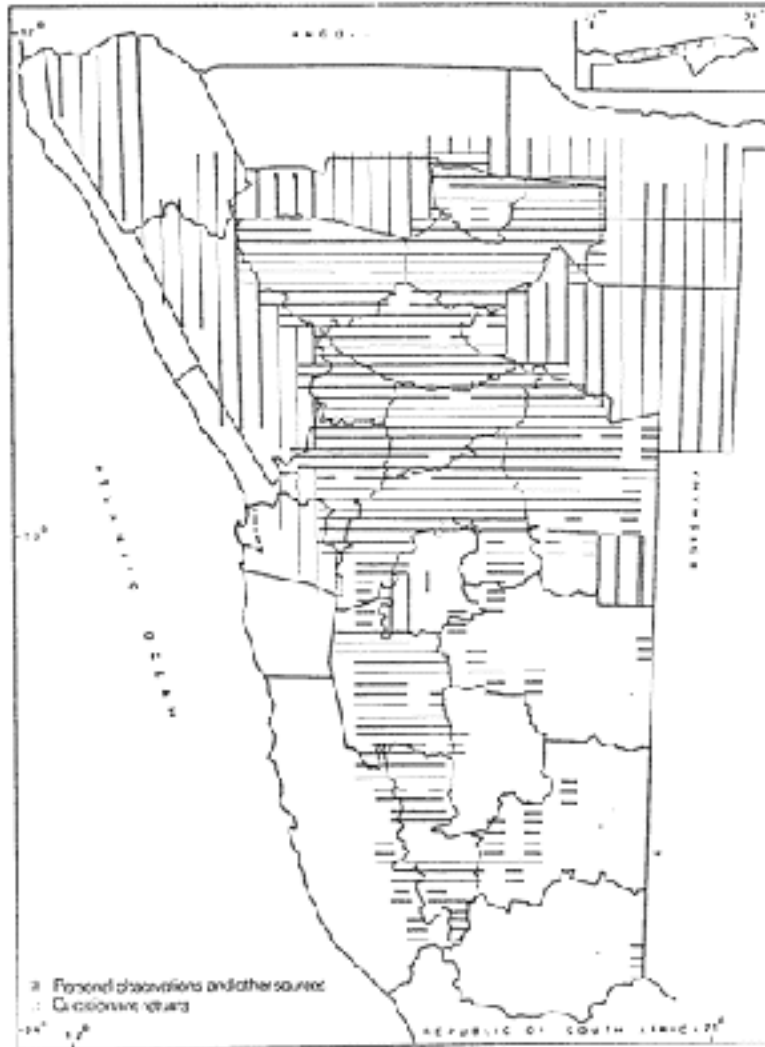
However, while the Department’s estimate of 5,000 cheetah was meant to apply to the entire country, including communal areas, the estimate of 6,252 applied only to the 3,284 farms which filled out questionnaires. The survey authors “decided to take this figure for all the farm land in SWA. Following this method meant that the overestimate was canceled to some extent” (Joubert and Mostert 1975: 9).

**Figure 4. Cheetah distribution in Namibia according to 1972 DNC farm survey. Source: Joubert and Mostert (1975)**

*Vertical lines = Personal observations and other sources; Horizontal lines = Questionnaire returns*

It is important to note here that it is not known whether the Department’s estimates of 5,000-6,000 cheetah included cubs. One could guess that most farmers reporting the number of cheetahs on their farm would be likely to report all cheetahs, rather than just adults. If the estimates do include cubs, the number of adult cheetahs would be on the order of 2,000-3,000 (see Table 5 for details of calculation).

However, if these estimates are taken at face value, for the same period of time even semi-quantitative estimates differ by a factor of four. Dieter Morsbach (1987), reviewing the information for cheetahs



published during this period, wrote, “The huge variation in the results of these estimates, both carried out in the same year, clearly proves that it is impossible to make any meaningful estimates of a population if the basic data on that population is not known.”

Myers (1975) considered Namibia’s cheetah population to be declining under trapping pressure for commercial trade in live animals. “In the view of some observers,” he wrote, “the present traffic in wild-caught cheetah could bring its existence in the ranchlands to an end by 1980...The demand for live cheetah is growing in Europe and North America at a time when the stocks in Southwest Africa are surely dwindling.”

On the other hand, Gaerdes (1974) and Joubert and Mostert (1975) considered the cheetah population to be increasing. These authors attributed the cheetah’s increase to eradication of competing predators and the increase in the kudu population. In addition, better than average rainfall during this period promoted good

grass growth, which in turn probably led to increases in many game species as well as increased numbers of livestock.

### 2.3.2. 1980s

A rabies epidemic in the early 1980s had a severe effect on kudu, one of the cheetah's main prey species, reducing the population by up to 75% in the central and northern farming districts. The first years of a prolonged period of below average rainfall set in, and other game species also declined. Against this changed environmental background, the DNC conducted a second farm questionnaire survey in 1981 (Joubert et al. 1982). Unlike the previous survey, no attempt was made to develop a population estimate based on farmers' reports because "it was thought unreasonable to expect the farmers to know how many of these secretive and mainly nocturnal animals occur on their land. With this in mind it was reasoned that any such figure would not be a valid indication of the status of a specific species" (Joubert et al. 1982: 12). However, comparing the two maps of cheetah distribution showing their reported presence on farms, they are strikingly similar (Figures 4 and 5).

The 1982 survey gives information on the percentage of farms in each district reporting cheetah presence. This is compared in Figures 6 and 7 with the same information for the 1992 farm survey (see discussion below).

