# NAMIBIAN CHEETAH CONSERVATION STRATEGY

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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 $km^2$ following an increase in blue wildebeest numbers, while cheetah density is roughly one per 100 $km^2$ (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$^2$ | Methodology | Source |
|---|---|---|---|
| **East Africa** | | | |
| Serengeti prime season* | 40.0 | Visual count on plains | Schaller (1972)[1] |
| 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) |
| **South Africa** | | | |
| Kruger NP | 1.35 | Unknown | de Pienaar (1969) |
| Kruger NP | 0.52 | Invls counted fm tourist photos | Bowland (1993) |
| **Namibia** | | | |
| 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*
*1 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$^2$ 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$^2$, which they patrol

**Table 2. Cheetah home ranges**

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

*1 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 $km^2$ 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 $km^2$ 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, Huntable 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 disused 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 (Ne): 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 (Ne) 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 Ne = 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 Ne = 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 [Ne = 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

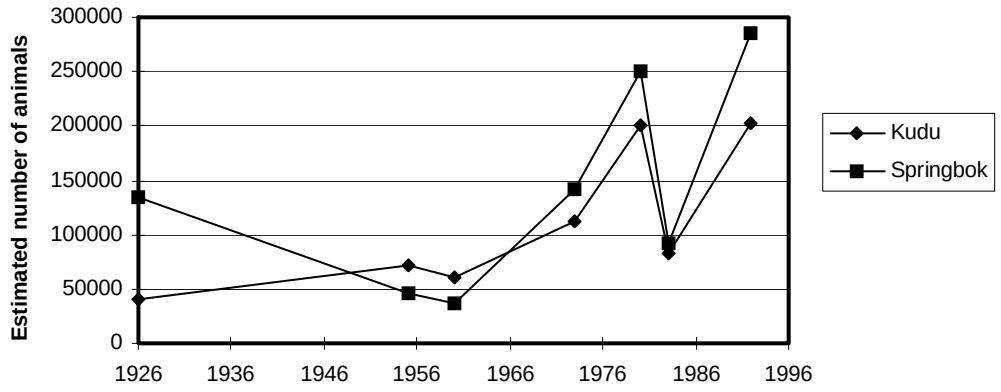
In wanting to conserve a viable cheetah population, it should be borne in mind that the environment in which the cheetah currently lives is markedly different in several important respects from the situation 150 years ago, at the beginning of colonization of Namibia. It is worth asking how these environmental 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.

**Figure 3. Changes in kudu and springbok populations during 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.

**Table 3. Population estimates of large predators in Southwest Africa in 1926, by district**

| 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 $km^2$ [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.

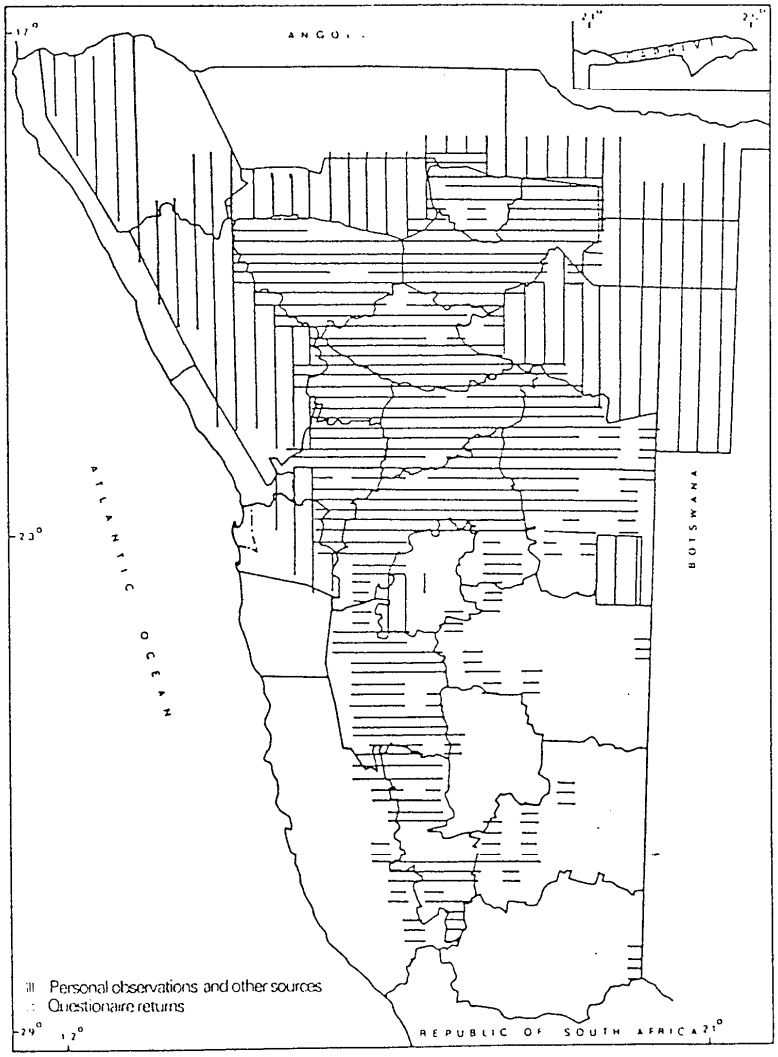
In the same report, Myers himself estimated the population at between 1,500-3,000, tending toward the lower figure. His estimate was based on a density of one adult cheetah per 150 $km^2$, a guestimated figure he says he derived through discussions with farmers, with Dr. W. Labuschagne, who had studied 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 $km^2$ 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 $km^2$ 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.

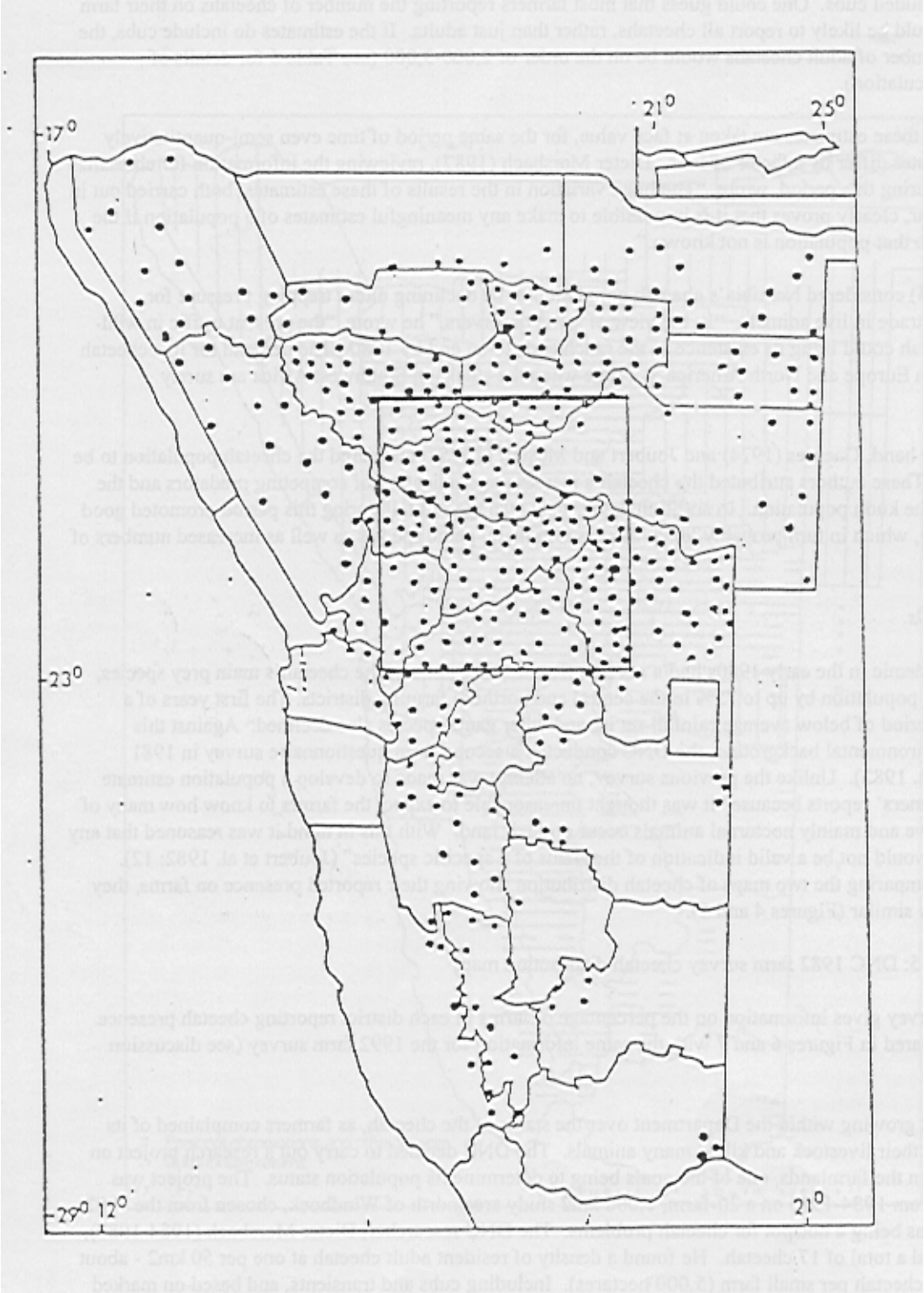
### *2.3.2. 1980s*

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 $km^2$ 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 $km^2$ - 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 $km^2$ (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 $km^2$) was based on actual field data, and was moreover three times higher than the density estimated by Myers (1/150 $km^2$). As did Myers, Morsbach applied his density estimate to 100,000 $km^2$ 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.




*Central square = stronghold of cheetah distribution (approx. 150,000 km2)*

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

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*

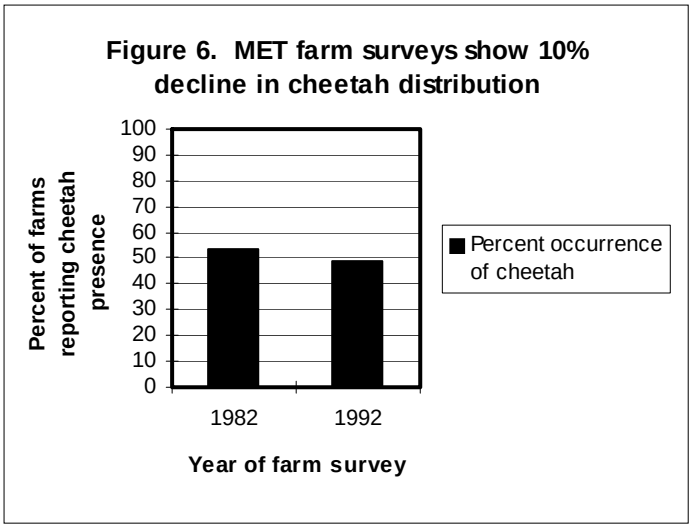
Morsbach's (1987) estimate, usually abbreviated to 2,500, is still widely used to represent the national cheetah population today. It appears in the Namibian government's proposal to establish a CITES export quota for cheetah (CITES 1994), in the 1996 Namibian cheetah Population and Habitat Viability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

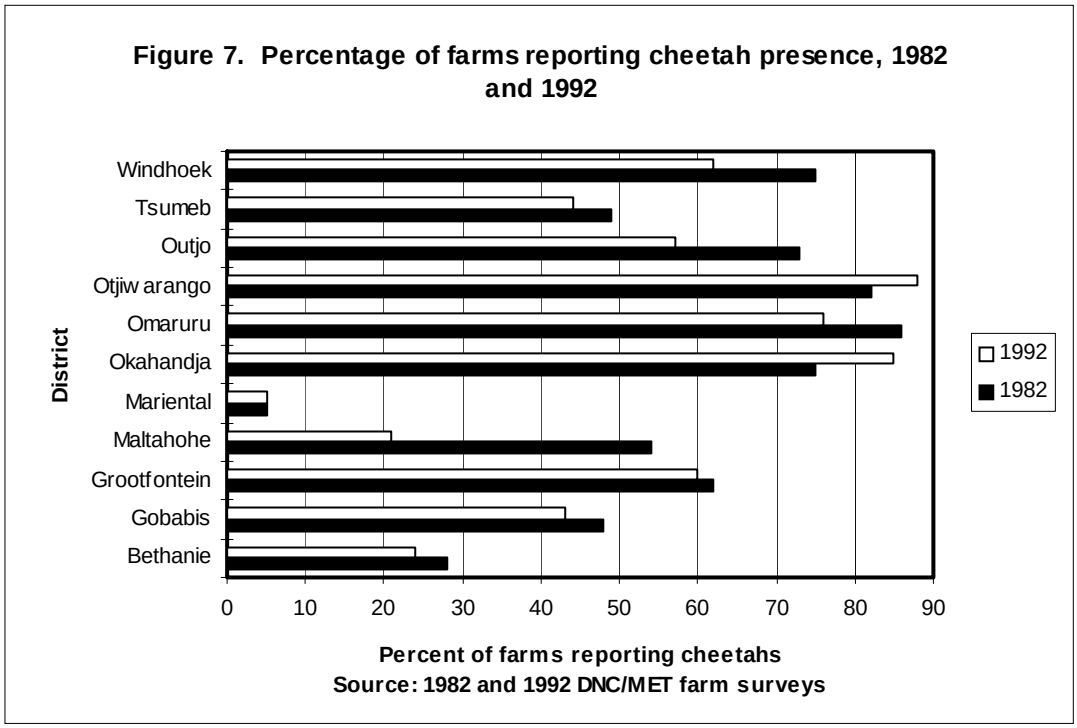
The renamed Ministry of Wildlife Conservation and Tourism (now MET) carried out another nationwide farm survey in 1992. Different questions were asked than in the two previous questionnaire surveys, but the methodology was the same. The results of this survey are still being written up, and ungulate 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).

**Figure 6. MET farm surveys show 10% decline in cheetah distribution**






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 $km^2$ (study area considered to be approximately 4,000 $km^2$). 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 $km^2$. Outside the reserve, density was twice as high, at one cheetah per 833 $km^2$. Kaudom, at 3,842 $km^2$, supports between 43-65 lions (1.2-1.7 lions per 100 $km^2$) and 62 -88 spotted hyena (1.6-2.3 hyenas per 100 $km^2$), which helps explain the low reported cheetah density (0.05-0.07 cheetah per 100 $km^2$, 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 $km^2$ 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 $km^2$ (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 $km^2$ - 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**

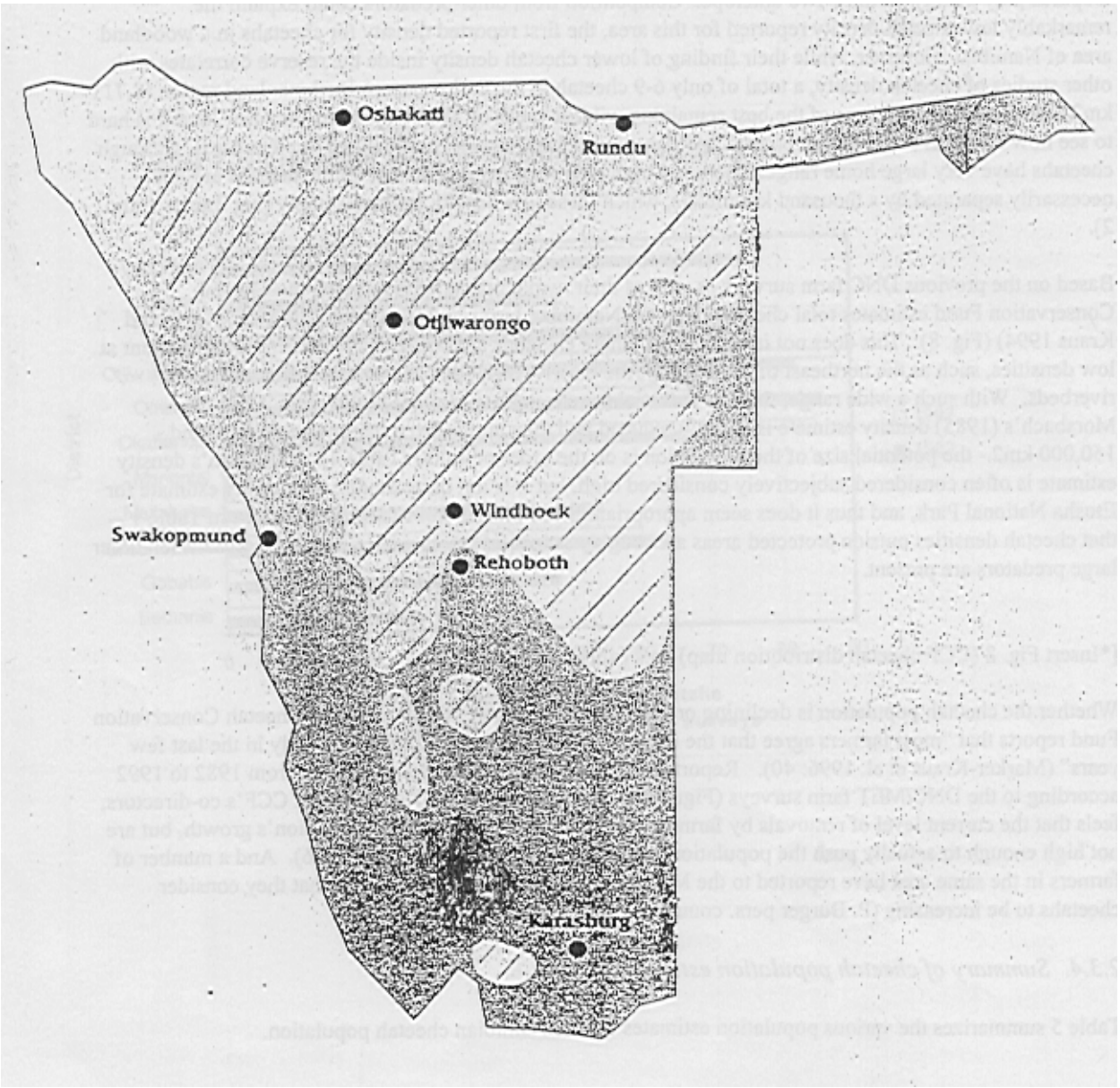


**Table 4. Potential size of the Namibian cheetah population based upon extrapolated density estimates**

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

* 150,000 km$^2$ 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$^2$ is reduced by 25% to account for inclusion of patches of non-prime habitat.
** 1.2 cheetahs per 100 km$^2$ 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$^2$.
*** 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$^2$, no field data) | 2 |
| 1975 | 5,000[a] [2,500] | Unknown (official DNC estimate) | 3 |
| 1975 | 6,252[a]* [3,126] | Farmers estimate no. of cheetah on their property | 3 |
| 1987 | 2,000-3,000 | Extrap. density (1/50 km$^2$) fm field study | 5 |
| 1992 | 4,688 [a]* [2,344] | Same | 4 |
| 1996 | 2,905 | Extrap. density based on 4 studies | 5,6,7,8,9 |

* Number refers to farmland population only.
[a] 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$^2$) 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:

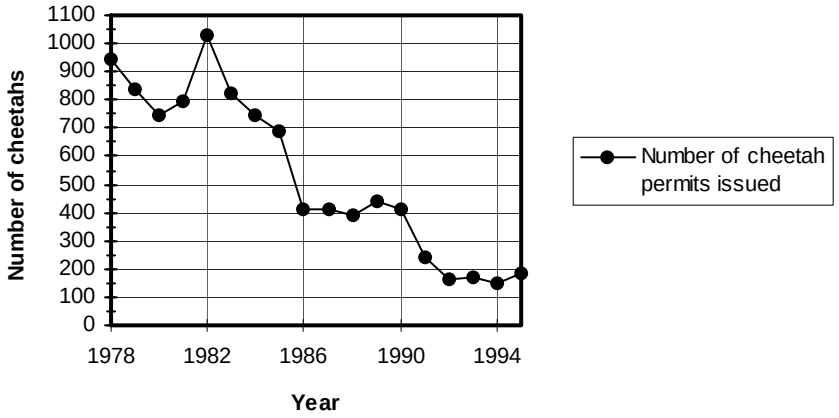
1. Capture, keeping and selling of game by game dealers
2. Capture, keeping and selling of game by non-game dealers

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.

**Figure 9. Number of cheetahs removed annually according to MET Permit Office annual reports**




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.

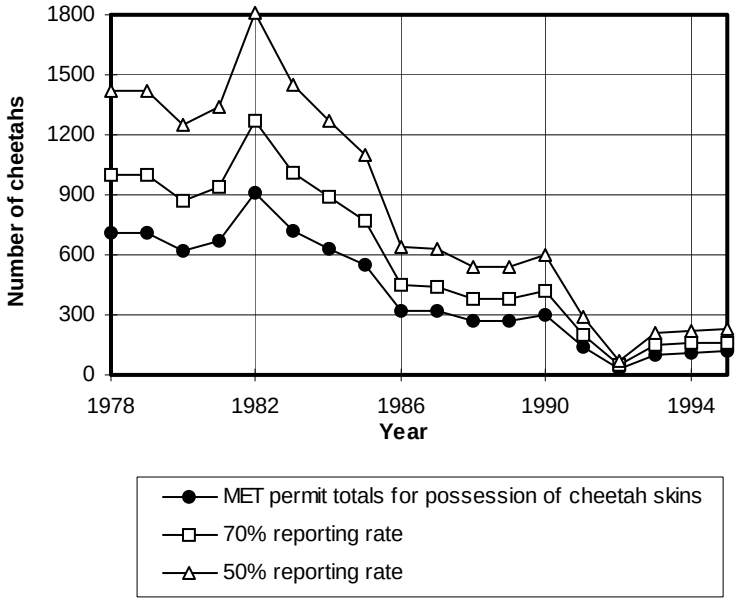
Many MET officials believe that farmers under-report their control measures against protected predators. As Dieter Morsbach (1987) wrote, "When a farmer catches a cheetah that has been causing livestock losses on his farm, he cannot sell it to the game dealers, as there is no market for live animals, 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.

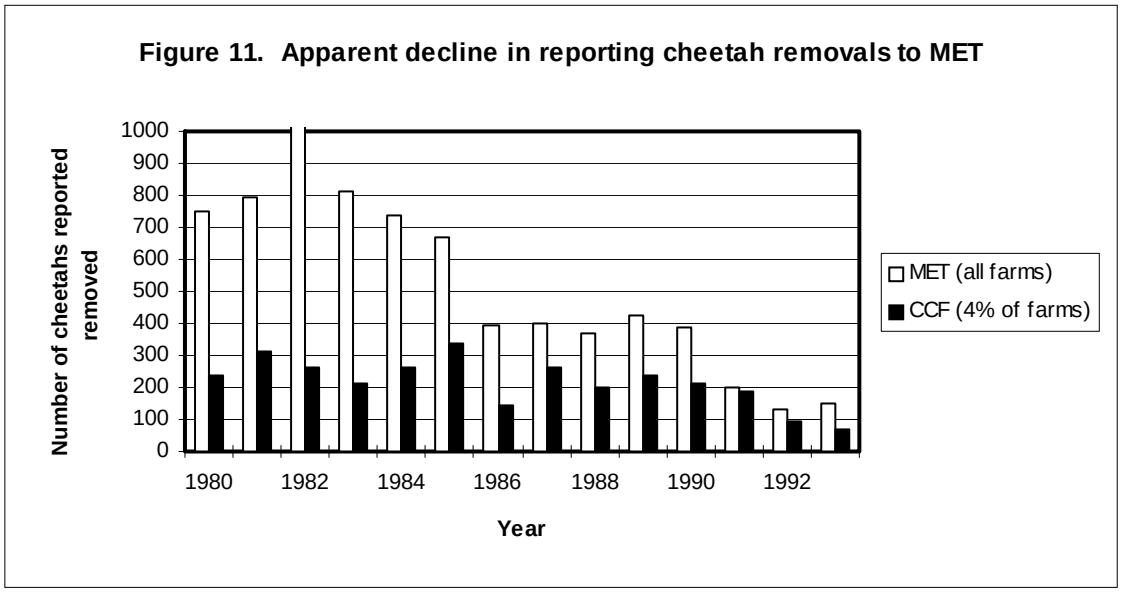
If the number of cheetahs killed by farmers is under-reported by 50-70%, as suggested by the discussion above, the total number of cheetahs destroyed from 1978-1994 may have been as high as 10-15,000 (Figure 10).

**Figure 10. Number of cheetahs killed in defense of livestock if removals are under-reported to MET**




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.

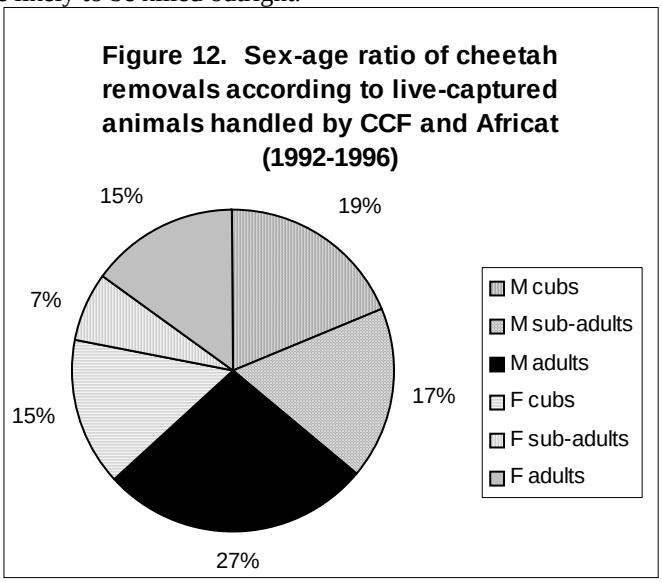
It is likely that the activity of the cheetah NGOs has also led to under-reporting in the 1990s. Farmers which capture a cheetah and donate it to CCF or Africat are unlikely to take the trouble to report the capture to MET, since they will not be applying for a permit to possess the skin. Figure 33 in 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.




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

### *2.4.2. Adequacy of the cheetah's prey base*

Another important limiting factor for the Namibian cheetah population is the amount of prey available to it. In southern Africa, main cheetah prey species are springbok, warthog, steenbok, duiker, impala, and the young of the larger antelope species (gemsbok, kudu, hartebeest, wildebeest, eland, etc.). Groups of males are capable of taking adult large antelope. Cheetahs are also known to take livestock, from sheep and goats to cattle calves less than one year old. Birds such as guinea fowl, kori bustard and young ostrich have also been occasionally reported, and cheetahs fairly frequently catch hares (de Pienaar 1969, Labuschagne 1979, Morsbach 1984-86, Mills 1990, Caro 1994, Marker-Kraus et al. 1996: Table 19; Nowell et al. in prep.).

Based on research carried out on cheetah kill rates in Etosha National Park, a cheetah group (adults or sub-adults) kills a springbok on average every 2.5 days, and needs approximately 150 ungulate kills per year to sustain itself (Nowell et al. in prep.). Of these kills, approximately 100 are adult or yearling springbok. Farmland cheetahs may have a lower kill rate than Etosha cheetahs. Due to the absence of large scavenging predators which might injure them at a kill, farmland cheetahs may feed longer off large carcasses, and thus kill less often. Morsbach (1985) recorded two instances of females with young cubs returning to feed off their kills after four and eight days, behavior which has never been observed in a protected area. Farmers have also reported cheetahs returning to their kills (Marker-Kraus et al. 1996). For the purpose of this exercise, it is assumed that cheetahs on farms will kill more small game (hares, game birds) and stay longer on a large carcass, so that their large prey kill interval is 3.5 days. A group of farmland cheetahs is thus estimated to need 104 large or ungulate kills per year, of which 73 will be adult or yearling animals.

Is the prey base sufficient to sustain this level of offtake? Although there are many uncertainties involved in calculating the adequacy of the prey base for supporting cheetahs, and the potential for error is great, it was felt to be a worthwhile exercise and a useful first attempt. In Etosha, the 39 known cheetah hunting groups on the short-grass plains were estimated to kill 3,822 adult and yearling springbok per year, removing 13% of the annual standing crop (est. number of springbok in Etosha = 30,000). According to the latest MET farm survey (Barnes and de Jager in press), there are 825,000 wild animals of suitable cheetah prey size on Namibian farmlands (Table 8). If cheetahs take up to 15% of this number, 123,750 prey animals would be sufficient to feed 1,695 cheetah hunting groups, or 2,204 adult and sub-adult cheetahs (Etosha average 1.3 adult or sub-adult cheetahs per hunting group).

**Table 8. Cheetah prey base on commercial farmlands in Namibia**

| Species | Number |
|---|---|
| **Wildlife**[1] | |
| Kudu | 203,087 |
| Gemsbok | 164,306 |
| Hartebeest | 50,804 |
| Eland | 29,150 |
| Blue wildebeest* | 4,935 |
| Sub-total | 181,000 |
| | |
| Springbok | 286,113 |
| Impala (black-faced+common) | 7,063 |
| Warthog | 121,250 |
| Steenbok | 138,941 |
| Duiker | 75,518 |
| Dikdik | 15,783 |
| Sub-total | 645,000 |
| Total | 826,000 |
| | |
| **Livestock**[2] | |
| Cattle calves | 330,000[a] |
| Small stock | 3 million |
| Total | 3,330,000 |
| **TOTAL** | **4,156,000** |

[1] Source: Farmers' 1992 estimates analyzed by Barnes and de Jager (in press: Table 1).

[2] Source: DVS statistics for 1992, as taken from Marker-Kraus et al. (1996: Fig. 2).
[a] To obtain the approximate number of calves in Namibia at any one time, the number given for cattle was reduced by 2/3s.
*Only young or yearling animals considered suitable cheetah prey = est. 40% of adult population

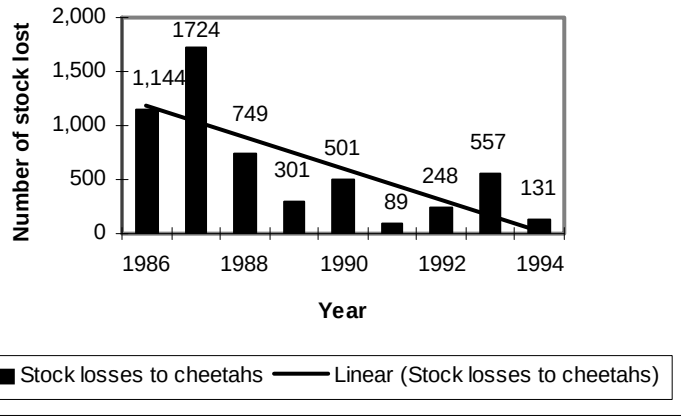
Another way to look at it is to compare predator:prey ratios. On the short grass plains of Etosha, there are 50 adult and sub-adult cheetahs and 30,000 adult and sub-adult springbok, or 600 springbok per cheetah. If the same ratio is applied to the farmlands, it indicates that only 1,375 cheetahs can be supported by the prey base. However, predator:prey ratios could differ between the park and the farms. In Tanzania's Serengeti National Park, famous for its cheetahs, there are 2,000 Thomson's gazelle per cheetah (250 cheetahs: 500,000 gazelles: [Caro 1994: 376 and 391]). The system is so much more productive that one would expect to find a higher cheetah:prey ratio, but in fact the Serengeti has a low predator-prey ratio compared to other African protected areas (Stander 1992), and far more lions and hyenas per cheetah than Etosha (Caro 1994), which keep the cheetah population at low density (Laurenson 1995). Because there are no lions and hyenas competing with the cheetah for Namibian farmland game, the cheetah:prey ratio on the farms could be higher than the Etosha ratio at 400 prey animals per cheetah, suggesting that 2,062 cheetahs could be supported.

These estimates indicate that about 2,000 cheetah can be supported by the wild prey base. This is the low end of the range of cheetah population estimates (2,000-3,000).

This exercise suggests three possibilities. The first is that the wild prey estimates are too low, or that the predation rate assumptions are incorrect, and that the wild prey base in fact sufficient to support a larger numbers of cheetahs. The second is that the estimated cheetah population size of 2,500 in 1987 (Morsbach 1987) is still accurate today, and is sustained mainly by wild prey. The third is that cheetah numbers are higher than 2,000 on the farms, and that livestock makes up a significant proportion of farmland cheetah diet.

Which scenario is correct can be checked by looking at the available data on livestock losses to cheetahs. Unfortunately, however, the data is inconsistent. According to statistics collected by the Department of Veterinary Services (Ministry of Agriculture, Water and Rural Development), cheetah have been responsible for average nationwide losses of 244 cattle calves and 360 small stock per year. The numbers of livestock taken by cheetah have shown a pronounced declining trend, from 425 cattle calves and 719 small stock in 1986 to 55 calves and 76 small stock in 1993 (Figure 13). Likewise, while 166 farms reported stock losses in 1986, only 27 reported losses in 1994 (Marker-Kraus et al. 1996: Table 4).

**Figure 13. Number of cattle calves and small stock lost to cheetah reported to the Dept. of Veterinary Services**

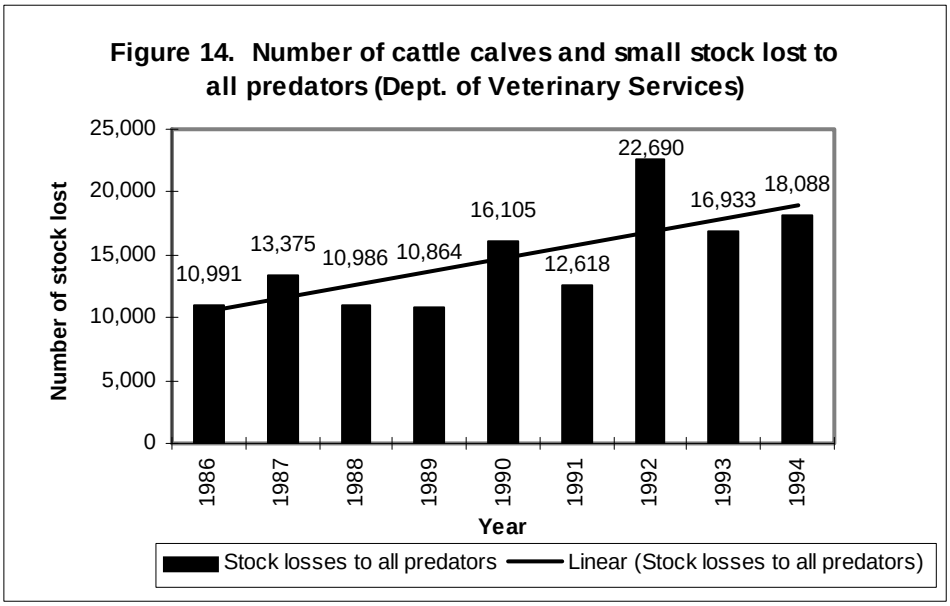



However, it is possible that livestock losses to cheetahs are under-reported to the DVS. While total reported losses are likely to be accurate, farmers can probably not always clearly identify when a cheetah has taken one of their animals or when it has died from other predators or other causes (R. Paskins, DVS, pers. comm.). Farmers' reported rates of stock loss to all predators are quite a bit higher, averaging 840 cattle and 14,000 small stock per year from 1986-1994, without a declining trend (calf losses are steady, while small stock losses are increasing) (Figure 14). Most of the small stock losses are attributed to black-backed jackal and caracal, and are highest in the southern farming region.

That rates of livestock loss to cheetahs can potentially be much greater than indicated by the DVS data is suggested by the CCF's own survey of farmers. Average annual losses to cheetahs of about five calves and five goats or sheep was reported by approximately 65% of farmers responding to the survey question (Marker-Kraus et al. 1996: Table 13). Although CCF describes this predation rate as "not as high as...expected" (p. 29), if these rates apply to their whole survey area of 257 farms an annual loss of some 1,600 livestock to cheetahs is expected, exceeding the 1993 national annual total reported to DVS.

In Morsbach's (1984-6) 20-farm study area, he found that cheetah were responsible for predation on 2-3% of the area's cattle calves and 8-10% of small stock. Morsbach (1986) reckoned that cheetahs were responsible for the deaths of an average of 3-4 cattle calves per farm per year, but he thought farmers tended to overestimate the impact of cheetah predation by blaming cheetahs for stock lost to other causes.

**Figure 14. Number of cattle calves and small stock lost to all predators (Dept. of Veterinary Services)**




The DVS figures would suggest that livestock comprises an extremely insignificant portion of cheetah diet (less than 1%). Morsbach' and CCF's data indicate that livestock is more important, but still not of great significance. If the average cheetah group kills 73 large animals per year, perhaps 10 will be livestock.

In conclusion, data on stock losses indicates that livestock comprises a minor but not insignificant percentage of cheetah diet. This is supported by farmers' reports collected by the cheetah NGOs that there were 4.5 times as many incidences of confirmed cheetah predation on game than on livestock (44 game kills:10 livestock kills - Part 3, Figure 35). It appears that cheetahs are sustained largely by wild prey, and that the prey base is sufficient to support at least 2,000 cheetahs on the farmlands. If cheetah predation on livestock is reduced over time due to better anti-predator management measures, there may be a slight decline in cheetah numbers unless game numbers increase. However, game numbers in Namibia have shown a strong increasing trend since 1992, despite prolonged drought and a major disease outbreak (Figure 3). According to farmers surveyed by CCF, an increase in their ratio of game to cattle was the most significant factor in reducing their rates of livestock loss to predators (Marker-Kraus et al. 1996: 24). Morsbach (1986) also reported that his radio-collared cheetahs would pass through farms with young calves available and move onto neighboring farms where they could catch game. Thus, an increasing wild prey base should aid MET in the goal of conserving a minimum viable population of 2,500 cheetahs and the NGOs in their mission to reduce the level of conflict between cheetahs and livestock owners.

### *2.4.3. Habitat loss and modification*

Unlike many other rare and endangered species around the world, the cheetah in Namibia has not suffered much from habitat loss. With the Namibian population is growing at some 3.3% a year it will soon double, but still the human population density will remain below five people per square kilometer, among the lowest in the world. There is no urban sprawl in Namibia. Very little land has been cleared for agriculture. The areas north of the Etosha National Park have been relatively more densely populated since pre-colonial times. There are roughly the same number of commercial farms in Namibia in the mid-1990s (5,805) as in the mid-1970s (5,355), and this number is likely to shrink rather than grow as larger farms are considered more desirable in a dry climate. Neither livestock nor game fencing

restricts cheetah movements. While bush encroachment has been marked since the 1960s over much of the cheetah's range (Figure 2), it has probably helped the cheetah, as discussed previously. Game farming and mixed game-livestock farming are becoming increasingly popular (Barnes and de Jager in press), whereas in the 1960s, farms for sale were promoted as "game-free" (M. Lindeque pers. comm.).

### *2.4.4. Natural catastrophes: drought and disease*

Cheetah are affected negatively to some degree by drought conditions, which can cause a decline in their wild prey base. Alternative prey is available in the form of livestock, but if cheetah increase their catch of livestock farmers will do their utmost to retaliate and solve the problem. This is likely what occurred in the early years of the current dry phase in the early to mid-1980s, when game populations declined due to drought and rabies, problems with cheetah predation on livestock were widely reported, and large numbers of cheetah were shot on the farms.

However, at present in the sixteenth year of below average rainfall, a new predator-prey equilibrium seems to have been established. Reported cheetah removals and reports of cheetah predation on livestock are both declining. Cheetahs are vulnerable to drought, it seems, mainly in the transitional phase. Drought conditions do not necessarily constitute a long-term catastrophe for cheetah populations, although initially it may lead to a decline. Droughts are a natural episodic feature of arid ecosystems and it seems unwarranted to consider them a threat to cheetahs given their estimated population size.

Because of their lack of genetic diversity, particularly at the major histocompatibility complex of genes which plays an important role in regulating immune function, cheetahs are thought to be particularly vulnerable to infectious disease (O'Brien et al. 1985). The example usually cited is the 1981 outbreak of coronavirus-associated diseases, including feline infectious peritonitis (FIP), which is fatal in its effusive form, in a large cheetah colony in the U.S. called Wildlife Safari (where the co-directors of the Cheetah Conservation Fund were working at the time). Over 60% of their cheetahs died, while lions showed some resistance in their antibody titers and none died.

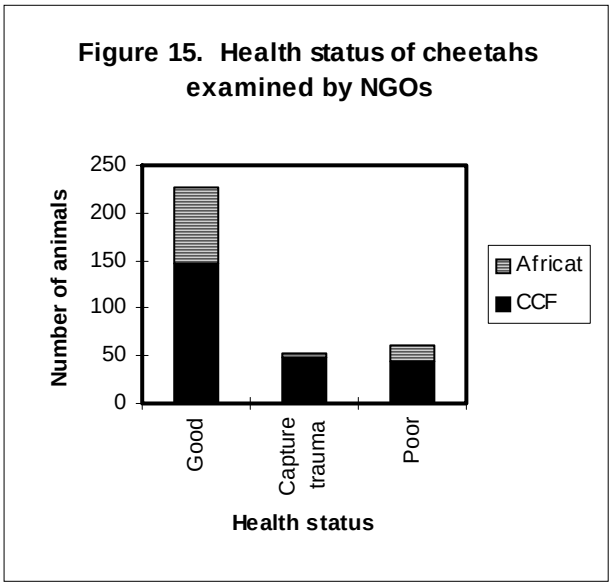
However, in the wild several aspects of the cheetah's behavior and ecology mitigate against the spread of infectious disease through the population. As enumerated by Caro (1994: 357): "[Cheetahs] live at low density, are somewhat asocial, feed on fresh kills, and live in dry climates. Indeed, these factors may have allowed them to thrive despite their compromised immune system."