Concern was growing within the Department over the status of the cheetah, as farmers complained of its predation on their livestock and killed many animals. The DNC decided to carry out a research project on the cheetah on the farmlands, one of the goals being to determine its population status. The project was carried out from 1984-1986 on a 20-farm, 1,000 km<sup>2</sup> study area north of Windhoek, chosen from the 1982 farm survey as being a hotspot for cheetah problems. The DNC researcher, Dieter Morsbach (1984-1987), radio-collared a total of 17 cheetah. He found a density of resident adult cheetah at one per 50 km<sup>2</sup> - about one resident cheetah per small farm (5,000 hectares). Including cubs and transients, and based on marked animals and animals killed by farmers, the total cheetah density was found to be very high at one per 29 km<sup>2</sup> (Table 1). This latter is an overestimate, as the study area probably made up only a fraction of the transients' home ranges, and partially resident animals should be counted as partial rather than whole cheetahs in a density estimate (Garshelis 1992).

In his estimate of the size of the Namibian cheetah population, Morsbach (1987) used a methodology very similar to Myers (1975). The important difference was that his estimate of resident adult cheetah density (1/50 km<sup>2</sup>) was based on actual field data, and was moreover three times higher than the density estimated by Myers (1/150 km<sup>2</sup>). As did Myers, Morsbach applied his density estimate to 100,000 km<sup>2</sup> of north-central commercial farmlands (box in Fig. 5), but his higher density estimate yielded a higher cheetah population estimate in this area of 2,000 animals. Including cheetahs found in other parts of Namibia, he suggested that in the mid-1980s the total population was between 2,000 and 3,000.

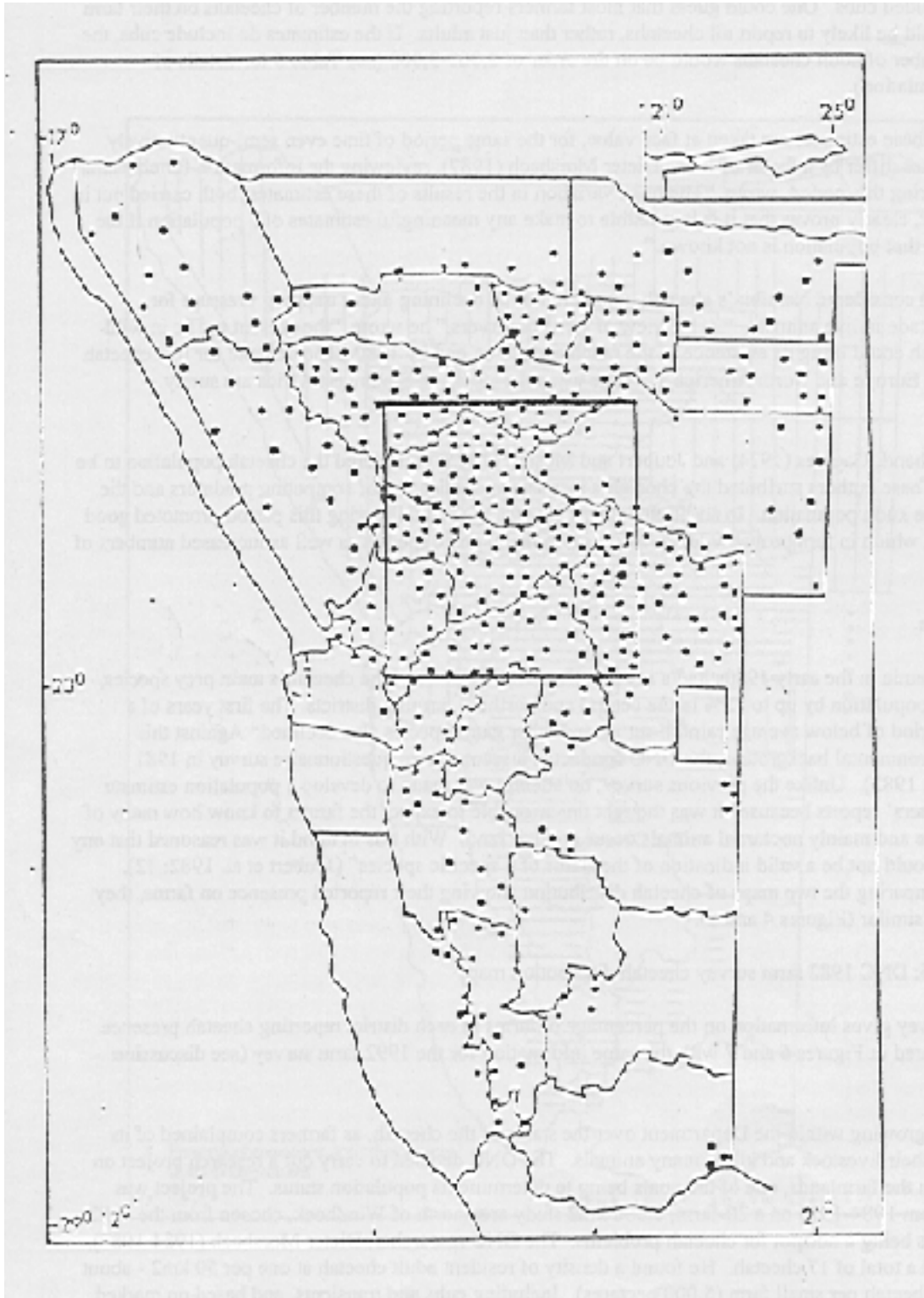
### **Figure 5. Cheetah distribution in Namibia in 1982 according to DNC farm survey. Source: Joubert (1984)**

*Central square = stronghold of cheetah distribution (approx. 150,000 km<sup>2</sup>)*

Joubert (1984: 13), on the basis of the 1982 DNC farm survey, reported that "cheetahs manage to maintain healthy, and probably increasing, populations on farms." However, upon the conclusion of his research, after several years of record high numbers of cheetahs shot by farmers in defense of livestock, and after the decimation of wild game by the rabies epidemic, Morsbach (1987) considered that the cheetah population was "decreasing with the increasing pressure from intensive persecution".