The only disease in Namibia, and anywhere in the species' range, that has been known to cause high mortality in a wild cheetah population is anthrax. In Etosha, seven radio-collared cheetahs died from it, probably contracting it by killing an infected springbok. However, cheetah susceptibility to anthrax is linked less with cheetah genetics than with the cheetah's lack of scavenging behavior. The scavenging predators in Etosha - lions, hyenas, jackals - which feed on anthrax carcasses are immune to the disease, having built up immunity over time. This immunity is not automatically bestowed upon a species by its genes: lions in Kruger which had not previously been exposed to anthrax died during a recent outbreak after scavenging on anthrax carcasses (Lindeque et al. in submission).

Anthrax is a threat to farmland cheetahs as well, as wildlife killed by anthrax are occasionally found, particularly around natural fountains. But livestock has been regularly vaccinated (by law) against anthrax for decades, and it is likely that the levels of viable anthrax spores in the soil is much reduced on the farms compared to Etosha.

There is some concern that the virulent strain Canine Distemper Virus which killed about 1/3 of the Serengeti lions in 1994 may impact cheetahs in Namibia (CBSG 1996). However, the lion population was then at an all-time high, which probably helped the spread of the disease. The disease is transmitted in saliva, and the lion's social behavior was also a factor. A few cheetahs in the Serengeti died of the disease, but otherwise no significant mortality has been observed by the Serengeti Cheetah Project, which monitors over 150 known individuals (T. Caro pers. comm.).

The health status of captured farmland cheetahs examined by the NGOs appears in Figure 15. Most are described as being in good health. Most of the animals described as in poor condition got that way as a result of being kept in a trap or cage for a period of time with inappropriate or no food and water (e.g., 90% of Africat's sample).




The cheetah population could be adversely affected by a disease epidemic causing high and sudden mortality in their wild prey base, such as the rabies outbreak which severely reduced kudu and other game species in the early 1980s.

### *2.5.5. Summary of factors affecting cheetah population viability*

In summary, the major factor currently affecting the viability of the Namibian cheetah population is the level of removals by farmers. The prey base appears to be sufficient to support a population of 2,000 cheetahs at a minimum. Habitat loss is not a major factor. Cheetah populations may initially decline under drought conditions, but only because of increased persecution by farmers if they turn to livestock when wild prey declines. The same is true for a disease outbreak which reduces their prey populations. Disease in cheetahs themselves may play a minor role but seems unlikely to affect population viability on a national scale.

## 2.5. Modeling the viability of the Namibian cheetah population

### *2.5.1. Is the Namibian cheetah population declining?*

As described in the previous section on population status of the Namibian cheetah, there has been substantial disagreement since the 1970s over whether the population is declining or increasing. This section will review the evidence.

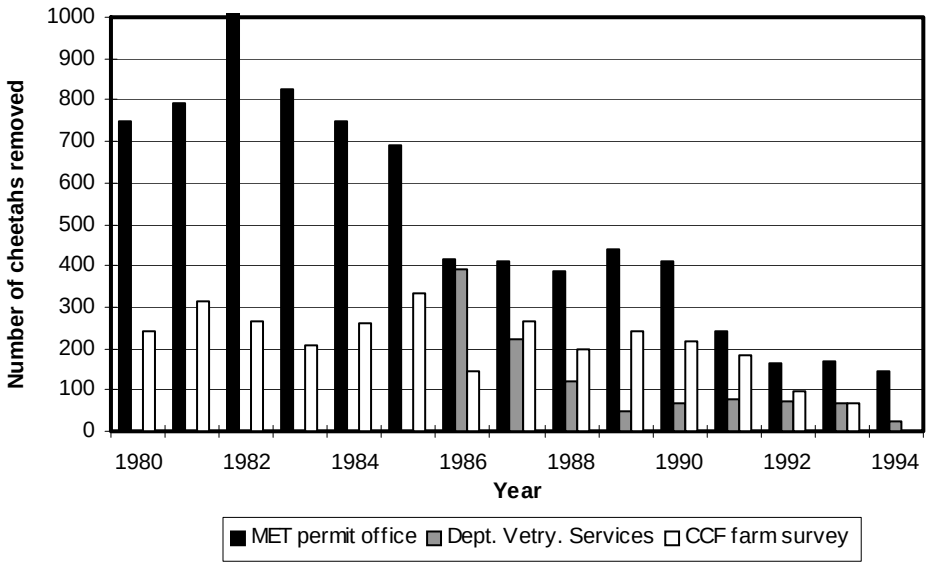
The first piece of evidence for a decline is that the cheetah population was estimated at 5-6,000 in the mid-1970s and at 2-3,000 in the mid-1980s (Table 5). This has been cited in probably every recent published document dealing with the Namibian cheetah. However, the methodology for the 5,000 estimate is unknown, but is definitely not based on field data, and the methodology for the 6,000 estimate from the 1972 and 1992 farm surveys is suspect (it was dropped for the 1982 farm survey). These estimates might be more credible if they are considered to include cubs, which the others specifically do not. If the high estimates do include cubs, the estimate of resident adults is probably somewhere in the region of 2,300-3,300. At face value the revised numbers indicate that the cheetah population has been remarkably stable since the earliest days of colonization! However, in truth all the methodologies used have their weak points, and none of them can really be considered reliable. It was concluded in the section on population status that the cheetah population is currently somewhere between 2,000-3,000, but that does not tell us whether it has declined.

Farm survey data on percentage occurrence of cheetah also indicates a decline. Comparison of the percentages of farmers reporting cheetah presence (out of those responding to the survey) in 1982 and 1992 suggests a decrease of 10% over ten years (Figure 6). This decline is much less than the presumed 50% decline suggested by the population estimates from the mid-1970s to the mid-1980s.

The next piece of evidence for a declining population is the declining level of cheetah removals recorded by both the MET permit office, the Department of Veterinary Services, and the CCF farm survey (Figure 16). That this reflects a population decline assumes that capture effort has stayed relatively constant, but that fewer cheetahs are caught because there are fewer to catch. Unfortunately, there are no data available on capture effort to test this assumption. Data on

the number of trap-days required to catch a cheetah would be a useful population trend monitoring index (see Recommendation 2.7.7).

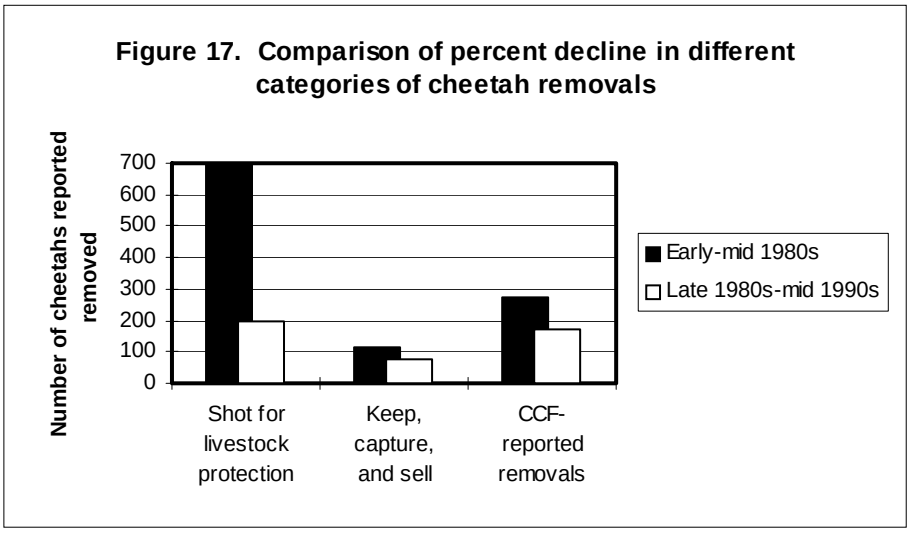
**Figure 16. Three sources of information on cheetah removals show a declining trend**




An alternative explanation is that cheetah removals are not really declining, but that removals have been increasingly under-reported to the government. As previously discussed, when a cheetah is killed in defense of livestock, the permit issued is a permit for possession of the skin. If farmers don't want the skin, perhaps they won't go through the trouble of reporting within ten days. Perhaps fewer want the skin now because the export market has collapsed. As shown in Part 3 Table 10, Namibian cheetah skin exports have declined steeply from hundreds exported per year in the late 1970s and early 1980s to hunting trophies only. Since Namibia joined CITES, export of cheetah skins for commercial purposes has become illegal. It is legal to sell cheetah skins domestically, but the market is small (D. Morsbach pers. comm., June 1996). Most farmers who want a cheetah skin or two around the house probably already have them, and thus there is the possibility that removals remain high, but are under-reported. This was indicated by Figure 11, which compares the number of cheetah reported removed in the CCF survey area in recent years to the removal level documented by MET.

Another factor which may have led to increased under-reporting of removals in the 1990s is the activities of the cheetah NGOs. A farmer who donates a captured cheetah to CCF or Africat is unlikely to report the capture to MET. However, even if these numbers (Part 3 Figure 33) are included average reported removals in the 1990s are about 250 - still lower than ten years ago.

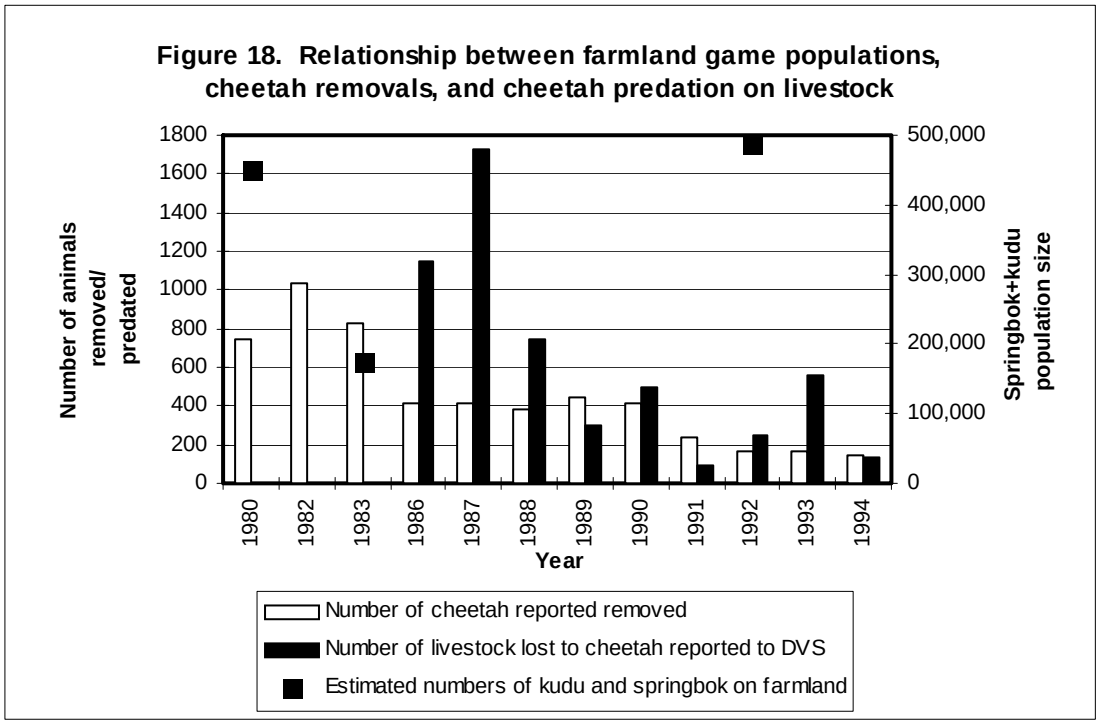
However, perhaps the best explanation is that the number of cheetahs shot in defense of livestock is declining because the cheetah has become less of a problem animal since game populations have rebounded from the rabies epidemic and reached a new equilibrium under drought conditions (Figure 3). It is supported by the fact that permitted removals of cheetah for capture, keeping and selling by non-game dealers (permit category 2) have declined only slightly. An average of 115 animals were removed for this purpose from 1978-1985, while 75 was the average for 1986-1995, a decline of 1/3, compared to a decline of 350% for the number shot in defense of livestock (691 to 199: Table 6). Similarly, from 1980-1985 to 1986-1993, CCF-reported removals declined by 35%, from an average of 271 per year to an average of 171 per year. This relationship is graphed in Figure 17.




Further support for this reasoning comes from the fact that reported livestock losses to cheetahs have also declined. According to statistics from the Department of Veterinary Services, the number of reported cases of cheetah predation on livestock has fallen sharply from the late 1980s to the early 1990s, as shown in Figure 13. Although farmers surveyed by CCF (Marker-Kraus et al. 1996) indicated a higher rate of loss in the 1990s than that shown by DVS figures, CCF's predation rate is still lower than that found by Morsbach (1985-6).

The 10% decline in farmers' reports of cheetah presence from 1982 to 1992 (Figure 6) could also be explained by the increase in game populations and decrease in cheetah predation on livestock. 1982 was the peak year of removals, with over 1,000 cheetahs taken out of the population. It is probable that more farmers reported cheetah presence in 1982 because there were more problems with livestock loss, whereas now that game populations have rebounded, farmers are less likely to observe and report cheetahs as present on their farms. The CCF farm survey asked farmers if their cheetah problems increased during the kudu rabies epidemic, and 43% indicated that they did. Although this does not appear at first glance to be very high, it is almost twice as high as the 25% of farmers reporting cheetah problems ten years later (Marker-Kraus et al. 1996: 30). Morsbach (1986) noted that a country-wide survey of problem animals carried out by the DNC's Problem Animal Officer in 1980 did not even name the cheetah, but just 1-3 years later, when game populations were crashing, the cheetah was suddenly considered the top problem animal in the north of the country.

The relationship between farmland game population size, cheetah removals, and cheetah predation on livestock is shown in Figure 18. The graph shows that both cheetah removals and cheetah predation on livestock were at their highest when game populations were low. As kudu and springbok increased, cheetah removals and livestock predation declined. Farmers surveyed by CCF identified having a high ratio of game to cattle as the most significant factor in reducing livestock loss to cheetahs (Marker-Kraus et al. 1996: 24).




The current level of cheetah removals is probably lower now than at any time since the 1960s. Whether this indicates a population decline is problematic because the evidence can be interpreted in various ways, as described above. It was decided to create a cheetah population model for this document to try to derive a better understanding of the impact of removals.

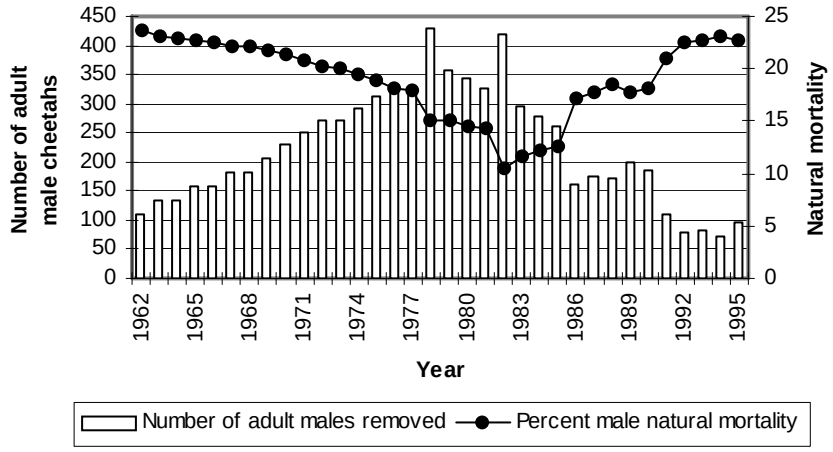
### *2.5.2. Modeling the dynamics of the Namibian cheetah population*

The question of how historic levels of removals have affected the cheetah population has never been examined quantitatively. While the data available is not as much or as rigorous as one would like, it is more than is available for most wild cat populations around the world. It was felt to be a worthwhile exercise to create a cheetah population dynamics model, despite the fact that educated guesses have to be made in the absence of reliable field data on such key population parameters as reproductive rate, sex ratio, demographics, and rates of natural mortality. The modeling process can help to indicate a realistic boundary range for these parameters. Most importantly, it yields a first quantitative analysis of under what circumstances the cheetah population could decline, and what level of removals can be considered sustainable (i.e., would not cause the population to decline).

The cheetah population model was designed with the generous assistance of K.P. Erb, MET Senior Conservation Scientist at the Etosha Ecological Institute. It is a deterministic spreadsheet model using the Microsoft Excel (5.0) computer program. It simulates cheetah population dynamics on an annual basis incorporating the following factors: initial population sex-age structure and size; production of cubs per female per year (fecundity); sex-age specific natural mortality; and sex-age specific removals. Each year, females produce cubs, animals die of natural causes, and the number of animals removed by farmers that year is subtracted. The end population cycles over to the next year and the process is repeated. Population dynamics are simulated from 1960 to 1995, since removal records are available for that period (removals from 1960-1977 are estimated based on anecdotal information, as discussed in Appendix 4). The model and the parameters used in the simulations below are detailed in Appendix 4.

Natural mortality rates for each sex-age class were made flexible within defined boundaries (Appendix 4) to tend toward the maximum in years when removals were low, and toward the minimum when removals were high. This is because removal rates were so high for some sex-age classes that removals must compensate to some degree for natural mortality. In other words, during the period of high removals, a male cheetah was more likely to be trapped before dying of old age (Figure 19). Similarly, a reduction of males in the population should reduce natural mortality from intraspecific competition for territory space. Female natural mortality rates tended to remain close to the maximum, however, since females have comprised a smaller proportion of the total harvest (Appendix 4).

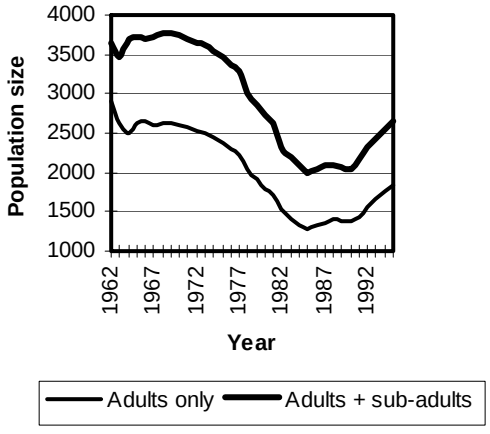
**Figure 19. Natural mortality declines when removals increase**




The sex-age composition of removals, as discussed previously, is unknown, but was estimated from data provided by the cheetah NGOs as shown in Figure 12. Because it was felt that the NGO sample was weakly biased toward females with cubs, the sex-age composition of annual removals was varied according to the population's sex ratio. More males were removed when the sex ratio was equal, and fewer males and more females were removed when females outnumbered males (Appendix 4). Still, there remains an overall strong bias in removals toward males, as indicated by the data. The total number of animals removed each year was increased to account for the presumed 70% reporting rate of removals to MET. The starting population in 1960 was set at approximately 3,500 adult and sub-adult cheetahs. This number yielded a population dynamic curve which roughly corresponds to the population estimate review in Table 5.

It must be stressed that the model is imperfect, and the data inputs are guesses which may not correspond to reality. The graphs and figures shown in this section do not represent what actually happened to the Namibian cheetah population over the last 35 years. Rather, they represent what could have happened.