### 2.3.3. 1990s

Morsbach's (1987) estimate, usually abbreviated to 2,500, is still widely used to represent the national cheetah population today. It appears in the Namibian government's proposal to establish a CITES export quota for cheetah (CITES 1994), in the 1996 Namibian cheetah Population and Habitat Viability Analysis (CBSG 1996), in the Cat Specialist Group's Cat Action Plan (Nowell and Jackson 1996), and in the



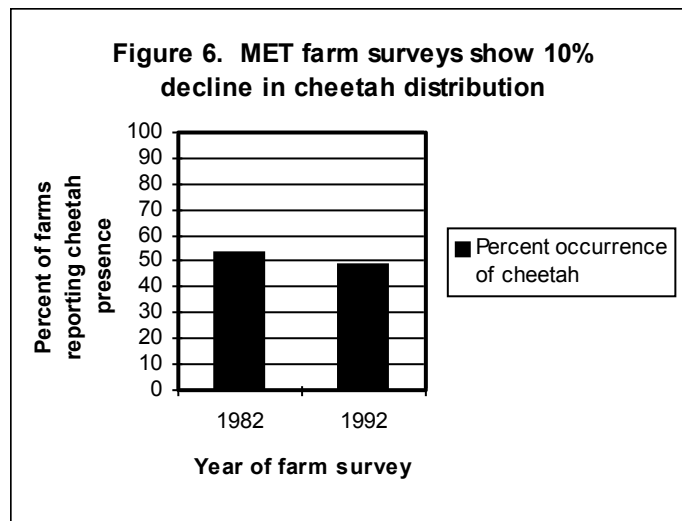
literature of both of the NGOs established in the early 1990s to work for conservation of the Namibian cheetah, the Cheetah Conservation Fund (Marker-Kraus et al. 1996) and Africat (1995 brochure).

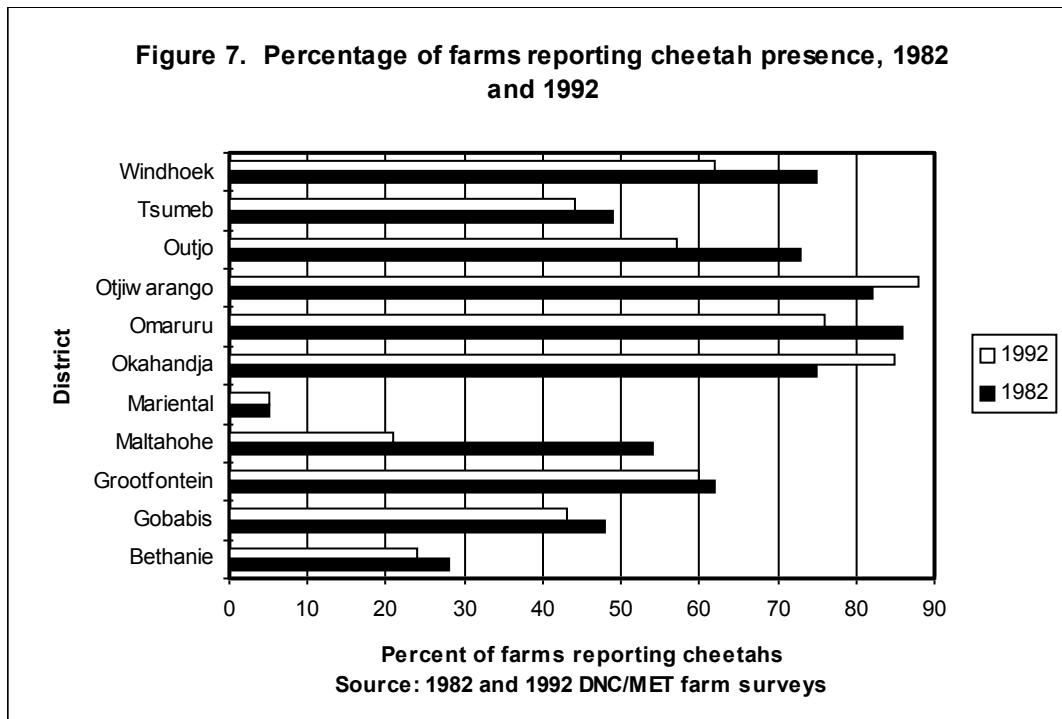
The renamed Ministry of Wildlife Conservation and Tourism (now MET) carried out another nationwide farm survey in 1992. Different questions were asked than in the two previous questionnaire surveys, but

the methodology was the same. The results of this survey are still being written up, and ungulate population estimates are just being published (Barnes and de Jager in press). The data pertaining to cheetahs was provided by M. de Jager to calculate the 1992 cheetah population estimate.

Again, farmers were not specifically asked to count only adult cheetahs. Some individual estimates were over 100 cheetahs per farm. If all the individual farm estimates are added together with no adjustments, as was done for the 1972 survey, the total comes to 4,688 cheetahs. If cubs are subtracted (50% of the population), the total is about 2,350 cheetahs, in line with Morsbach's estimate. A 25% decline from 1972 is implied if these figures are taken at face value. However, the methodology used to derive the reasonable-sounding estimate of 2,350 is highly suspect, given that many individual farms reported more than 50 cheetahs, yielding unrealistic densities. This shows that farmer surveys are an impractical way of estimating total cheetah population size.

Still, perhaps an indication of relative distribution and relative abundance over time can be derived from comparing the percentage of farmers in each district reporting cheetah presence in 1982 and 1992. This data also indicates a decline, but to a lesser degree of 10% (Figure 6). However, reporting of cheetah presence seems to be lower for the MET farm survey (Figure 7) than for CCF's cheetah-focused farm survey, where 97% of farmers from the districts of Otjiwarango, Gobabis, Windhoek and Okahandja reported cheetah presence (Marker-Kraus et al. 1996: 51).





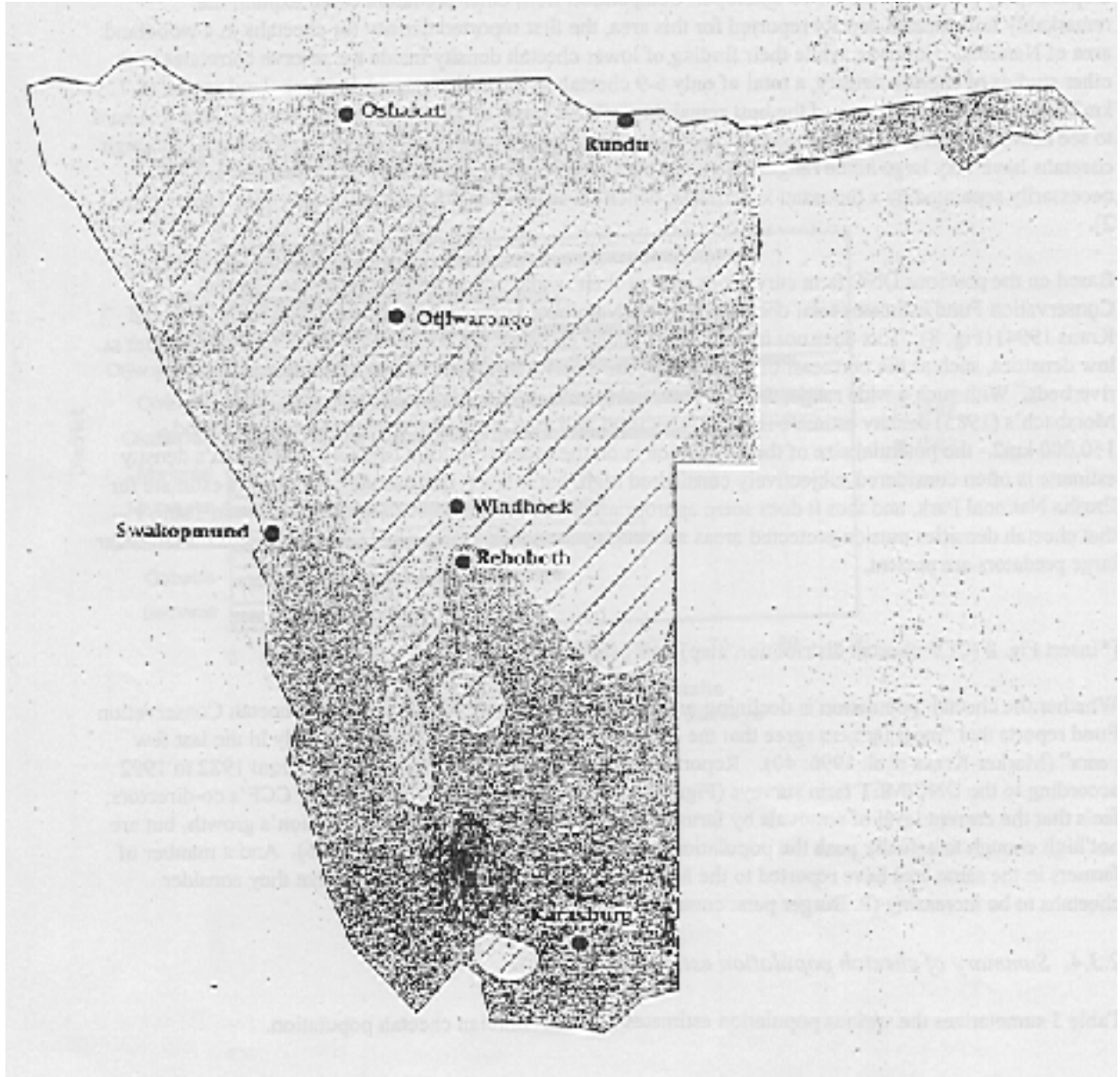
Two smaller scale population estimates were also developed during this period as a result of MET research projects. Records on cheetah sightings were analyzed for the period 1992-1994 in Etosha National Park as part of a large scale study on the interaction between predators and plains ungulates. Fifty known adult and sub-adult cheetahs were counted on the short grass plains to the south and east of Etosha Pan, yielding a density of approximately one cheetah per 80 km<sup>2</sup> (study area considered to be approximately 4,000 km<sup>2</sup>). The total park population was estimated at being between 135 (if density in other habitats, such as mopane woodland, is half what it is on the plains) to 175 (if density is constant) (Nowell et al. in prep.) Note that both adults and independent sub-adults are included in this density estimate, which is recommended because the two are very difficult to distinguish from either sightings or spoor unless the histories of the individual animals are known.