**Figure 20. Predicted cheetah population dynamics, 1962-1995**



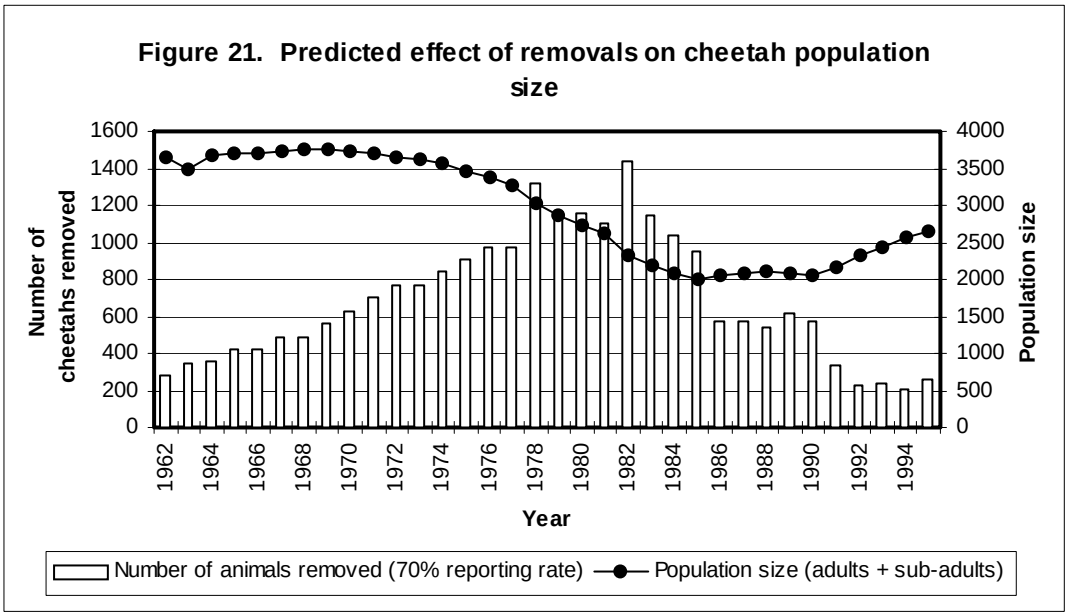
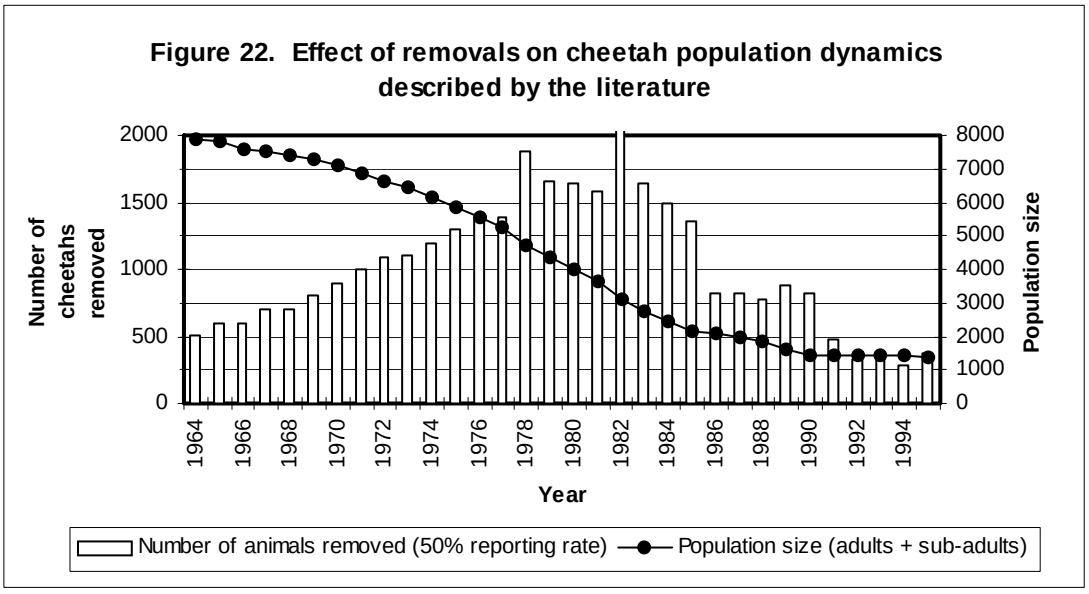
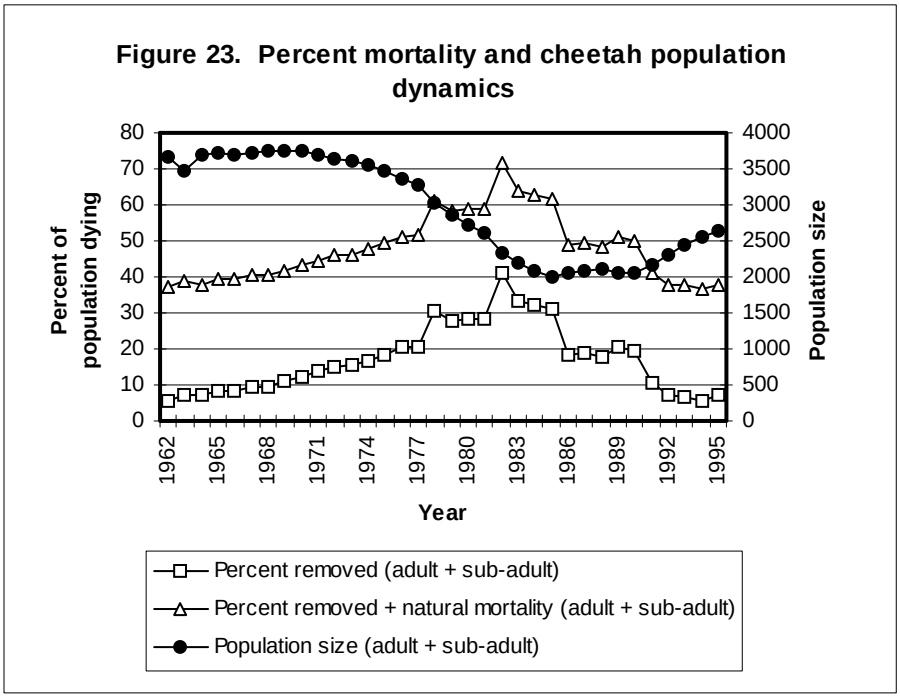



Figure 20 shows the predicted population dynamics. It shows a strong decline in the cheetah population from the mid-1970s to the mid-1980s, years when removals were at an all-time recorded high (Figure 21). In fact, it appears that these removals caused the cheetah population indeed to decrease by close to half. The model suggests that the cheetah population by the mid-1980s was at the low end of Morsbach's (1987) estimate of 2,000-3,000. Moreover, it indicates that the population in the early 1990s was about 10% lower than in the early 1980s, as suggested by the farm survey's reports of cheetah occurrence (Figure 6). The model also suggests that under the current regime of relatively low removals, the population in the mid-1990s is recovering from its sharp decline and has begun to increase again.

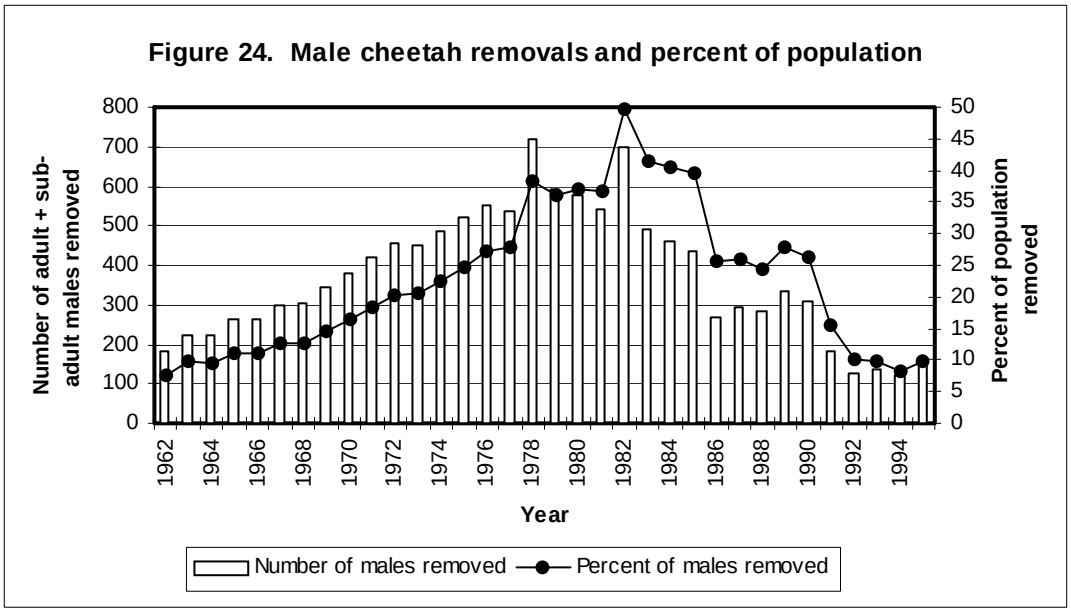
As previously discussed, it is uncertain whether the 5,000-6,000 cheetahs estimated in the early 1970s (Joubert and Mostert 1975) included cubs. The estimate is usually treated in the literature as if it did not, although since it is based on farmers' observations of cheetahs the inclusion of cubs is likely. It is not clear whether the questionnaire specifically asked farmers only to count adults, but it is not likely to have. An alternative population curve was generated to see if it were possible to have a population of 5,000-6,000 adult and sub-adults cheetahs in the mid-1970s decline to 2,500 ten years later and still be declining today (the scenario often described in popular literature). The curve shown in Figure 22 is improbable for several reasons. First of all, a population of 8,000 cheetahs in 1960 is highly unlikely, given low game numbers at that time (Figure 3) and the cheetah's high prey requirements described in section 2.4.2 above. Second, the cheetah's fecundity rate had to be lowered so that the population would recover very slowly when removals declined, and removals had to be set at twice their reported levels, so that 2,000 cheetah were taken out in 1982. The 1982 farm survey shows that farmers who reported removing cheetahs that year took a per farm average of 3.2 (Appendix 5). To have 2,000 cheetahs removed that year implies that over 600 farmers took control actions against cheetah. High removals are possible, but the reproductive rate used in this scenario (average litter size of 3 cubs = 1.5 cubs per adult female per year: Appendix 4) seems low given that the cheetah is characterized by having one of the highest litter sizes of any cat. Even then, the model suggests that the population would stabilize by the 1990s when removals decline.




Both this modeling exercise and that done at the Namibian Cheetah Population and Habitat Viability Analysis show that the cheetah population has the potential to increase rapidly. CBSG (1996: 10) considered that "the population appears to have a robust growth potential of 10-15% per year if it is subjected to only natural mortality. Under these conditions the population could double in size in 5-7 years if undisturbed or it could recover from a 50% loss in that time." Figure 23 suggests that cheetahs can recover quickly even after periods with both high natural mortality and high removals (measured on the graph as percent of population dying). This is not an unrealistic scenario. In Montana, researchers found that the endangered wolf (*Canis lupus*) population grew at 22% per year with low density and low prey availability, despite the fact that humans were removing (illegally) about 9% of the population (Fritts et al. 1995).




The model suggests that removals have had a markedly different effect on males vs. females. The NGO data (Fig. 12) and the literature show a strong bias in male removals. Figure 24 suggests that during the mid-1970s to the mid-1980s over 25% of the adult and sub-adult male population was removed each year, peaking in 1982 at 50%. For females, however, maximum rate of removals amounted to only 10% of the population (Figure 25).



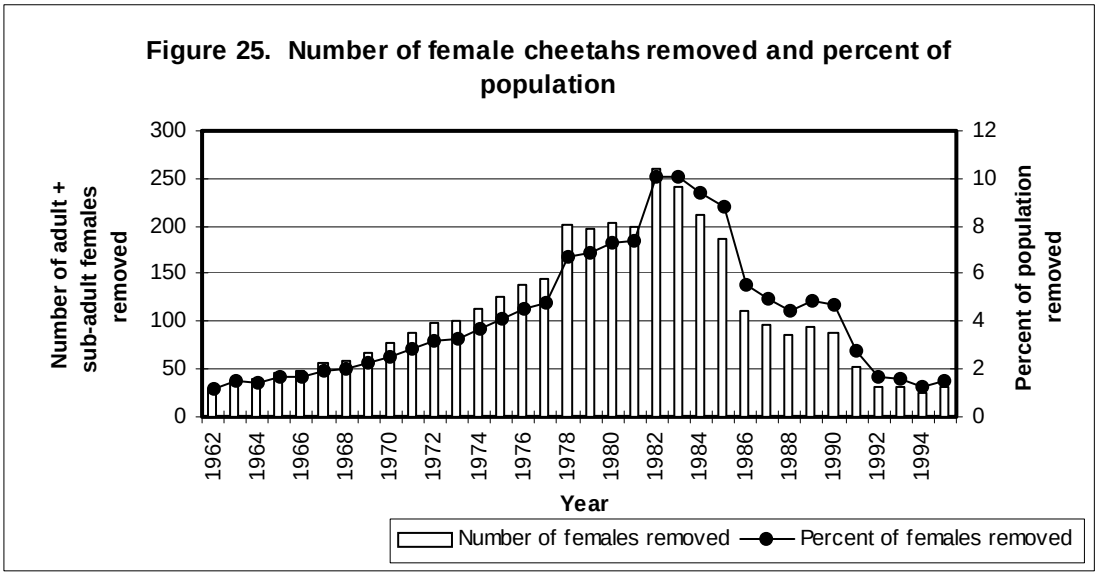
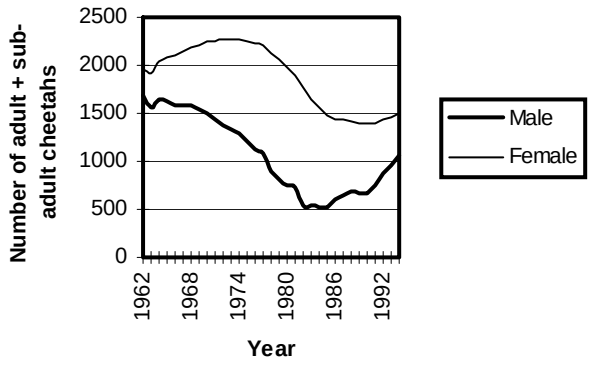




Figure 26 compares the population dynamics of male and female cheetahs. Both declined during the period of high removals from the mid-1970s to the mid-1980s, but females less sharply than males. At most times the population sex ratio favored females. A sex ratio of two females per male is often reported in the literature for cat populations, and the typical population structure for cat populations is that one male mates with several females whose territories his encompasses (Nowell and Jackson 1996). Cheetahs have a very different mating strategy, as discussed in Part 1, in that males stake out small territories which females visit to mate. Caro (1994) describes deadly male-male competition for these territories. It is likely that a male mates with more than one female, although this is not known for certain - despite over ten years of study in the Serengeti, the Serengeti Cheetah Project was never able to observe cheetahs mating (Caro 1994). Still, the sex ratio shown in Figure 26 is not improbable for cheetahs, and the disparity between the sexes did not necessarily affect reproductive rates.

**Figure 26. Predicted male and female cheetah population dynamics**



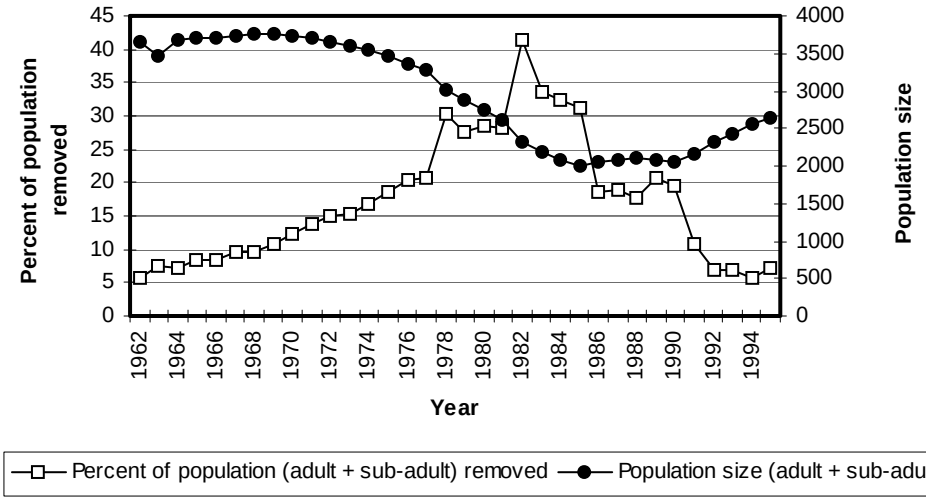
### *2.5.3. What level of removals is sustainable?*

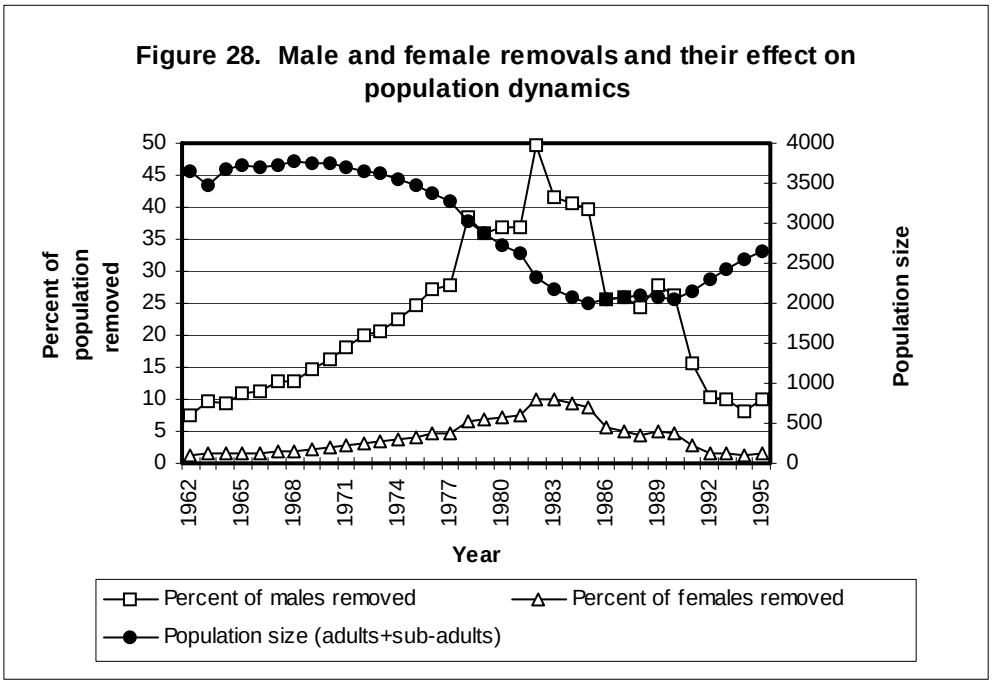
It is possible that the task of conserving a viable cheetah population on private lands would be made easier for MET if there were fewer cheetah removals. That would remove the uncertainty over the sustainability of removal levels - the closer they approach zero, the more they are likely to be sustainable. However, given that livestock, or mixed livestock and game, is the land use in the cheetah' range and is likely to remain so for years to come, and given the cheetah's substantial prey requirements, it is likely that farmers will continue to remove cheetahs even if prevented by law. Such a prohibition is not practical, nor is it necessary if the cheetah population is large. It is important for MET to foster a good working relationship with private landowners, because most wildlife in Namibia does occur on private land. It is possible that if the cheetah population were allowed to increase by reducing or preventing removals, increasing numbers of farmers would suffer livestock losses and develop a hostile attitude towards both the MET and to predator conservation efforts. In this sense, then, it is in the interests of conservation to encourage a sustainable offtake of cheetahs in order to prevent the population from increasing to a nuisance level.

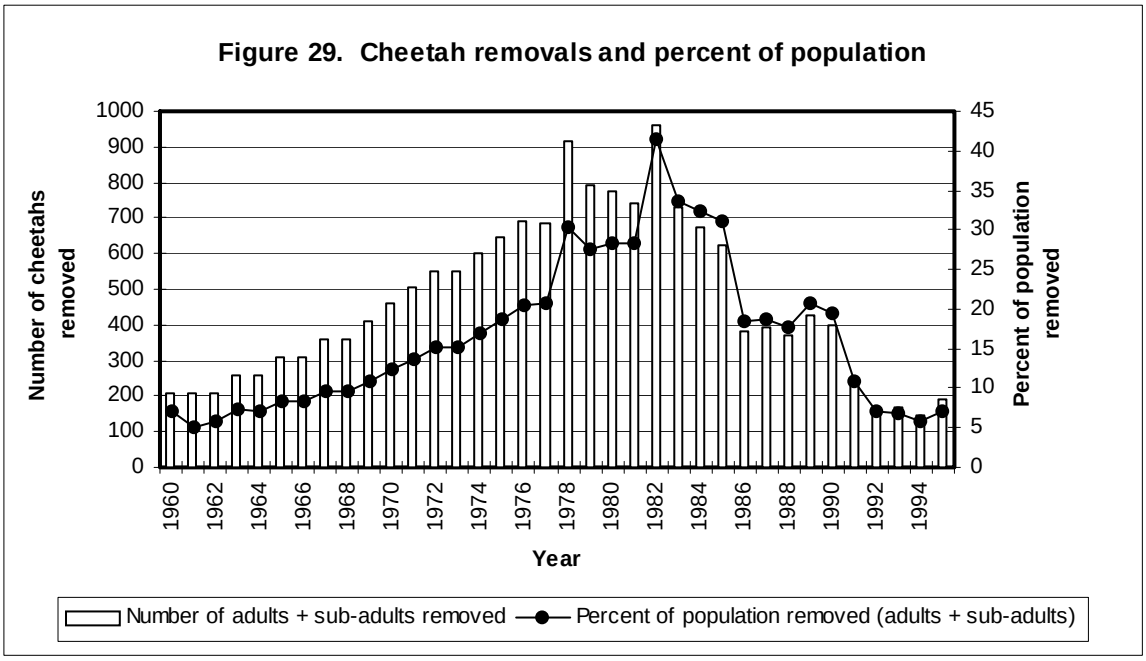
Preferably, sustainable levels of harvest are calculated as a percentage of the population. However, the total size of the Namibian cheetah population is not known, and neither is its sex-age composition, and given the numerous constraints involved in mounting a massive population census and study, this information is likely to be unavailable to managers for some time.