Based on the frequency of cheetah spoor encountered while driving transects on roads in eastern Tsumkwe district, also known as the Nyae Nyae area or eastern Bushmanland, Stander et al. (1996) estimated extremely low cheetah densities, the lowest reported anywhere in the species' range. In the Kaudom Game Reserve, density was estimated at one adult per 1,666 km<sup>2</sup>. Outside the reserve, density was twice as high, at one cheetah per 833 km<sup>2</sup>. Kaudom, at 3,842 km<sup>2</sup>, supports between 43-65 lions (1.2-1.7 lions per 100 km<sup>2</sup>) and 62-88 spotted hyena (1.6-2.3 hyenas per 100 km<sup>2</sup>), which helps explain the low reported cheetah density (0.05-0.07 cheetah per 100 km<sup>2</sup>, or just 2-3 cheetahs in the reserve). Although steenbok and duiker, ideal cheetah prey, are plentiful both inside and outside the reserve, leopard density is quite high and leopards prey mainly on these two antelope. Competition from other predators could explain the remarkably low cheetah density reported for this area, the first reported density for cheetahs in a woodland area of Namibia. However, while their finding of lower cheetah density inside the reserve correlates with other studies of cheetah density, a total of only 6-9 cheetah in the entire eastern Bushmanland region (8,711 km<sup>2</sup> including Kaudom), one of the best remaining wildlife areas of Namibia, seems very low, and it is hard to see how cheetahs could persist at such low densities. Elsewhere in Namibia and in other areas, although cheetahs have very large home ranges, there is a high degree of overlap so that adult cheetahs are not necessarily separated by a thousand kilometers, which these low density estimates imply (see Tables 1 and 2).

Based on the previous DNC farm surveys as well as their own contacts with farmers, the Cheetah Conservation Fund estimates total cheetah range on Namibian farms at 275,000 km<sup>2</sup> (Marker-Kraus and Kraus 1994) (Fig. 8). This does not include areas where cheetahs are occasionally present or are present at

low densities, such as the northeast of the country, the Caprivi Strip, and the coastal desert along the riverbeds. With such a wide range, there is potential for cheetahs to number higher than 2,500. If Morsbach's (1985) density estimate is slightly reduced and then applied to a larger area of farmland - 150,000 km<sup>2</sup> - the potential size of the population is on the order of 3,000 (Table 4). Morsbach's density estimate is often considered subjectively considered high, but it is not quite double the density estimate for Etosha National Park, and thus it does seem appropriate given the general relationship shown in Table 1 -- that cheetah densities outside protected areas are roughly twice as high as within protected areas when other large predators are present.

**Figure 8. 1995 cheetah distribution in Namibia according to the Cheetah Conservation Fund**



**Table 4. Potential size of the Namibian cheetah population based upon extrapolated density estimates**

Area	Size	Cheetah density (per 100 km <sup>2</sup> )	Cheetah numbers
Farmland savanna	150,000 km <sup>2</sup> *	1.5	2,250
Other farmland savanna	125,000 km <sup>2</sup>	0.4	500
Etosha NP	16,000 km <sup>2</sup> **	0.8	135
Northern woodlands	139,800 km <sup>2</sup> ***	0.05	70
	430,800 km <sup>2</sup> (about 50% of Namibia)		2,905

\* 150,000 km<sup>2</sup> is the approximate size of the magisterial districts (with urban areas subtracted and rounded off to an even figure) of Gobabis, Grootfontein, Okahandja, Omaruru, Otjiwarango, Outjo, Tsumeb and Windhoek. Fifty percent or more of farmers who responded to the DNC 1982 survey indicated that they had seen cheetahs on their farms in these districts. This may be an under-reporting of cheetah presence; Marker-Kraus et al. (1996: 51) reported that 97% of farmers in their survey area - which includes Otjiwarango and portions of Windhoek, Okahandja, Grootfontein and Gobabis districts - saw cheetahs at least once per year on their farms, with the average frequency of sighting every three weeks. Morsbach's density estimate of 2 cheetahs per 100 km<sup>2</sup> is reduced by 25% to account for inclusion of patches of non-prime habitat.

\*\* 1.2 cheetahs per 100 km<sup>2</sup> for the Etosha plains only; density halved for remaining woodland and shrub habitats with lower water and prey availability; average density is 0.8 cheetahs per 100 km<sup>2</sup>.

\*\*\* Woodland area of the former Owambo district removed.

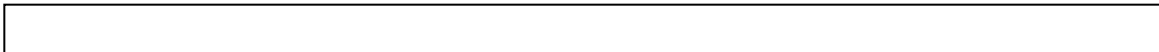
Whether the cheetah population is declining or increasing is a matter of opinion. The Cheetah Conservation Fund reports that "most farmers agree that the cheetah population has declined noticeably in the last few years" (Marker-Kraus et al. 1996: 40). Reports of cheetah presence declined by 10% from 1982 to 1992 according to the DNC/MET farm surveys (Figure 6). Yet Laurie Marker, CCF director, feels that the current level of removals by farmers may be limiting the cheetah population's growth, but are not high enough to actually push the population into a decline (pers. comm. May 1996). And a number of farmers in the same area have reported to the MET Senior Warden for Otjiwarango that they consider cheetahs to be increasing (P. Burger pers. comm. March 1996).

#### **2.3.4. Summary of cheetah population estimates**

Table 5 summarizes the various population estimates for the Namibian cheetah population.

The 1926 estimate is of little use as a number, but is probably illustrative of the relative abundance of cheetah at that time in comparison to other predators (Table 3). The lower range of Myers' (1975) estimate is probably too low, while the other estimates for 1975 and the 1992 farm survey estimate probably include cubs and are too high. The potential estimate done in this report is based on several untested assumptions.

There is no single current estimate of the cheetah population in Namibia that is sufficiently reliable, but a range from 2,000 to 3,000 adult and sub-adult cheetahs probably brackets the real number.



**Table 5. Estimates of cheetah population size in Namibia**

Year	Number of cheetahs	Methodology	Source
1926	3,010	Survey of magistrates	1
1975	1,500-3,000	Extrapolated density (1/150 km <sup>2</sup> , no field data)	2
1975	5,000 <sup>a</sup> [2,500]	Unknown (official DNC estimate)	3
1975	6,252 <sup>a*</sup> [3,126]	Farmers estimate no. of cheetah on their property	3
1987	2,000-3,000	Extrap. density (1/50 km <sup>2</sup> ) fm field study	5
1992	4,688 <sup>a*</sup> [2,344]	Same	4
1996	2,905	Extrap. density based on 4 studies	5,6,7,8,9

\* Number refers to farmland population only.

<sup>a</sup> These estimate may include cubs; the farmers' estimate almost certainly does. If so, the estimated number of adult cheetah [in brackets] would be on the order of 2,000-3,500 (assume 50% of the population is cubs).

Key to sources: 1 SWA Admin. (1926); 2 Myers (1975); 3 Joubert and Mostert (1975); 4 1992 MET farm survey, unpubl. data; 5 Morsbach (1985, 1987); 6 Stander et al. (1994); 7 Nowell et al. (in prep.); 8 Marker-Kraus and Kraus (1994) (estimated cheetah range at 275,000 km<sup>2</sup>) 9 This report, Table 4.

## 2.4. Factors affecting the viability of the Namibian cheetah population

In order to determine the viability of this population, the factors which affect population viability first need to be looked at: removals by farmers, condition of the prey base, modification of habitat, and "catastrophic"-type events, including drought and disease.

### 2.4.1. Cheetah removals

There is little information available on the number of cheetahs removed from the population prior to 1975, when the cheetah was made a protected species and permits were required for the destruction or removal of a cheetah. In the early 1970s, Myers (1975) reported that Namibia had an export quota of 130 live animals per year, although he cautioned "it seems very uncertain whether the figure of 130 is strictly observed. Thus one official told me that cheetah exported to South Africa do not fall within the quota, since Southwest Africa is administered as a province of the Republic (no customs checks exist on the border, so in any case cheetah could be taken out freely). But another official seemed certain that exports to South Africa do fall within the quota. The two commercial firms exporting cheetah also disagree with one another in exactly the same way" (p. 41). Myers estimated annual removals between 1965-1972 (p. 41) at around **230** per year - 130 exported live, with "perhaps a further 100 per year...added to cover casualties caused by live-capture operations and surplus an unwanted males killed for what their skin will fetch" (p. 42).

Prior to this, Gaerdes (1974) collected records on the number of cheetahs removed by 126 farms in eight districts from 1960-1973, yielding a total of 915 cheetahs removed and an annual average of 65 cheetahs per year, or 0.5 cheetahs per farm per year. If this figure is extrapolated to the percentage of farms found by the 1982 Department of Nature Conservation survey to have removed cheetahs that year (13% of farms with cheetahs present: Appendix 5), and this percentage is applied to an estimated 3,000 farms with cheetah present, the annual average number of cheetah removed for this period is **195**, very similar to Myer's (1975) estimate.

These estimates may be too low. W. Delfs, one of the major game dealers in this country, reckoned that between the mid-1960s to the mid-1970s his firm alone had exported between 200-300 live animals per year (Marker-Kraus et al. 1996: 10). There was one other major dealer at the same time, probably exporting a similar number. Mr. Delfs told Norman Myers in 1972 (p. 41) that he was certain "the world market could absorb at least 500 live cheetah annually from [Namibia] alone," perhaps indicating that exports were actually far in excess of the quota of 130. In addition, an average of 320 skins per year were exported from Namibia, primarily to South Africa, between 1978-1982. Although there are no trade data

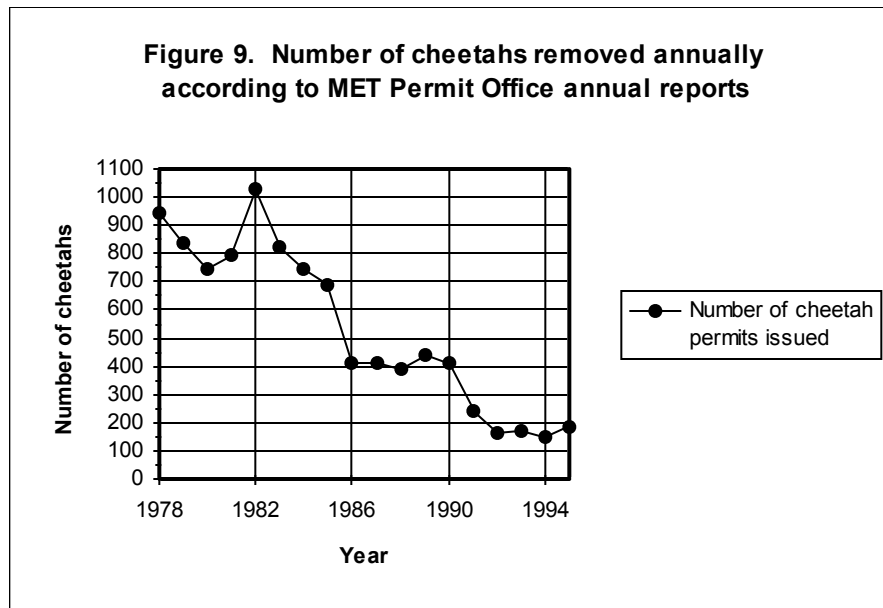
prior to this period, annual skin exports were unlikely to have been much lower, as there were no trade restrictions then. This implies that cheetah removals in the 1960s and 1970s ranged up to **700-800** per year.