In the absence of data, the cheetah population model can suggest a sustainability threshold. Figure 27 shows the predicted cheetah population dynamic curve graphed against the estimated percent of the population removed. Figure 28 graphs it against the percentages of males and females removed. When the population was stable or increasing (1960s and 1990s), 10 percent or less of the population was removed (20% of the males and 5% of the females). When the population was declining (late 1970s to early 1980s), removals took 10-40% of the population (20-50% of the males and 5-10% of the females). Figure 29 shows the percentage of the population removed graphed against removals (70% reporting rate; removals shown do not include cubs).

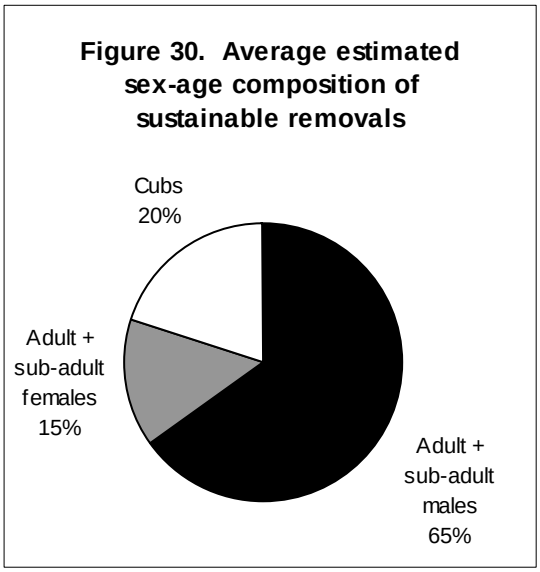
**Figure 27. Cheetah population dynamics and percentage of population removed**






Since it is unlikely to be known soon with certainty how many male and female cheetahs there are on Namibian farmlands so that the calculation of 10% of the population size can be carried out, the number of cheetahs removed during the periods when the model shows the population to be stable or increasing can be used as a working sustainability threshold for MET. Numbers removed during those periods were between 150-300 permitted removals. The estimated average sex-age composition of these "sustainable" removals is shown in Figure 30.




It is recommended that MET not issue permits for the removal of more than 300 cheetahs in any year. MET should endeavor to keep removals at or below 200, working closely with the NGOs and farmers to achieve this. These two thresholds - a "concern" threshold of 200 and an "alarm" threshold of 300 - are both practical and conservative at the same time. Removals in 1995, for example, were 186. Namibia has a CITES export quota of 150. If the population is at 2,000, which seems likely, the concern threshold of 200 is 10%. MET should also monitor the population trend indices suggested in the Recommendations (7.7) to ensure that this level of removals is indeed sustainable, adjusting the preferred and maximum permitted removal levels as the evidence warrants.

### *2.5.4. How viable is the current Namibian cheetah population?*

This question was investigated at a Population and Habitat Viability Assessment for the Namibian cheetah and lion held in February 1996 in Otjiwarango. The workshop was organized by the IUCN/SSC Captive Breeding Specialist Group and hosted by the Cheetah Conservation Fund. Participants included MET officials and researchers, officials from a number of Western zoos, Namibian farmers and veterinarians, researchers working with these cats in other southern African countries, and American specialists in genetics, pathology and assisted reproduction. The viability of the Namibian national cheetah population was modeled using the Vortex population simulation program (Vers. 7: Lacy et al. 1995). Vortex is designed especially to model "demographic, environmental and genetic stochastic [random] events" which may impact wildlife populations, based on a Monte Carlo simulation (Lacy et al. 1995: 4).

The Vortex model differs from the cheetah population model designed for this document because it is specially designed to model stochasticity, or randomness. However, it is not well suited to predicting the results of harvest or offtake. "Mortalities can be entered in Vortex in three ways: 1) as the percentage of animals in each sex-age class expected to die each year, with a corresponding variance; 2) as a fixed number removed (e.g. harvested) in each sex-age class; and 3) as a catastrophic event that reduces or increases the normal survival rate by some fixed amount" (CBSG 1996: 4). The harvest function is inappropriate for modeling cheetah removals, since it must be entered as a fixed amount; there is no way of making harvest dependent on population size, or to have it change over time. Incorporating removals into natural mortality is also inappropriate, as the model comes up with a random number of animals dying per year within a selected variance. Cheetah removals have varied by up to 300%, but there is a definite declining trend which cannot be input into Vortex. The catastrophe scenario is also not appropriate for a steady annual removal of cheetahs.

The first draft of the PHVA report used a very conservative total cheetah population size of 2,500, including cubs (48% of the population). This represents a minimum figure because the number of adults and sub-adults is probably larger than 1,300, and since the Namibian cheetah population is not isolated from the Botswanan population the total size will be larger than any Namibian national estimate. This is important when modeling population viability, because an isolated population with no possibility of new immigrating animals will be more vulnerable to extinction.

Still, the model found that a cheetah population of 1,300 adults and sub-adults is quite viable. Probability of extinction for the Namibian cheetah population over the next 100 years was zero for most scenarios. Factors that tended to make the population decline include an adult female mortality rate of > than 30% (a 25% maximum was used in this document's cheetah population model), or frequent catastrophes, such as disease epidemics, every five years with over 50% mortality across most age classes. The frequent catastrophe scenario is unlikely - there is no evidence for

Namibian cheetahs suffering any lethal disease outbreaks in the past. That the population will decline if there is a female mortality rate > 30% is also suggested by this document's cheetah population model. Figure 31 graphs total female mortality (adults and sub-adults; removals and natural mortality) against the predicted population dynamic curve.

**Figure 31. Female mortality and population dynamics**

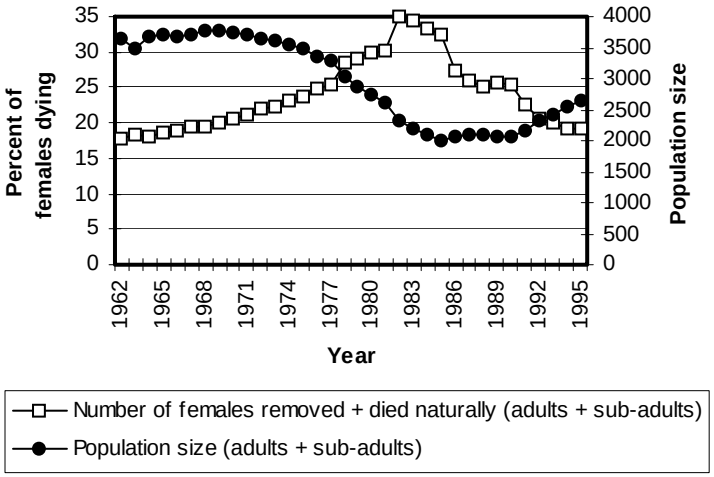
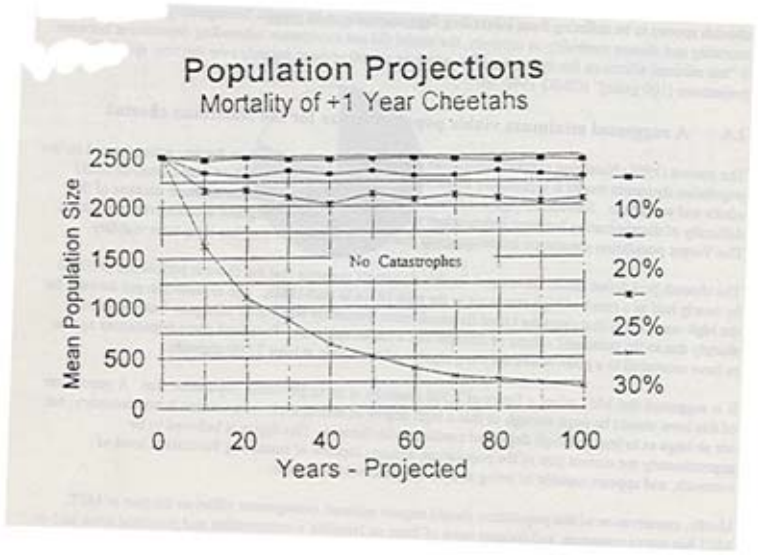



Figure 32 shows the effect of mortality rate on the projected mean cheetah population size over the next 100 years derived from the Vortex model. The population declines only if mortality rates for all age classes except one-year cubs are 30% or greater. The cheetah population model suggests that the population will not decline unless total adult and sub-adult mortality is 40% or greater (Figure 32).

It is interesting that the workshop chose not to incorporate inbreeding depression as a factor affecting the Namibian cheetah population. Although many of the key participants in the workshop have proclaimed the cheetah species to be suffering from inbreeding depression due to its genetic homogeneity and high juvenile mortality and disease morbidity in captivity, the model did not incorporate inbreeding depression because it "has minimal effects on the dynamics of populations of 200 or more animals over the time spans of these projections [100 years]" (CBSG 1996: 6).

**Figure 32. Cheetah population dynamics under a range of adult mortality rates modeled by Vortex. Source: CBSG (1997: Figure 3)**




***Effects of adult cheetah mean annual mortality (10, 20, 25 and 30%) on 'N', projected mean population size over 100 years. No catastrophes.***

## 2.6. A suggested minimum viable population size for the Namibian cheetah

The current (1996) Namibian cheetah population size is unknown, but based on density estimates and on the population dynamics model it is probably in the range of a minimum of 2,000 and a maximum of 3,000 adults and sub-adults. Sub-adults (age 2-3 years) are included in the population estimate because of the difficulty of discriminating between independent sub-adults not yet breeding and breeding resident adults. The Vortex population simulation model suggests that such a population size has long-term viability.

The cheetah population model developed for this document suggests that the cheetah population declined by nearly half as a result of high removals in the mid-1970s to mid-1980s. The explanation put forward for the high removals is that cheetahs killed livestock more frequently when their wild prey base declined sharply due to the combined effects of drought and a rabies epidemic. Farmland game populations appear to have recovered to a point where they are capable of sustaining at least 2,000 cheetahs.

It is suggested that MET adopt a figure of 2,500 cheetahs as its target viable population size. A population of this level should be large enough so that a high degree of management intervention is not necessary, but not so large as to lead to a high degree of conflicts with farmers. This figure is believed to be approximately the current size of the population, appears capable of sustaining the current level of removals, and appears capable of being sustained by the wild prey base.

Ideally, conservation of this population should require minimal management effort on the part of MET. MET has scarce resources, and focuses most of them on Namibia's conservation and protected areas and on species whose populations are much lower, like the black rhino. 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.

## 2.7. Recommendations

Many of these recommendations are linked to recommendations made in the third section. Section 4 condenses recommendations made in the two previous sections into a list of actions to be taken by MET.

**2.7.1. Adopt 2,500 as target viable population size and aim to conserve a national population of this size.** MET should adopt 2,500 adult and sub-adult cheetahs as its target viable population size for Namibia. According to the information presented in this chapter, it appears unlikely that the current population could be much lower than this. However, if further research (see Recommendation 2.7.2 below) indicates that the actual population size falls substantially below this threshold, MET should re-evaluate its cheetah conservation policy and possibly intensify protection measures for the cheetah if it appears that the population is not viable or declining (see Recommendation 2.7.6. below).

**2.7.2. Derive an accurate cheetah population estimate.** MET should cooperate with the private sector, particularly the cheetah NGOs, to refine estimates of cheetah density. It should be the responsibility of the recommended MET Carnivore Coordinator (Recommendation 3.7.1) to design the study, but it is suggested that the study be integrated with the ongoing radiotelemetry and monitoring efforts of CCF and Africat. The study should replicate the efforts of Dieter Morsbach, who worked over a three-year period to identify all cheetahs resident in his study area (20 farms). Some of his cheetahs were radio-collared, while others were unmarked but detected by sighting, spoor sighting, or capture. There should be two studies: one in the Otjiwarango area where the NGOs primarily operate, and one in the south, which is potentially good cheetah habitat and has a large population of springbok, but where cheetahs appear to be very sparsely distributed according to farm surveys and permit records. In the south there is a history of poor cooperation between farmers and MET.

**2.7.3. Improve monitoring of the number of cheetah removals.** MET should try to improve the accuracy of its cheetah removal permit system. To improve monitoring of removals, regional offices should be requested to forward their cheetah removal permits on a monthly basis to the Permit Office at headquarters. If this does not work efficiently, the Carnivore Coordinator could telephone all offices at month end for verbal reports. The Carnivore Coordinator should cooperate with the cheetah NGOs and other concerned individuals in the private sector to evaluate potential under-reporting to MET. Monthly reports received from the cheetah NGOs in fulfillment of their permit requirements (see section 3.4) should be checked against MET permit system records to estimate the degree of under-reporting of cheetah removals. Individuals who consistently fail to report cheetah removals should be prosecuted. Since there is no penalty involved for removing a cheetah, there should be no reason to fail to report a removal.

**2.7.4. Determine sex-age composition of cheetah removals.** MET should make cheetah sex and age a reporting condition of cheetah removal permits. Permits for animals already captured or killed should not be issued unless this information is provided. Sex-age discrimination should be kept simple so that farmers can be asked at the time they telephone or visit their local permit-issuing office. Permit applicants should be asked to specify the number of adult males, adult females, and cubs.

**2.7.5. Improve discrimination between different types of cheetah removals.** MET should adjust its permit categorization system so that the purpose of cheetah removals can be easily distinguished. In particular, cheetahs removed in defense of livestock should be clearly noted. Permits issued for live animals should be distinguished from permits issued for cheetahs killed. Permits issued for trophy hunting should continue to be kept clearly distinguishable for permits issued for other removals. Permits for cheetahs meant to be kept on the owner's premises in captivity should be distinguished from permits issued for the owner to sell or transfer a live cheetah.

**2.7.6. Ensure sustainability of removals.** MET should try to keep cheetah removals at around 200 per year until a better estimate of population size is obtained. If the level of removals in any given year begins to approach 300, MET, through its Carnivore Coordinator, should work with the cheetah NGOs and with the concerned farmers to try to prevent more animals from being removed from the population in that year. MET should consider instituting a licensing requirement for large carnivore box traps to derive an index of capture effort to relate to other indices of population trend monitoring. If capture effort increases, if annual removals climb above 300, if the sex-age composition of the removals begins to include more reproductive-age females, or if there are indications that the population is seriously declining, MET should consider paying compensation for livestock losses to cheetahs. There is the possibility that the funds to pay for this could be raised from the private sector, as was done for wolves in Montana (Ream et al. 1995). This program should only be instituted if the cheetah population appears to require direct management intervention in order to halt an unsustainable rate of decline. The overall annual cost of the program should be on the order of N$150,000 maximum (less than the annual budgets of either of the cheetah NGOs), and if the proviso that the receiver of compensation cease to trap cheetahs works, this measure should be sufficient to stop

unsustainable removals. The Carnivore Coordinator should outline the structure of an emergency livestock loss compensation program and seek to raise funds for it as a contingency plan.

**2.7.7. Monitor cheetah population trend.** MET should develop a cheetah population trend monitoring system in cooperation with the private sector. MET will be in a better position to deal with international concern regarding the status of its cheetah population if it has in place a reliable system of detecting changes in the population. The system should be relatively straightforward and uncomplicated, should make use of indigenous expertise and resources, and should be inexpensive. When monitoring population trend, it is advantageous to have a system of multiple indices, as opposed to a single index, to reduce the probability of error. A suggested list of monitoring indices follows below. The Carnivore Coordinator should have final responsibility for coordinating and analyzing this data.

*a) A national bi-annual predator track survey.* It should be possible to derive an index of cheetah population trend by monitoring spoor frequency on selected transects over time. For example, if five surveys over ten years yield consistently lower cheetah spoor occurrences per distance unit (e.g., per 100 km of transect), then that would be an indication that the cheetah population is declining. A transect would be a game trail or infrequently used vehicle track or dirt road, and could be walked or driven when looking for spoor. An advantage of this method is that is not species-specific: other predators or other game species can also be monitored by searching road and trail transects for their spoor. Namibia is fortunate in having good soil conditions as well as substantial indigenous expertise in animal spoor tracking. Many farm laborers are skilled trackers, as are hunters and cattle herders living in communal lands. MET researcher Philip Stander has used track surveys to estimate predator densities in the former eastern Bushmanland region (Stander in submission).

Smallwood and Fitzhugh (1995) describe a track count for estimating mountain lion (*Puma concolor*) population trend in California. Their technique can be adapted to Namibian conditions. MET and the NGOs should determine how extensive they wish the survey to be.

This recommended track survey should most importantly indicate whether predator populations are increasing or decreasing over time. It may be possible to eventually correlate the survey with the cheetah density research project recommended above (Recommendation 2.7.2) to link cheetah spoor abundance to density, and to indicate whether cheetah density changes over time.

The survey should be undertaken as a joint MET project with the cheetah NGOs. NGO participation will be crucial. They are in a good position to identify farmers willing to cooperate with the survey, and to educate trackers about how to carry out the survey.

To be efficient, game trail or vehicle track transects should be located through areas likely to be used by cheetahs, such as near play trees or along farm fencelines. The survey design should aim to maximize predator track presence and reduce expensive driving and survey labor time. The survey should be limited at first only to the north-central farmlands where the cheetah NGOs work, and where most cheetahs are found, to test its practicality and accuracy before a national system of transect surveys is attempted.

*b) Monitor cheetah removals and their sex-age composition on an annual basis.* Every year, the Carnivore Coordinator should calculate the total number of cheetahs reported removed nationwide and their sex and age. Increasing numbers of females and cubs in the offtake may indicate that removals are becoming unsustainable. It will be important to analyze how the changing number and composition of removals over time relates to other indices of population trend, for declining removals does not necessarily indicate a declining population. On the contrary, declining removals could lead to an increasing population. The annual removal data should be used to refine the cheetah population models developed in this document.

*c) Monitor reports of problem cheetahs to the MET, DVS (Dept. of Veterinary Services) and to NGOs.* This index is related to the previous one, but is not necessarily a duplicate, as not all reported cheetah problems lead to removals. Again, when yearly compilations are compared over time, it will be informative to see how they relate to other population trend indices, providing an indication of just how cheetah predation on livestock does relate to changes in cheetah population size.

*d) Monitor trapping effort by farmers.* It is suggested that both MET officials and the cheetah NGOs ask farmers about their trapping effort every time a cheetah removal is reported. How many days was the trap open before the cheetah was caught? The trap effort index should be correlated with the removal and problem animal indices. In addition, MET should consider instituting a box trap licensing or registration requirement in order to derive a national index of cheetah capture effort. The annual license fee should be minimal.

*e) Monitor cheetah use of play trees through photo-traps, spoor recognition, and other methods.* The visitation rate to a number of known cheetah play trees could be another index of population change. CCF has experimented with monitoring cheetah use of play trees near their farm by placing camera photo traps in the trees (a picture is taken of the animal which steps on a buried pressure-sensitive pad), by searching the trees for scats and spoor at fixed intervals, and by leaving a box trap open by the tree.

*f) Monitor percentage occurrence of cheetahs reported by farmers in farm surveys.* MET will hopefully carry on the tradition of a nationwide farm survey every 10 years, while continuing to refine and improve the questionnaire. CCF and Africat also survey farmers about cheetah presence.

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

## 3.1. Introduction

The Ministry of Environment and Tourism, like other Namibian government agencies, is currently undergoing the process of rationalisation. Rationalisation involves streamlining government bureaucracy to achieve more efficient use of limited public resources, in recognition of new development priorities emerging after the country became independent in 1990. As the former MET Permanent Secretary, Hanno Rumpf, put it in a 1995 "vision speech": adopting a more streamlined approach in government means divesting some Ministry functions. A major example of this is the establishment of a parastatal company to take responsibility over tourism-related functions formerly carried out by the Ministry (e.g., tourism development and running of resort facilities). This will leave the MET with a stronger focus on natural resource conservation.

While the government bears primary responsibility for conservation, there is substantial scope for cooperation with the private sector. Namibia has been an international pioneer in this respect. An example of this policy most relevant to the cheetah is the 1967 legislation which transferred ownership of huntable game species from the State to private landholders. This has led to the development of a multi-million dollar game farming, tourist and hunting industry. This has promoted the conservation of wildlife outside protected areas, made a substantial contribution to the national economy, and yet taken very little financial and technical support from the government. A MET resource economist compared government expenditures on wildlife on private lands to expenditures by landowners, and concluded that "the private commercial game farming sector has [largely] taken over the role of investment, management and use of wildlife on farmland from government" (Barnes 1996).

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. Its main tool in this regard is the MET permit system, which regulates use and movement of protected and specially protected species on private land, and controls commercial harvest of huntable game. In order to issue an appropriate number of permits for offtake, MET officials must have regular contact with landowners, and assist them with game counts and surveys.

Because the bulk 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. Associations or organizations of concerned individuals should help to simplify the Ministry's task.

## 3.2. The activities and role of the cheetah NGOs

### *3.2.1*. Cheetah Conservation Fund

The Cheetah Conservation Fund (CCF) was established in 1990, originally as the Cheetah Preservation Fund. It was founded by an American husband and wife team, Dan Kraus and Laurie Marker-Kraus, who serve as co-directors of CCF. CCF is a registered Namibian trust, and also retains links with the United States' International Wilderness Leadership Foundation, so that CCF can collect nonprofit donations from that country. The Krauses have a long history of working with the cheetahs in the American zoo community. They worked together in Oregon's Wildlife Safari park, which at the time (1970s) had one of the largest captive cheetah collections in the world. Later the two went on to co-direct the NOAHS center at the National Zoo in Washington DC. The NOAHS Center - which stands for New Opportunities in Animal Health Sciences - specializes in research into endangered species genetics and reproduction.

CCF is based at the farm Elandsvreugde, part of the Waterberg Conservancy of farms on the border of the Waterberg Plateau Park in Otjiwarango district. The farm is being developed into the International Cheetah Research and Education Center. Elandsvreugde was purchased with monies raised for CCF in the U.S., primarily by the Cincinnati Zoo's Angel Fund, and private donors Cathryn and Carl Hilker.

CCF's mission is "to develop and implement long-term monitoring, multi-disclipinary research and conservation efforts for the survival of the free-ranging cheetah and its ecosystem in remaining habitats in Namibia and other African habitats."

The activities of CCF are described briefly below according to their stated objectives (from their 1995 annual report).

**Evaluate current livestock practices and their impact on cheetahs. Identify key components in farmland ecosystems necessary for the sustenance of healthy cheetah populations.**

CCF has published the results of its farmers' survey: *Cheetah Survival on Namibian Farmlands*, by L. Marker-Kraus, D. Kraus, D. Barnett and S. Hurlburt. Published by the Cheetah Conservation Fund, Otjiwarango, 1996. At nearly 100 pages, the survey is an important reference work on the situation of farmland cheetahs, and data from it is used in many places throughout this report. The survey tries to correlate farm management practices with farmers' perceptions of cheetahs as problem animals. For example, farms that reported problems with cheetah had a significantly lower ratio of game to cattle than farms with no cheetah problems. Also, farms with more internal fenced calving camps tended to practice more intensive livestock management and thus had fewer problems with predators. Game farmers were found to remove a disproportionately high number of cheetahs compared to livestock farmers.

**Conduct conservation education programs in Namibian schools to increase awareness about cheetahs and the environment and provide students with the opportunity to participate in cheetah conservation efforts.**

CCF has produced a teacher's resource guide which has been distributed to schools throughout Namibia. Called *Cheetah: A Predator's Role in the Ecosystem*, it contains materials suitable for use for a variety of age groups and curricula. CCF conducts training workshops to teach teachers how to use the handbook. CCF works closely with students from several schools in the Otjiwarango area, travels around to give talks at schools around the country (often with a tame cheetah along to brighten up the lecture), and hosts school groups at its farm headquarters. The Ministry of Education agreed in 1995 to include a question about cheetahs in their end-of-year exams, which will help to provide an indication of the success of CCF's educational efforts. CCF sponsored a short story and poetry writing contest for students, in cooperation with the Shell Art Competition, and has published selected entries in a book for children, entitled *The Orphan Calf and the Magical Cheetah*. CCF was commissioned by the National Museum of Namibia to develop an exhibit about the Namibian cheetah at the State Museum in Windhoek. CCF has taken on several Namibian students as short-term volunteers

**Address conflicts between farmers and predators in order to develop a conservation and management strategy that benefits both humans and cheetahs.**

CCF has spent much time visiting farms to talk to livestock owners about cheetah conservation and how to reduce cheetah predation on livestock. They have a Livestock Guarding Dog Program which provides Anatolian shepherd breed dogs to interested farmers. They often speak at farmers' association meetings. They will take cheetahs captured by farmers, put them into CCF holding pens, and attempt to relocate them elsewhere (see below for further discussion of this aspect of their work).

As the Krauses wrote in a recent article (Marker-Kraus and Kraus 1994: 370), "For the cheetah to survive, it must have a habitat and a prey-base. These essential elements can only be maintained through a holistic approach on the farmlands which incorporates land-use, livestock and wildlife. We need to work towards a balance between the economic needs of the people and the survival of the species. The long-term goal of CCF is to develop a conservancy for cheetahs on Namibia's commercial farmlands in cooperation with the farmers and the local human communities. Conservation of this last large stronghold for cheetahs will determine whether the species survives for future generations."

CCF is beginning to undertake a program of vegetation and wildlife monitoring on their farm to provide a model for application to other farms.

**Conduct field research to learn more about the biology and overall health of the southern African wild cheetah population and to gain information about the animals' movements through the farmlands.**

CCF has radio-collared twelve farmland cheetahs and monitors their movements twice-weekly by air, and has been doing this for nearly four years. Cheetahs captured on farms are also ear-tagged before release, so that resighting and recapture information can be gained.

**Adapt model programs developed in Namibia for use in other southern African countries.**

CCF has a researcher working with them in Botswana. They have participated in reintroductions of cheetahs (from Namibia) in Zambia and South Africa.

**Coordinate work with wildlife officials and other non-governmental organizations working with cheetahs.**

CCF has worked with a number of both national and international agencies and wildlife organizations. However, the level of cooperation and communication with MET and Africat should be increased.

### *3.2.2.* Africat

The Africat Foundation was established in 1992 by a Namibian husband and wife team, Lise and Wayne Hanssen. Africat is based at the Hanssen farm Okonjima in western Otjiwarango district. Okonjima contains sizable predator holding facilities and is also a guest farm. Okonjima offers the unique spectacle of wild leopards coming regularly to a baiting area at sundown. Wayne Hanssen has worked intensively with leopards on his farm for 15 years, studying their habits and movements, and experimenting with aversion therapy to train problem leopards not to attack livestock.

Africat's mission is to advise farmers regarding management techniques to reduce their losses to predators and to rescue and relocate predators captured on farms which would otherwise be killed. They work mainly with cheetah and leopard.

The activities of Africat are described briefly below according to their stated objectives (from their 1995 brochure and newsletters).

**Releasing non-problem predators caught in traps back into the wild in order to maintain a healthy free-roaming population and stabilize the territories of these predators on the farmlands of Namibia.**

Africat responds to requests from farmers to take captured predators off their hands. These animals are kept at holding facilities at Okonjima, and most are either released back onto farmland or exported to breeding facilities or parks for reintroduction.

**Monitoring these animals in order to understand their movement on farmlands and interaction with wild antelope and livestock.**

All released cheetahs and leopards to date have been ear-tagged, but Africat is now switching to a microchip implant system (less conspicuous), and plans to selectively fit radio collars as well.

**Spreading the word about, and distributing, tried and tested farming methods to livestock farmers who live in predator inhabited areas in order to prevent stock losses, thereby reducing the number of predators removed from the free-ranging population.**

Africat promotes the use of electric fencing to deter predators for both livestock and game farmers, especially for smaller predator-proof enclosures for young calves or valuable exotic game species. It may be possible to make these enclosures collapsible and mobile so there is less interference with herd grazing movements.

Africat is surveying farmers regarding their management techniques. They report that 70% of respondents do not pen young calves at night, and that 30% do not manage for a calving season (Hanssen 1995a: 4).

**To educate children, the farming community and the general public in preventative livestock farming methods, importance of predators in the environment, and veld management.**

Africat states: "Namibia is mainly a farming community and a large percentage of school-going children today will be the farmers of the future. Teaching effective livestock protection methods and conservation and the role that predators play in the environment could lead to a whole generation of environmentally aware farmers who would be proud to be the custodians of endangered species" (Africat 1995). The foundation invites school groups to tour the facilities at Okonjima and hear talks on predator ecology and management. An education center is planned where week-end workshops can be held for adult audiences with topics including overgrazing, bush encroachment, land carrying capacity, livestock protection methods and predator conservation.

**Conservancies: to work with the landowners of Namibia in the development of conservancies to improve the utilization of that area, including veld, antelope and predator management.**

Africat consults with conservancies regarding predator management, and encourages conservancies to support predator presence, which can keep prey populations from overexpanding and overgrazing, and can generate revenue as tourist attractions.

### *3.2.3. Cheetah Awareness Week*

Cheetah Awareness Week consists of a week of public events designed to raise public awareness about the cheetah. With the first held in August 1995 and another planned for August 1996, activities include a fun run/walk for CCF, a bicycle tour from Windhoek to Okonjima/Africat, and talks at various Windhoek schools. Cheetah Awareness Week is organized and sponsored by the Cheetah Awareness Week Committee based in Windhoek. Funds raised by the campaign have helped to improve holding facilities and construct on-site veterinary clinics at both CCF and Africat.

### *3.2.4. Namibian Association of Professional Hunters (NAPHA)*

NAPHA is the major representative body for the trophy hunting industry in Namibia. Members established a Rare Species Committee (RASPECO) in 1994 for the cheetah. Its purpose is to "develop guidelines and programs which will support the sustainable utilization of a rare species, such as the cheetah, to the enhancement of the species" (1995 brochure). In cooperation with Safari Club International, the Committee drew up a Cheetah Compact (Teer 1994) which is being circulated for NAPHA members for their signature (Appendix 6). The Compact commits the signer to manage their farms for cheetah conservation by: taking reasonable steps to control the indiscriminate killing of cheetah, cooperating with cheetah conservation programs of the Namibian government, managing for appropriate cheetah habitat and surveying their property for cheetah presence. Signers agree to donate N$1,000 of the trophy price for cheetahs hunted on their property to a fund for cheetah conservation projects administered by the Namibian Nature Foundation (NNF). The Cheetah Committee is currently developing guidelines for cheetah conservation project proposals. The suggested trophy price is at least N$6,000, with the remainder to be split between the farmer on whose property the cheetah was hunted and the professional hunter who guided the client. According to NAPHA records, over 80 farmers representing over 100 farms have signed the Compact (B. Roschlau pers. comm. April 1996). The Cheetah Committee is trying to collect more signatures (J. Hein pers. comm. June 1996).

NAPHA is interested in working closely with MET in order to make a linkage between cheetah-hunting sportsmen and farms which suffer livestock losses to cheetah. MET is in a position to put farmers reporting cheetah problems into contact with professional hunters applying for cheetah hunting permits on behalf of their clients. Farmers who suffer losses may tolerate some cheetah presence if they can earn enough money from a trophy hunt to compensate for their damages. It was suggested at the June 1996 of the NAPHA RASPECO cheetah committee that MET issue permits for cheetah trophy hunts only at farms which have signed the Cheetah Compact.

NAPHA has put together a brochure about the cheetah, its conservation, and ethical hunting guidelines.

### *3.2.5. Namibian Nature Foundation (NNF)*

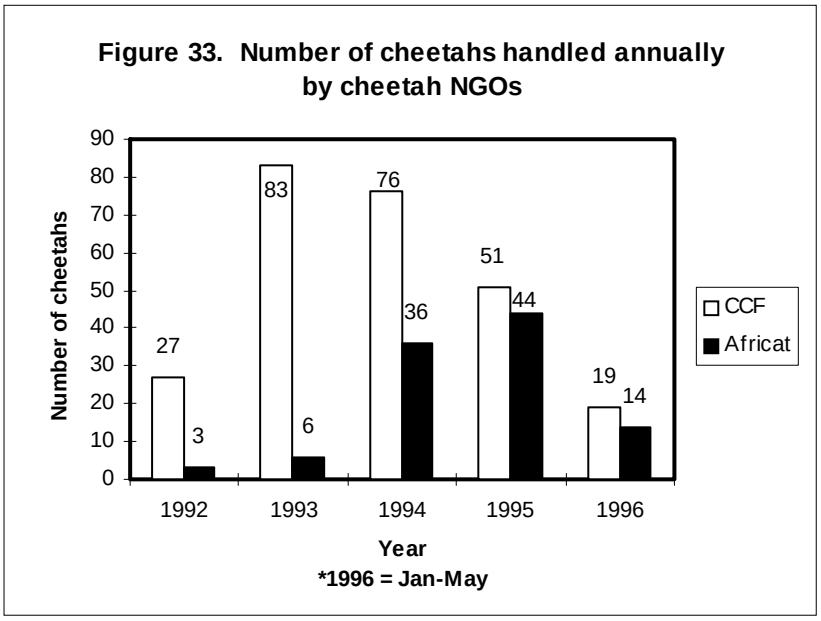
NNF has assisted the other three NGOs with fund raising and administrative support. They also helped to raise funds for the production of this conservation strategy.

## 3.3. CCF's and Africat's handling of cheetahs

Thanks in large part to the efforts of the cheetah NGOs to promote cheetah conservation, many farmers who capture cheetahs on their property are reluctant to shoot them, and 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. Figure 33 shows the number of cheetah handled annually by Africat and CCF. Both organizations encourage the farmer to release the animal where it came from, arguing that the loss of a resident animal will create an influx of new cheetahs into the vacant territory. If the farmer is not willing, cheetahs are donated to other farms willing to release them. Figure 34 shows the breakdown of the types of cheetah releases carried out by each organization.

CCF reports that out of 96 releases, 19 marked cheetahs were recaptured (about 20%: CCF unpubl. data). Africat reported in their brochure that out of 119 released predators (includes leopards), four were eventually killed by farmers (Africat 1995). Most of the releases have taken place in the Otjiwarango area. This has led to some concern among the local farming community and both organizations have spoken at local farm meetings to explain their activities.

The success of relocating cheetahs outside their presumed original home range is variable. For example, according to Africat records, a male cheetah trapped under a play tree in Omaruru was ear-tagged and released in Otjiwarango, but recaptured in the same trap under the same tree 1.5 years later (L. Hanssen pers. comm.). Long distance travel has been recorded. One cheetah handled by Africat was caught in Outjo district, ear-tagged and released in the Otjiwarango area, and recaptured a year later in Tsumeb (L. Hanssen pers. comm.). It would be useful for the NGOs to radio-collar animals released away from their capture areas in order to monitor whether they take up residence.



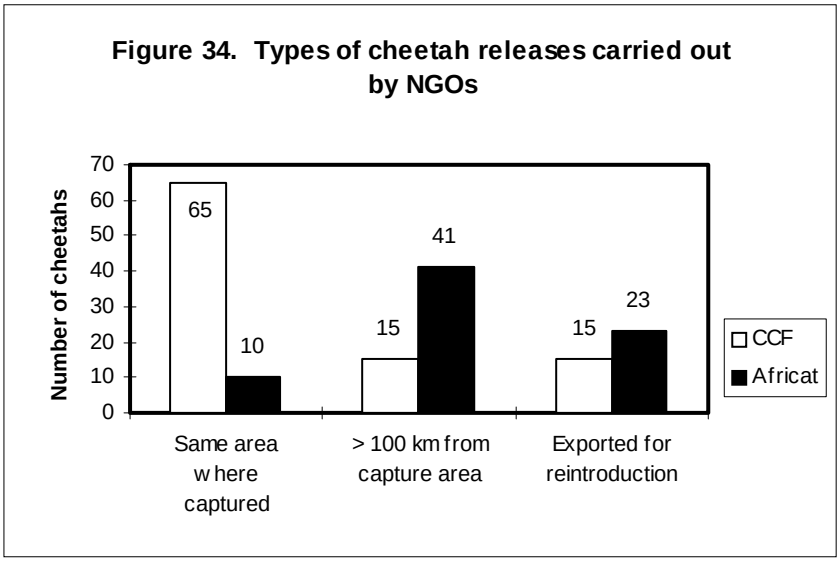




**Table 9. Districts where farmers capturing cheetahs have contacted the NGOs**

| District | Number of cheetahs handled [% of total] | |
|---|---|---|
| | CCF | Africat |
| Gobabis | 37 [14] | 50 [50] |
| Grootfontein | 17 [ 7] | 1 [ 1] |
| Karibib | 2 [ 1] | |
| Okahandja | 52 [19] | 10 [10] |
| Omaruru | 18 [ 7] | 10 [10] |
| Otjiwarango | 113 [42] | 7 [ 7] |
| Outjo | 12 [ 4] | 10 [10] |
| Windhoek | 20 [ 7] | 12 [12] |
| TOTAL | 271 | 100 |

Table 9 shows the districts where farmers have contacted the NGOs about captured cheetahs. There are few contacts south of Windhoek; most are in the central-northern farmlands.

The effects of cheetah releases and translocations are largely unknown. This activity of the NGOs warrants closer MET supervision through the permit process. The activity should be supported by MET unless it can be shown to have harmful effects (Recommendations 3.7.1-2).

### 3.4. Improving MET-NGO cooperation and communication

The cheetah NGOs are an asset to MET in its goal of conservation of a viable cheetah population. They lead efforts to raise public support for cheetah conservation. They work intensively with livestock owners to help them reduce damages caused by predators in a way that MET cannot hope to duplicate with its present structure and resources. The combined annual budgets of Africat and CCF in 1995-1996 amount to over half a million Namibian dollars, which represents a substantial savings to MET. Yet better coordination between MET and the NGOs should result in a heightened efficiency of the use of all cheetah conservation funding and resources, both public and private.

The release and translocation activities undertaken by Africat and CCF represent an innovative approach to cheetah conservation on the farmlands. The efficacy of this approach, however, is unproven. Removing cheetahs from areas where they are unwanted or have caused problems and releasing them elsewhere could aid MET in its goal of ensuring that removals are sustainable - **if** these cheetahs are able to re-establish themselves in the breeding population. If most animals fail to establish themselves and breed, however, or cause livestock damage in their new territories, the money spent on this activity could be used more profitably in other ways (such as compensating farmers for livestock losses caused by cheetahs). In addition, translocating cheetahs carries some risk of spreading disease.

To date, the cheetah NGOs have not been required to obtain a permit every time they keep or transport cheetahs. None of their releases have been officially reported to MET. The NGOs are technically in breach of reporting requirements that other citizens are required to adhere to. This exception has been informally granted them in recognition of the volume of cheetahs they handle, and due to their special role in promoting predator conservation.

However, it is not unreasonable to require each NGO to submit a research project proposal to MET, just as all other researchers, both government and private, are required to do. MET should then grant special permission for the NGOs to handle and translocate cheetahs, but should require comprehensive reporting and that certain conditions should be adhered to.

In order for MET to improve its ability to responsibly and efficiently coordinate the activities of the cheetah NGOs, it is recommended that the position of Carnivore Coordinator be established within the Directorate of Specialist Support Services. The responsibilities of this post should parallel those of the newly created Rhino Coordinator. In a broad sense, the Carnivore Coordinator should oversee all research and conservation activities involving the rarer large predators in Namibia, including not only the cheetah, but also wild dog, lion, leopard, and spotted and brown hyena. The Carnivore Coordinator should not be seen as a modern revision of the old post of Problem Animal Officer, which has been eliminated in the Ministry rationalisation process. The duty of helping the public deal with problem animals has been decentralized and is now devolved to local Resource and Management staff.

With specific regard to the cheetah, the Carnivore Coordinator should serve as MET liaison to the cheetah NGOs. This person should work with the cheetah NGOs to develop their research project proposals, and should negotiate permit conditions. One condition should be the submission of reports from the NGOs detailing their activities in handling cheetahs. The Carnivore Coordinator should define the reporting requirements based on discussions with the NGOs and the recommendations presented in this document. These reporting requirements should not be construed as a paperwork hassle. They should be designed to yield maximum information on the status of the cheetah population.

A list of minimum suggested NGO reporting requirements for permit approval includes the following:

- Number of cheetahs handled and their sex-age composition.
- Details on capture, release and translocation of individual cheetahs.
- Number of calls received regarding problem cheetahs.
- Names of individuals capturing cheetahs (for comparison with MET permit office data in order to improve estimation of annual numbers of cheetahs removed).
- Details on disease screening of cheetahs handled.

MET should set up a Cheetah Committee, with the structure paralleling that of the Rhino Conservation Group, to be chaired by the Carnivore Coordinator. Committee members should include the cheetah NGOs, a NAPHA Cheetah Committee representative, private land owners involved in cheetah conservation activities, other involved MET staff, and staff from the Department of Veterinary Services. The Committee should meet once or twice a year. All members should be expected to provide a report of their cheetah activities, possibly within reporting format guidelines drawn up by the Carnivore Coordinator to standardize data collection and aid its analysis. The Carnivore Coordinator should be responsible for producing an annual cheetah status report which includes a summary of proceedings of the Cheetah Committee meetings.