Since the late 1970s, the permit office of the government agency now known as the Ministry of Environment and Tourism has issued permits for removal of cheetahs over the years under the following categories:

1. Capture, keeping and selling of game by game dealers
2. Capture, keeping and selling of game by non-game dealers
3. Shooting of game in communal areas and other State land
4. Possession of skins of protected and specially protected game
5. Trophy hunting of cheetah and leopard

A new system was put in place in 1994. Category 4 is subsumed into Category 2, but it is still possible to distinguish between the two as the notation “live” vs. “skin” is usually appended.

Data on cheetah permits issued under these categories was collected from Permit Office annual reports and computerized databases. The figures presented in Table 6 and graphed in Figure 9 are higher than the cheetah removals MET reported to CITES in 1992 (CITES 1994; see Appendix 2 of this document), reprinted in Marker-Kraus et al. (1996: Table 1) and CBSG (1996: Figure 1), which included only permit category 4. Permit category 1 is not included in the Figure 9 and Table 6 data to eliminate the possibility of double-counting, as game dealers would more frequently purchase and keep cheetahs captured by farmers rather than run their own capture operations for this species.



Cheetah removals as documented by the MET permit system from the late 1970s to the mid-1990s have averaged 553 per year. Removals from 1978-1985 averaged 827 cheetahs per year, much higher than removals from 1986-1995, which averaged 2.7 times less at 297 cheetahs per year.

**Table 6. Cheetah removals documented by the MET permit system, 1978-1994**

Year	Permit category* 2	3	4	5	TOTAL
1978	234	0	711a	0	945
1979	125a	1	711a	0	836
1980	125a	0	623	0	748
1981	125a	0	669	0	794
1982	125a	0	907b	0	1032
1983	88	0	725b	12	825
1984	107	0	633b	7	747
1985	117	0	552b	21	690
1986	79	0	318	17	414
1987	84a	0	317	12b	413
1988	95	0	272	20	387
1989	132	21	271	17	441
1990	84a	2	301	24b	411
1991	54	1	145	40	240
1992	95	0	34	35	164
1993	44	0	105	20	169
1994	32	0	111c	20	146
1995	50	0	116	20	186
TOTAL	1,795	25	7,521	265	9,588

\* See text for definition of permit categories.

a Permit category data is not broken down by species in this year's annual report; figure given is an average for the previous, surrounding, or consecutive five years as appropriate.

b Number in permit office annual report differed from figure given in the Namibian cheetah Appendix I quota proposal (CITES 1992); figure given is the average of the two.

c Figure given is average of years 1993 and 1995.

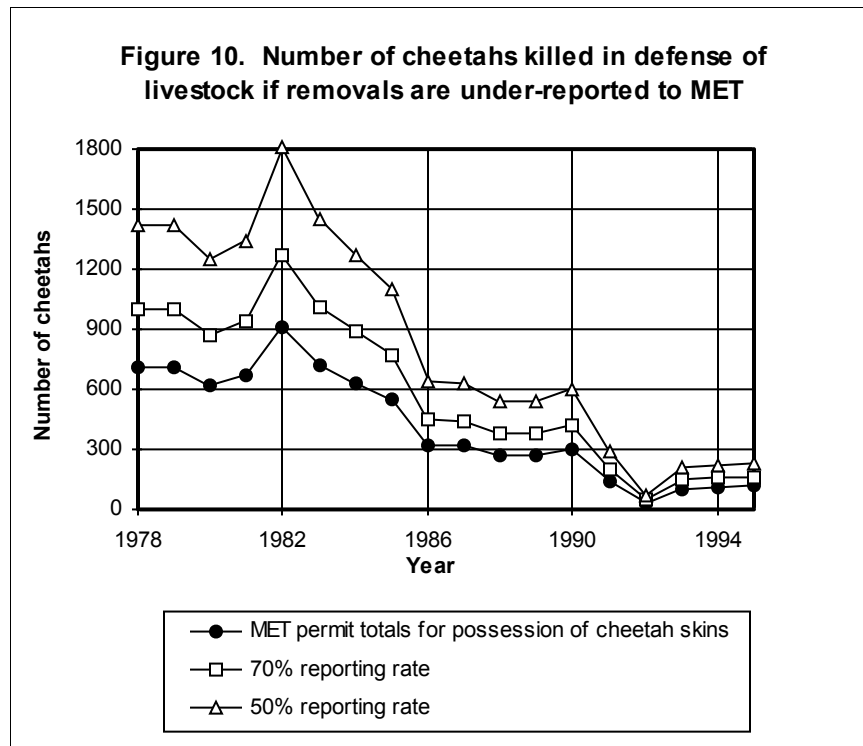
While these figures appear at first glance to be quite high for a large, ostensibly rare cat, it is likely that they still do not fully represent the number of removals. Morsbach (1985) found during his research into farmland cheetah that 22 cheetahs were destroyed from November 1984-November 1985 in his 20-farm study area. However, only 12 cheetah were reported destroyed by farmers in the study area to the MET permit office. Official records for cheetah removals for that time and that area were thus 45% lower than the number actually removed. It is difficult to say if a 55% reporting rate can be applied to all permitted cheetah removals (or at least to permit category 4, Possession of skins of protected and specially protected game, which is taken to represent the number of cheetahs killed in defense of livestock). One would think that farmers would be more likely than usual to make an official report for killing cheetah in Morsbach's study area due to his high profile official presence. Or maybe they were less likely to report in order to avoid possible conflict with the researcher (who to his credit did his utmost to minimize conflict, and on several occasions destroyed his study animals to placate farmers suffering stock losses).