## 3.5. Enhancing the economic value of cheetahs

It is widely agreed that an increase in the perception that wild game species represent a source of economic value has been a primary factor in the general increase of game on private lands over the past 30 years. Game numbers (ungulates) appear to have increased by over 70% since the early 1970s.

Use of wildlife on the commercial farms where most of the cheetah population is found has developed primarily as a supplementary activity to livestock production, although the number of game farms with no livestock is growing. Forms of wildlife use on these farms include 1) game meat production, through either organized night culls or informal shooting and selling; 2) live capture and game dealing; 3) selling of recreational hunting opportunities for either biltong or trophies; 4) specialized, semi-intensive ostrich farming; and 5) non-consumptive wildlife viewing tourism (primarily on the larger game ranches).

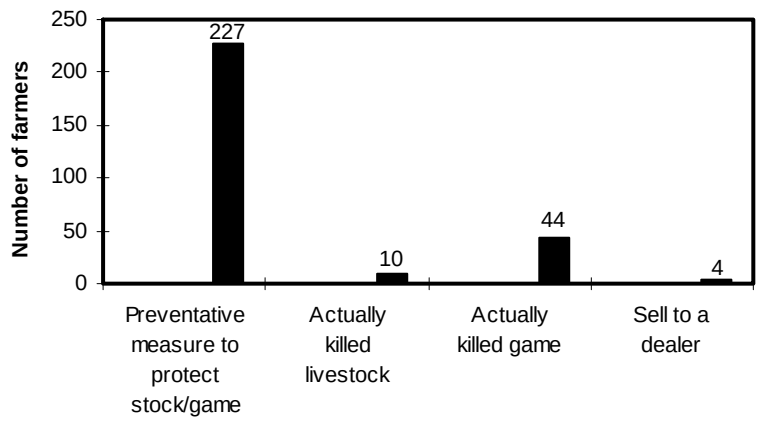
The financial rate of return on these wildlife-based industries is not nearly so impressive as the game population's rate of increase. MET has analyzed the profitability of wildlife to individual land owners (Barnes and de Jager in press). For mixed game/livestock ranching systems, they found the wildlife component to yield only low profitability for the farmer, with owners earning less profits than with the livestock component. Profitability was slightly higher for the southern sheep farms than for the northern cattle farms which are the cheetah's stronghold. Overall, they consider Namibian ranching to be rather an unprofitable enterprise, with net annual cash income for southern sheep/game farms at about N$65,000 and for northern cattle/game farms at $N37,500.

With such low profit margins, it comes as no surprise that commercial farmers view cheetahs as a liability. A calf killed by a cheetah is worth between N$300-500 - or would be worth N$1,000-1,500 if it grew to adult slaughter size. A springbok is worth about **$XX, a gemsbok calf about **$XX. Some species of exotic game are very expensive, with roan or sable antelope fetching up to N$20,000. Blesbok, which are often killed by cheetah, sell for N$1,000-3,000.

The cheetah is thus essentially left out of the wildlife value equation. It is considered a liability rather than an asset. The perception of the cheetah as a problem animal is correlated with trapping effort. Farmers surveyed by CCF who considered cheetahs a problem removed significantly more cheetahs (more than twice as many) than farmers who did not consider cheetahs to be a problem (Marker-Kraus et al. 1996: 43). Still, farmers who didn't consider cheetahs a problem still removed about one cheetah per year. Cheetahs do not even have to kill livestock or game to be considered a source of financial loss. For example, one farmer told Africat that he captured cheetahs because they made the free-ranging springbok nervous so they wouldn't stay on his farm (L. Hanssen pers. comm.).

Figure 35 shows the reasons farmers gave to NGOs for removing cheetahs. The vast majority were removed as a preventative measure. Not only could these animals not be linked definitively to any recent losses, but most farmers had not even had any losses that they knew of. It is also interesting to note that most confirmed incidents of predation were game rather than livestock. The CCF farm survey found that although game farmers did not report more problems with cheetahs than the livestock farmers, they removed a disproportionately large number of cheetahs (31% of farmers [game farmers] removed 45% of the total number of cheetah: Marker-Kraus et al. 1996: 33).

**Figure 35. Reasons farmers gave to NGOs for removing cheetahs**



It is logical that most farmers will not want cheetahs on their land unless the cheetah's value is greater than its cost, actual or potential. Contacting the NGOs to relocate the unwanted cheetahs is not a long-term solution to the problem. Innovative approaches must be tried to enhance the economic value of cheetahs if their conservation on private lands is not to be a constant struggle with the farmers.

### *3.5.1. Trophy hunting*

Trophy hunting is the economic enhancement for cheetah conservation that is the most developed. It is also the most profitable. A farmer who has a cheetah trophy hunted on his farm should make approximately at least N$2,500 from the trophy fee alone (if he has signed NAPHA's Cheetah Compact). That amount of money should not only cover any losses he may have suffered, but should be a small but important contribution to his total annual income. MET plans in the future to only grant trophy export permits to cheetahs hunted on properties which are party to the Cheetah Compact.

Trophy hunting is also one of the more profitable wildlife-based industries in Namibia. In 1991, it was estimated that commercial farmers had a combined turnover of some N$13 million for the sale of trophy hunts (including trophy fees, accommodation, and related costs) (Barnes 1996). It is important that cheetahs be considered part of this significant form of sustainable use of wildlife, instead of a threat to it.

At present, only small numbers of cheetahs are trophy hunted compared to other trophy species. From 1983-1995, the average number of cheetahs exported as trophies has been just 20 (Table 10), whereas in 1993 there were 260 eland trophies, 974 hartebeest trophies, and 1,657 gemsbok trophies (Barnes 1996). Thus, for the cheetah and other trophy species, a relatively small offtake yields relatively large revenues.

**Table 10. Exports of cheetah from Namibia, 1978-1994**

| Year | Live | Hunting trophy | Skin | Total |
|---|---|---|---|---|
| 1978 | 109 | | 374 | 483 |
| 1979 | 143 | 1 | 297 | 441 |
| 1980 | 139 | | 196 | 275 |
| 1981 | 54 | | 268 | 322 |
| 1982 | 33 | | 471 | 504 |
| 1983 | 124 | 11 | 125 | 260 |
| 1984 | 70 | 8 | 158 | 236 |
| 1985 | 109 | 22 | 45 | 176 |
| 1986 | 78 | 23 | 33 | 134 |
| 1987 | 77 | 22 | 52 | 151 |
| 1988 | 100 | 25 | 44 | 169 |
| 1989 | 78 | 21 | 16 | 115 |
| 1990 | 50 | 22 | | 72 |
| 1991 | 51 | 38 | | 89 |
| 1992 | 13 | 35 | | 48 |
| 1993 | 14 | 20 | | 34 |
| 1994 | 25 | 17 | | 42 |
| Totals | 1,267 | 265 | 2,079 | 3,551 |

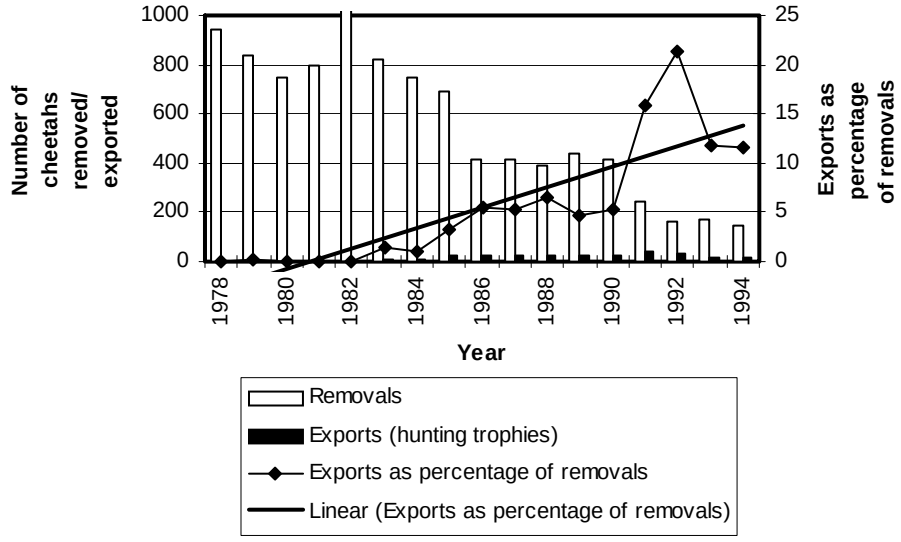
In addition to representing an economic incentive for farmers to tolerate the presence of cheetahs on their property, trophy hunting is also the only cheetah "industry" which is being structured to have a wider feedback for cheetah conservation. The NAPHA Cheetah Compact binds the signer to contribute N$1,000 of the trophy fee to a fund for cheetah conservation projects

Most cheetah trophies are exported to Europe (Namibia CITES annual reports). At the time of writing, the United States does not allow cheetah trophies to be imported, although it is taking a policy change under consideration. NAPHA has estimated demand from the American market to be about 20 animals per year (J. Vaatz pers. comm.). Thus, American imports could lead to a doubling in the present level of economic value for the cheetah through trophy

hunting. Not only would there be funds raised for cheetah conservation on the order of N$40,000 per year through the donations of Compact signers, but up to 40 farmers would also have directly benefited from cheetahs on their land.

If 2/3s of Namibia's annual CITES export quota of 150 cheetah per year were used for trophy hunting, there would be over N$100,000 funneled into NAPHA's cheetah conservation projects fund every year. It is a worthy goal to try to make a transition from the majority of cheetah removals being problem animals to the majority being trophy hunted. There are signs that this is happening - although the number of cheetahs trophy hunted every year has been relatively constant since 1983, trophy hunted animals have made up an increasing proportion of removals over the past ten years (Figure 36). MET plans to cooperate with NAPHA by helping to link farmers reporting cheetah problems to the MET permit office to professional hunters with clients seeking cheetah. If cheetah trophy hunting were to grow in importance, it might incorporate major problem animals, and also lead to a decrease in the number of cheetahs removed to protect livestock and game. More farmers would have an appreciation that the cheetah potentially represents a source of additional income, and would hopefully close their traps and tolerate a minor degree of loss.

**Figure 36. Export of cheetah trophies in relation to cheetah removals**




### *3.5.2. Export of live animals*

The Namibian CITES export quota includes not only sport hunting trophies, but also live animals. Since the quota was granted in 1992, Namibia has exported live cheetahs for reintroduction, or for sale to zoological institutions participating in recognized captive breeding programs.

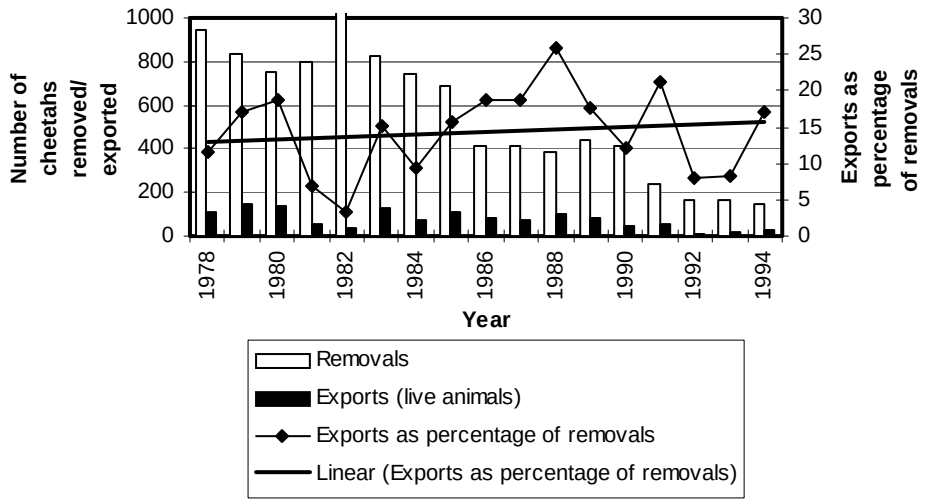
Some of the animals have been sold to zoos, others have been donated. All of the cheetahs exported for reintroduction were donated by Africat or CCF, and these organizations have sometimes also paid associated transport, keeping and veterinary costs.

While zoos have paid up to US$6,000 (= over N$25,000) for a live cheetah in recent years, it is the Namibian game dealer, rather than the farmer who captured the cheetah, who receives the majority of the profit. Farmers are seldom paid more than N$1,500 for a live cheetah (L. Hanssen pers. comm.), and therefore land owners selling their cheetah to a game dealer will profit less than those who arrange a trophy hunt. Still, the price represents currently the second highest economic value for cheetahs, after trophy hunting, and like trophy hunting, should serve as an incentive for cheetah conservation.

Export of live animals has shown a declining trend, probably because zoos are now having more success with the captive breeding of cheetahs (Marker-Kraus and Grisham 1993), in comparison to the export of cheetah trophies, which has remained stable since cheetah trophy hunting was first legalized (Table 10). In the late 1980s, close to 50% of the annual global exports of live cheetahs were from Namibia. Most of these animals were reported as captive-bred by importing countries (in order for their import to be legal) (IUCN 1992), but most were undoubtedly wild-caught (L. Marker-Kraus pers. comm.).

Despite the declining numbers of live animals exported, as a percentage of removals live animal exports have fluctuated around the average of 15% (Figure 37).

**Figure 37. Export of live cheetahs in relation to removals**



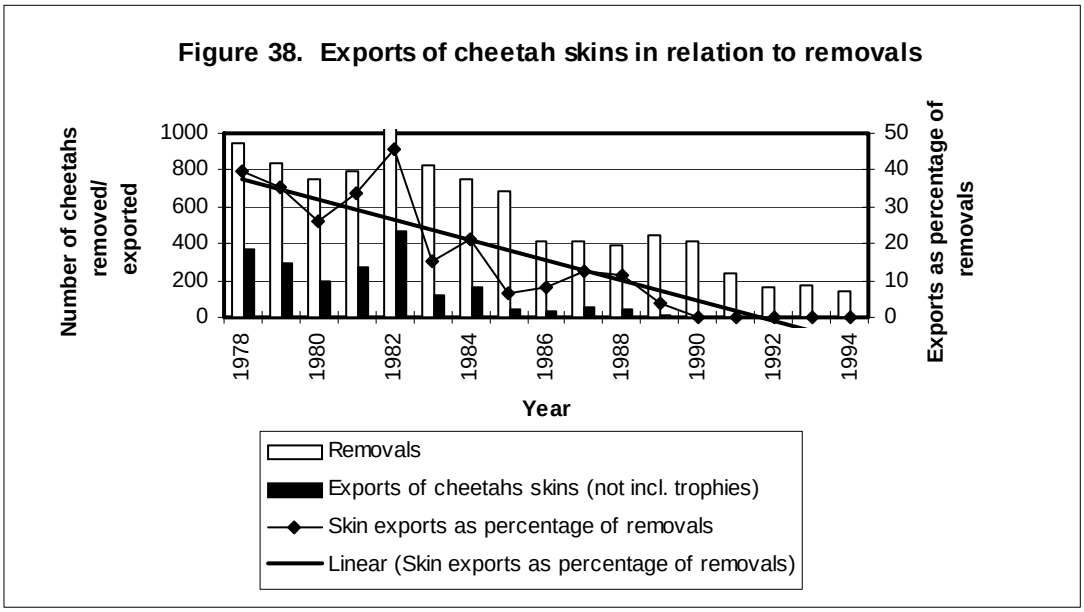

It was recently reported by the wildlife trade monitoring group TRAFFIC that two live cheetahs exported from Namibia to South Africa were shot by trophy hunters on a game farm there and re-exported just a week later (TRAFFIC 1996). MET should be careful in the future to ensure that this abuse of the live animal quota does not happen again. If cheetahs are to be trophy hunted, it should be in this country where maximum value can be retained.

### *3.5.3. Skin trade*

Namibia formerly carried out a substantial export trade in cheetah skins (Table 10). Over 50% of reported global exports of cheetah skins from 1985-1989 were from Namibia. These skins went mostly to South Africa (IUCN 1992), which at the time was not considered international trade and thus did not fall under CITES purview. The skins were probably sold mainly for tourist curios in South Africa, which does not have many cheetahs, although some were sent to South Africa for tanning and mounting and then brought back to Namibia by the owner (data from MET permit office annual reports).

Namibia no longer allows export of cheetah skins for commercial purposes since it has joined CITES, but domestic trade in cheetah skins is legal with the proper permits. The market is quite small - cheetah skins are rarely seen for sale in the souvenir shops frequented by tourists in Windhoek. Skins are sold whole for wall mounts or are cut into pieces for the production of curios. Farmers can obtain approximately N$350 for a cheetah skin from a skin dealer (Marker-Kraus et al. 1996: 11). This is a price sufficient to cover the loss of one calf.

Figure 38 compares annual cheetah removals with annual cheetah exports from 1980 to 1994. The proportion of skin exports of removals fell steadily along with the declining total number of removals. The graph shows that a reduction in trade is correlated with a reduction in removals, but removals did not stop when skin exports stopped. Skin prices paid to farmers in 1982, at the height of cheetah removals, were only about N$60 (MET Permit Office annual report, 1982), lower than today. In terms of foreign currency, however, and considering inflation, the 1982 price is probably just slightly higher than today's price. That removals have declined and the skin price has not markedly increased indicates that there is not a high demand for skin trade for tourist curios.




There are only two or three dealers which currently buy cheetah skins (D. Morsbach pers. comm.). These dealers are obliged by the Nature Conservation Ordinance to keep records of the skins of protected game which they handle. These should be examined by the Carnivore Coordinator to determine accurately the size of the domestic skin market and assess its significance as a factor in the sustainable use of cheetahs.

### *3.5.4. Cheetah tourism*

A number of guest farms in Namibia keep cheetahs near their guest quarters (L. Marker-Kraus pers. comm.). Some of these animals are quite tame and can be petted by guests. However, wild farmland cheetahs are exceptionally shy and retiring (D. Morsbach, L. Marker-Kraus pers. comm.), and it is unlikely that tourists visiting a guest farm will see a cheetah on a game drive. Cheetah tourism as such does not constitute much of an incentive for game farms to tolerate wild cheetahs on their property. If a tourist comes to Namibia to see cheetahs in the wild, he is more likely to visit Etosha than a guest farm.

However, cheetahs are rarely seen in Etosha either (Etosha tourist sightings of predators, O. Forge pers. comm.). A tourist coming to visit the "cheetah capital of the world" is likely to go away disappointed; seeing a tame guest farm cheetah is not all that different from seeing a cheetah in a zoo back home, except for the expense involved.

It is recommended that guest farms radio-collar cheetahs and work to habituate them to being observed from a vehicle, as has been done successfully in several African game reserves, including Etosha. Radio telemetry is not an expensive technology, and while the process of learning to use it and habituating the cheetah to observation is not simple, neither is it exceedingly difficult. Guest farms would then be able to guarantee that their tourists could observe wild cheetahs, for as long as they care to, something that even Etosha cannot offer. It is likely that a premium price could be charged for such an experience, seeing as there are no "cheetah tours" anywhere else in the world. Guests could also help to fill in data recording sheets, which many of them probably would enjoy, seeing the current popularity of the "research tourism" approach of organizations like Earthwatch.

This form of non-consumptive use would seem to fit nicely into the conservancy strategy. Barnes and de Jager (in press) found the wildlife-oriented conservancy to be the most potentially profitable form of land use on the Namibian farmlands. Since cheetahs range widely, the conservancy approach to radio-collared cheetah tours makes more sense than just an individual farm, as it is more likely that a cheetah will not be present on an individual farm when guests arrive, but be present somewhere within the conservancy.

It has also been suggested that conservancies pool small annual member donations into a compensation fund, which can be used to compensate members suffering losses from predators or other problem animals such as elephants (M. de Jager pers. comm.). Enhancing the value of cheetah tourism would provide more of an incentive for conservancies to form such insurance pools.

### *3.5.6. Develop an environmentally sustainable farming subsidy or tax break*

Finally, the government of Namibia considers the cheetah a valuable species, as evidenced by its protected status which makes it an asset of the State. The government should consider promoting conservation-compatible farming practices, including tolerance of rare predators, by developing a subsidy or tax break for this. This is an appropriate way for the State to repay the private sector for the costs it bears in cooperating with the national goal of cheetah conservation, and to encourage environmentally sustainable forms of land use.