In 1981, 750 cheetahs were reported destroyed by farmers in the Department of Nature Conservation's farm survey (Joubert et al. 1982: Table 16). This compares favorably with 669 permits issued for possession of cheetah skins by the permit office in 1981, indicating an 89% reporting rate. However, it is also likely that some farms killing cheetahs did not return the farm survey questionnaire. If the survey percentage of farms reporting cheetah presence in each district is extrapolated to the total number of farms in each district (standard procedure for extrapolating the results of a large sample size), and it is assumed that the same proportion of total farms killed the survey sample average of 3.2 cheetah per farm that year, a total of 948 cheetahs are then estimated to have been killed in Namibia in 1981 (see Appendix 4). That is a 70% reporting rate, still better than what Morsbach (1985) found. It can be anticipated that if farmers are reluctant to report control measures to the permit office, they will also be reluctant to report them to an official farm survey from the same government agency.

Many MET officials believe that farmers under-report their control measures against protected predators. As Dieter Morsbach (1987) wrote, “When a farmer catches a cheetah that has been causing livestock losses on his farm, he cannot sell it to the game dealers, as there is no market for live animals, and neither can he give it to the local [MET office], as they do not want it. The farmer is then also told that the cheetah is a protected and highly endangered animal and that he therefore needs a permit to kill it. The farmer then simply kills the cheetah(s) and buries it or leaves it out in the veld. This was found to be increasing on almost all farms throughout the country, for at least the past three years.”

That under-reporting is not uncommon is also indicated by the report-back rate. For each permit issued, there is a report-back requirement for the permittee to confirm that the permitted action has been taken. For permits issued in advance, such as trophy hunting, the number of permits issued far exceeds the number of animals killed according to reports back, and the latter are taken as accurate because reports back on trophy hunting are very similar to the number of trophies actually exported. However, for permits which are usually issued after the action has been taken (although technically they’re not supposed to be, which is why there is the report-back requirement), such as possession of a cheetah skin, or permission to capture, keep and sell a cheetah, the report-back requirement is somewhat superfluous and few farmers bother. Reports back average between 10-20% for skin possession and 30-50% for capture, keep and sell. The number of permits issued for such categories is thus considered to actually represent the number of animals removed, rather than the report-back.

If the number of cheetahs killed by farmers is under-reported by 50-70%, as suggested by the discussion above, the total number of cheetahs destroyed from 1978-1994 may have been as high as 10-15,000 (Figure 10).



Moreover, there are indications that under-reporting is becoming increasingly common. Figure 11 compares MET’s permit records for categories 2 and 4 (Table 6) to the number of cheetahs reported removed by 157 farmers to the CCF (Marker-Kraus et al. 1996). CCF’s survey covered just 4% of the country’s farms, but in recent years (which are likely to be the most accurate as the responses were mostly from memory rather than from accurate records), that is 1987-1993, these farmers’ reported offtakes have averaged 65% of the national totals reported to MET. From 1980-1986, they averaged just 35% of the MET national totals.

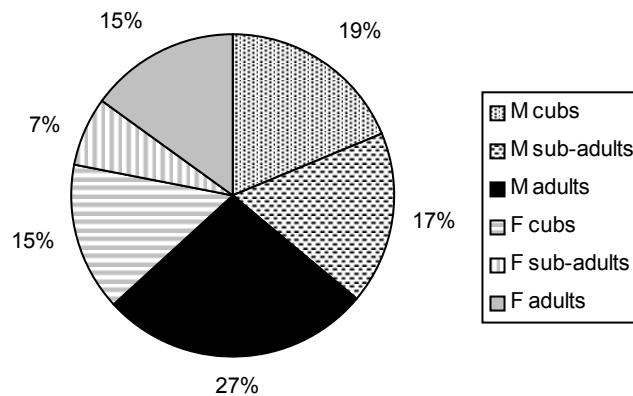
It is likely that the activity of the cheetah NGOs has also led to under-reporting in the 1990s. Farmers which capture a cheetah and donate it to CCF or Africat are unlikely to take the trouble to report the capture to MET, since they will not be applying for a permit to possess the skin. Figure 33 in Part 3 shows the number of cheetahs handled by the NGOs from 1992-1996. These figures added to the number of MET permits issued from 1992-1995 (category 4, Table 6) result in an average increase of 33% in the number of cheetahs removed (from 166 to 248).

In order to understand the impact removals have had and will have on the cheetah population, it is essential to have information on the sex and age of cheetahs removed. Unfortunately MET permits issued for cheetah removals have not required the applicant to identify sex or age. This should be a requirement of all future permits (see Recommendations in section 2.7).

At present, the only source of data is the sex and age of cheetahs handled by CCF and Africat from 1992-1996, a total of 274 animals. These are cheetahs live-captured by farmers and examined by the NGOs. This sample indicates that approximately twice as many adult and sub-adult male cheetahs (44%) are removed compared to females (22%). Figure 12 shows the sex-age composition of the NGO sample.

The NGO sample suggests that a higher proportion of females is being removed by farmers than was estimated in the past. Gaerdes (1974) reported a ratio of 94% males for cheetahs caught by farmers in the 1960s and early 70s. Also, three game dealers interviewed by Myers (1975: 42) in 1972 put the proportion of males captured at 90%, 75% and 66% respectively - even though they were catering to a market for live animals and actively sought out females. However, an alternative explanation is that farmers are more likely to call the NGOs when they capture females with cubs, whereas males are more likely to be killed outright.

**Figure 12. Sex-age ratio of cheetah removals according to live-captured animals handled by CCF and Africat (1992-1996)**



The consequences of the degree of male bias in cheetah removals is discussed in section 2.5 below when population dynamics are modeled.

[Remainder of document and appendices](#)