## 3.6. Summary of economic values for cheetahs

Economic values for cheetahs are currently limited, but not insubstantial. The value of cheetahs trophy hunted in Namibia in 1994 represents approximately N$40,000 in trophy fees for farmers. The value of cheetahs live-exported in 1994 comes to about N$25,000 (deducting for cheetahs exported by NGOs, which were donated). The value of cheetah skins on the domestic market in 1994 is probably not more than $17,500 if 50 skins were sold. The tourism value of wild cheetahs on private land is minimal. Therefore, the total amount of revenue potentially derived in 1994 by commercial farmers from cheetahs comes to just over N$80,000.

What were the costs of cheetah conservation to the private sector in 1994? Livestock losses according to the Department of Veterinary Services were 55 calves and 76 small stock, which amounts to a financial loss on the order of N$30,000. Farmers should have been able to write off these losses on their taxes, but it probably still results in a loss of income for them, especially if they consider the animal's value to be its worth when it is grown to maturity. There are also associated costs for farmers in undertaking management measures to deter predators, including labor and materials. For those who choose the most sophisticated and possibly most expensive route, electric fencing, Africat calculates a cost of about N$10,000 to electrify an existing 100 hectare game camp fence, and about half that for a predator-proof enclosure for livestock (Hanssen 1995b,c).

There are no centralized statistics on game losses to cheetahs, but cheetahs probably killed at least 100,000 ungulates in 1994 (based on calculations in section 2.4.2). It can be appreciated that this would represent substantial financial losses to farmers who consider game to be largely an economic asset, at least N$5 million if the average value of a wild ungulate is set at N$50 - which is quite low. Even warthogs have value as trophy animals.

The operating expenses of the cheetah NGOs should also be considered a cost of cheetah conservation. The combined budgets of Africat and CCF amounted to about N$400,000 (CCF and Africat annual reports).

Altogether, the cheetah's cost to the private sector in 1994 far outstripped its value, so much so that it is clear that the day when cheetahs will "pay their own way" in conservation is a long way off. Indeed, the cheetah would probably have to become much rarer for its value to increase by the necessary amount, which is why MET does not set itself the goal of having the cheetah pay for its conservation. However, through its actions the Ministry does hope to cooperate with the private sector in enhancing the value of cheetahs for farmers. If the value of wildlife on private lands continues to increase, but the cheetah remains a liability, conservation of a viable cheetah population will become very difficult.

## 3.7. Recommendations

**3.7.1. Develop an MET counterpart to work on cheetah conservation and management with the private sector.** It is recommended that MET establish the position of Carnivore Coordinator within the Directorate of Specialist Support Services. The responsibilities of this post would parallel those of the newly created position of Rhino Coordinator. The Carnivore Coordinator would serve as the focal point for the private sector in their dealings with MET regarding cheetah conservation. He should oversee project design and permit conditions for the cheetah NGOs. The Carnivore Coordinator should also maintain a wider overview of activities affecting all the rarer large predators in Namibia, including the wild dog and lion (recently reclassified as protected species), as well as the leopard and spotted and brown hyenas. The creation of a predator specialist post should lead to more efficiency in MET activities involving predators.

**3.7.2. Increase MET-NGO cooperation and communication.** The cheetah NGOs and other concerned members of the private sector are an important asset to the Ministry in its goal of conserving a viable population of cheetahs. Likewise, the experience and resources of MET staff, especially in regard to research and management, would be valuable to the NGOs if there were greater cooperation and communication between all parties. MET should set up a Cheetah Conservation Committee to be chaired by the Carnivore Coordinator. Again, this would parallel the Ministry's Rhino Advisory Committee, which advises MET management on rhino issues. All of the NGOs should be represented on the committee, as well as other private individuals active in cheetah conservation, and possibly the Department of Veterinary Services. The committee should meet at regular intervals to consolidate information on the cheetah

population and its management, and to plan jointly for future work, such as revising regulations on keeping predators in captivity, and revising predator control courses taught to MET trainees.

**3.7.3. Support enhanced economic values for cheetahs as a conservation incentive.** MET should explore ways it can aid the private sector in enhancing economic use values for cheetahs. The following are suggested:

**3.7.4. Incorporate the NAPHA Cheetah Compact into MET trophy hunting policy on cheetah.** Trophy hunting currently represents the most profitable economic use of cheetah. Ideally, it can be used to target problem animals and also have the effect of reducing overall removals. It is also the only cheetah industry which expressly provides wider benefits for cheetah conservation through the NAPHA Compact. Farmers signing the Compact commit to providing N$1,000 of their cheetah trophy fee to a fund administered by the Namibian Nature Foundation, as well as to carrying out cheetah-friendly farm management practices. The Compact was first circulated in 1994, but so far few of the cheetahs trophy hunted have been on Compact signer's farms (NAPHA Cheetah RASPECO meeting, June 1996). In order to support NAPHA's initiative, MET should implement a policy, on a trial basis, of only issuing cheetah trophy export permits for cheetahs hunted on Compact-signing farms.

**3.7.5. Support cheetah tourism by providing training in predator research techniques.** MET has carried out a substantial transfer of knowledge from the public to the private sector through its policy of co-managing the utilisation of game species with land owners. It should also transfer knowledge of predator research techniques to help guest farms interested in enhancing the value of wild cheetahs to tourists. MET research staff should offer training on how to use radio-telemetry and how to habituate cheetahs to being observed from vehicles.

**3.7.6. Investigate development of an environmentally sustainable farming methods subsidy or tax break.** MET should work with other government agencies to investigate the feasibility of the State subsidizing some degree of the private commercial farming sector's contribution to conservation.

# Part 4. Summary List of Recommended Actions for the Ministry of Environment and Tourism

*Directorate: Specialist Support Services*

**Appoint a Carnivore Coordinator.** This position should be at the Senior Conservation Scientist or Senior Warden level. The Carnivore Coordinator will have work on all the large predators in Namibia, including not only the cheetah, but also wild dog, lion, leopard, and spotted and brown hyena. The Carnivore Coordinator should coordinate all research and conservation activities involving these species (Recommendation 3.7.1).

With specific regard to the cheetah, the Carnivore Coordinator should have specific responsibility for the following activities:

- Oversee research efforts on cheetah density and analysis of data to develop a national cheetah population estimate (Recommendation 2.7.2).
- Improve monitoring of cheetah removals by analyzing data from the MET Permit Office for the production of a short annual cheetah status report (Recommendations 2.7.3-7.5 ).
- Oversee data collection on cheetah population trend indices and analysis of data (Recommendation 2.7.7).
- Monitor removals for sustainability and produce a contingency plan for a livestock loss compensation program if there are indications that the intensity of trapping is causing a serious and potentially permanent population decline (Recommendation 2.7.6).
- Develop permit requirements for NGOs involved in cheetah translocations and releases, and evaluate their activities based on their reports (Recommendation 3.7.1).
- Chair meetings of the Cheetah Committee (Recommendation 3.7.2).
- Work with other government agencies on a feasibility study of implementing an ecologically sustainable farm management tax break or subsidy (Recommendation 3.7.6).

- Work with the NAPHA Cheetah RASPECO to monitor the effects of trophy hunting and the Cheetah Compact on the cheetah population (Recommendation 3.7.3).

**Permit Office actions**

- Require regional permit-issuing offices to forward all cheetah permits to headquarters on a monthly basis, and supply this information to the Carnivore Coordinator (Recommendation 2.7.3).

- Make sex and age a reporting requirement before issuing permits for cheetah removals. Regional office staff should request applicants to report whether cheetahs are male adult, female adult or cubs when issuing permits for cheetah removals (Recommendation 2.7.4).

- Improve categorization of types of cheetah removals in the MET computerized permit database (Recommendation 2.7.5).

- Investigate with the Carnivore Coordinator the feasibility of instituting a box trap licensing or registration scheme to derive a national index of large predator trapping effort (Recommendation 2.7.6).

- Issue trophy export permits only for cheetahs hunted on farms party to the NAPHA Cheetah Compact (Recommendation 3.7.3).

- Ensure that no cheetahs are exported live to be trophy hunted in other countries (Chapter 3 section 3.5.2).

## *Directorate: Resource Management*

- Regional permit issuing offices should forward permits issued for cheetah removals to the permit office in Windhoek on a monthly basis (Recommendation 2.7.3). Applicants for cheetah removal permits should be required to give information on the sex-age composition of their removals: number of adult males, adult females, and cubs (Recommendation 2.7.4).

- Resource Management staff should contact the Carnivore Coordinator if farmers or communities in their regions have persistent or serious problems with damages caused by cheetahs or other large predators (Recommendation 3.7.1).

- Resource Management staff should form a working group which includes the Carnivore Coordinator and local NGOs involved in predator conservation to develop comprehensive guidelines for dealing with problem predators. The group should revamp the problem animal courses taught to Nature Conservation students at the Technikon (Recommendation 3.7.2).

- Resource Management staff with research experience, with the Carnivore Coordinator and/or the cheetah NGOs, should offer training to guest farms or conservancies which want to radio-collar cheetahs (or other large predators) in order to enhance their value as tourist attractions. The Etosha cheetah research project is producing practical guidelines on how to habituate radio-collared cheetahs to observer presence which should be of use. It would not be unreasonable to charge a fee for this service (Recommendation 3.7.5).

## *Directorate: Environmental Affairs*

- A natural resource economist with the DEA should do a study of the costs and values of predators on private lands, which may perhaps yield new ideas or approaches to enhancing the cheetah's economic value (Recommendation 3.7.3).

- DEA staff should work with the Carnivore Coordinator and other government agency personnel on a feasibility study for an environmentally sustainable tax break or subsidy, which would allow the State to support some degree of private sector costs of cheetah conservation (Recommendation 3.7.6).

## Appendix 1. Cheetah species account from the IUCN/SSC Cat Specialist Group's Cat Action Plan (Nowell and Jackson 1996)

## Appendix 2. CITES Appendix I export quota for cheetahs (separate document, PDF file)

## Appendix 3. Calculation of a theoretical minimum viable population size for cheetahs based on population genetics

Lehmkuhl (1984) presented a framework and procedure for defining minimum viable population size based on maintenance of genetic heterozygosity and reduction of inbreeding. Following his calculations results in an approximate census number that falls within a range of effective population size of 50-500 animals.

Two sets of calculations were made for cheetahs. The first assumes that the theoretical rule-of-thumb effective minimum viable population size (Ne) of 50 is desirable for the species.

The second takes into account the cheetah's markedly reduced genetic heterozygosity, and estimates the effect this would have on reducing the effective population size. O'Brien et al. (1987) reported that southern African cheetahs had an average genetic heterozygosity of 0.0004, and a higher figure for east African cheetahs of 0.014. The median of 0.0007 was taken for the species as a whole. O'Brien et al. (1983) gives the following data on average heterozygosity for other African felids.

| Species | Average heterozygosity | Number of genetic loci surveyed | Number of animals |
|---|---|---|---|
| Cheetah* | 0.007 | 52 | 80 |
| Lion | 0.037 | 50 | 20 |
| Serval | 0.033 | 49 | 16 |
| Leopard | 0.029 | 50 | 18 |
| Caracal | 0.029 | 50 | 16 |

* from O'Brien et al. 1987

The mean average heterozygosity for these five African cats is 0.027. The cheetah has 39 times less average heterozygosity. This implies that its effective population size would be 39 times smaller, or just 1.3, in order to conserve genetic heterozygosity over the short term. The figure was rounded upward to 2.0 to ensure breeding!

The census number resulting from the first assumption is designated N. That resulting from the second, lower assumption is marked Nalt.

Step 1. Variance in progeny number

The first step in Lehmkuhl's procedure for calculating minimum viable population size is to estimate the effect of variance in the number of young surviving to breed produced by each cheetah female. There is an equation for determining the approximate census number needed to achieve an effective population of 50 breeding cheetahs if appropriate reproduction and recruitment data are available - which, for the Namibian cheetah, they are not. In the absence of data, he recommends multiplying the minimum short-term effective population size by 1.4. According to a survey of observed distribution of progeny number done by Crow and Morton (1955), the census number ranged from 1.18-1.67 times of the effective number, and 1.4 is the approximate mean of that range. Data on lifetime reproduction by tigers in Chitwan National Park indicate that the higher end of the range may be more appropriate for large felids (Smith and McDougal 1991), with an N:Ne ratio of 1.6. Here a factor of 1.5 is used.

1. N = 50 x 1.5 = 75
2. Nalt = 2 x 1.5 = 3

Step 2. Unequal sex ratios

Whenever the numbers of each sex contributing to the next generation are not equal, the census number must be increased. The number of breeding males is first calculated based on the breeding sex ratio; the number of females is then back-calculated and summed with the number of males to get the census number.

The equation is: Nm = [Ne + (male:female ratio x Ne)]/4 where Nm = number of males

The adult cheetah sex ratio in Tanzania's Serengeti National Park is 1 male: 1.9 females, or 0.52 males: 1 female, based on sightings of 169 adults (Frame and Frame 1984). This observed sex ratio is typical of large felids (Nowell and Jackson 1996).

Nm = [50 = (0.52 x 50)]/4
Nm = 19; Nf = 37 Nm + Nf = 56
56/50 = 1.12 increase in N: 75 x 1.12 = 84
Nalt: 3 x 1.12 = 3.36 = 4

3. Overlapping generations

Overlapping generations shrink the effective size, so the census number should be increased to maintain the fixed effective number. Based on the literature, Soulé (1980) recommends doubling the census number for species with overlapping generations.

N = 84 x 2 = 168
Nalt = 4 x 2 = 8

4. Population fluctuations

The intent here is to take the census number from step 3 and adjust it so that fluctuations in population size, observed from empirical data, will not on the average take the population below the census number from step 3. According to recent historical estimates, the highest cheetah population (5,000-6,000 in the mid 1970s) was about double the lowest estimated population (2,000-3,000 in the mid-1980s). Thus double the gene-based MVP estimate:

N = 168 x 2 = 336
Nalt = 8 x 2 = 16

Step 5. Adjustment for planning period

Franklin (1980) suggests that the minimum long-term effective population size needed to conserve evolutionary potential should be an order of magnitude (that is, 10 times) larger than short-term. So the long-term effective size should be 500 based on the short-term figure of 50. Below 500, it is likely that genetic variance for complex traits is lost at a significantly faster rate than it is renewed by mutation and, theoretically, the ability of the species to adapt and evolve with the changing environment would be limited.

Multiply the census number from step 5 by 10:

N = 336 x 10 = 3,360
Nalt = 16 x 10 = 160

## Appendix 4. Cheetah population dynamics model (separate document)

## Appendix 5. Extrapolation of the DNC's 1982 survey results for cheetah in Namibia

The number of farms on which cheetahs took livestock, the number of farms which took control measures, and the number of cheetahs killed is shown below in the table below. The figures have been recalculated from Joubert et al. (1982) to show the proportion of farms with cheetah problems compared to the proportion of farms having cheetahs, rather than to all farms covered by the questionnaire. The number of farms is the number of farms in each district expected to have cheetahs present obtained by extrapolating the survey's reported percentage occurrence of cheetah over the entire district. The number of farms taking control measures is presented as a percentage of the number of farms reporting livestock loss. If this number is compared to the number of farms with cheetahs present, the percentage is lower at 13%.

Number of farms with cheetah problems in 1981

| District | Total farms with cheetah present | No. (%) with livestock loss | No. (%) taking control measures | Avg. number cheetah killed[1] | Total cheetah extrapolated killed |
|---|---|---|---|---|---|
| Tsumeb | 90 | 60 (66%) | 10 (16%) | 3.2 | 32 |
| Grootfontein | 370 | 259 (70%) | 34 (13%) | 3.2 | 109 |

| | | | | | |
|---|---|---|---|---|---|
| Outjo | 287 | 241 (84%) | 60 (25%) | 3.2 | 192 |
| Otjiwarango | 215 | 151 (70%) | 35 (23%) | 3.2 | 112 |
| Omaruru | 113 | 104 (92%) | 19 (18%) | 3.2 | 61 |
| Karibib | 100 | 75 (75%) | 15 (20%) | 3.2 | 48 |
| Okahandja | 163 | 124 (76%) | 55 (44%) | 3.2 | 176 |
| Windhoek | 389 | 296 (76%) | 38 (13%) | 3.2 | 122 |
| Gobabis | 341 | 256 (75%) | 13 (05%) | 3.2 | 42 |
| Maltahohe | 109 | 83 (76%) | 06 (07%) | 3.2 | 19 |
| Mariental | 53 | 50 (94%) | 0 | 0 | 0 |
| Bethanie 46 | | 28 (61%) | 4 (09%) | 3.2 | 13 |
| Keetmanshoop | 15 | 13 (86%) | 2 (14%) | 3.2 | 6 |
| Karasburg | 55 | 50 (91%) | 5 (09%) | 3.2 | 16 |
| | 2346 | 1790 (76%) | 296 (17%) | | 948 |

1 Average number of cheetah killed derived from total reported killed during the survey (750) divided by the number of farms reporting control measures (236).

The farms of the southern districts show an interesting trend. In general the reported occurrence of cheetah is quite low, except for Maltahohe and Bethanie occurring along the edge of the western escarpment. For the other districts (where cheetahs are presumed not to be permanently resident), judging by the high percentages of farms reporting damage, cheetah presence is only noticed if livestock or game goes missing. Still, very few farms reported taking control measures. It could be that southern farmers are more reluctant to report such actions to the Ministry. Because of the high numbers of springbok in the southern districts, they comprise good cheetah habitat. It should be a priority for MET to look into the status of the cheetah in these areas, and develop a better working relationship with farmers there (Recommendation 2.7.2).

## Appendix 6. NAPHA Cheetah Compact (separate document, PDF file)

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CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA

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Eighth Meeting of the Conference of the Parties

Kyoto (Japan), 2 to 13 March 1992

Interpretation and Implementation of the Convention

Exports of Cheetah Hunting Trophies and Skins

# QUOTAS FOR TRADE IN SPECIMENS OF CHEETAH

Cheetah *Acinonyx jubatus* were once widely distributed in Asia and Africa, but are now nearly extinct in Asia and declining in Africa. The world's cheetah population is estimated to number between 9,000 to 12,000 individuals. The world's largest concentration of cheetah is now found in southern Africa.

In Namibia, historical records show cheetah to have been widespread throughout the country, but rare until the early 1970's. From about 1970 to 1982 there appears to have been a large increase in numbers, proportionately related to the large increases in wild game populations on farmland for the same period. In 1982 a widespread outbreak of rabies caused a sharp decline in game populations, which resulted in large numbers of cheetah being killed on farmland due to their depredation of livestock. Cheetah were estimated to number from 2,000 to 3,000 in 1985, based on radiotelemetry studies. However, numbers appear to have declined since then.

Botswana is thought to hold the world's second largest cheetah population, with between 1,000 to 2,500 animals. Zimbabwe is third with 500 to 1,000.

In southern Africa, it is estimated that only 18 to 24% of the cheetah population occurs in protected areas. Cheetah generally do not fare well in protected areas due to interspecific competition with other large predators. In a study of cheetah biology in the Serengeti, researchers found cub mortalities of up to 92%, with the major cause being losses to other predators. The vast majority of wild cheetah today occur on private farmland; it is estimated that 95% of Namibia's population and 80% of Zimbabwe's population are found on farmland. Cheetah are viewed by farmers as a major threat to livestock and large numbers are killed annually. They are not killed primarily for their skins as the pelt is not commercially valuable. The table below presents data on the number of cheetah reported shot annually as livestock predators in Namibia since 1980. In Namibia, the cheetah is a protected animal; if killed in defense of livestock, the farmer must take the skin and report to the government within ten days.

| Year | Shot in protection of livestock | Trophy hunting | Live exports | Total |
|---|---|---|---|---|
| 1980 | 623 | 0 | 139 | 762 |
| 1981 | 669 | 0 | 58 | 727 |
| 1982 | 850 | 0 | 40 | 890 |
| 1983 | 721 | 12 | 124 | 857 |
| 1984 | 646 | 7 | 61 | 714 |
| 1985 | 537 | 21 | 113 | 671 |

| | Shot in protection of livestock | Trophy hunting | Live exports | Total |
|---|---|---|---|---|
| 1980 | 623 | 0 | 139 | 762 |
| 1986 | 318 | 17 | 67 | 402 |
| 1987 | 317 | 12 | 87 | 416 |
| 1988 | 272 | 20 | 82 | 374 |
| 1989 | 271 | 32 | 67 | 370 |
| 1990 | 301 | 29 | 69 | 399 |
| 1991 | 145 | 40 | 51 | 236 |

The number of cheetah utilised annually in Namibia is decreasing, and this may be attributed to two factors: declining populations, on the one hand, but also the growing success of efforts to dissuade farmers from killing cheetah. Trophy hunting and export of live cheetah have been encouraged in Namibia as an attempt to curb farmers' attempts to eradicate cheetah from their land, and to change their attitude from one of "kill at all cost" to one where cheetah would be tolerated and accepted. Giving the cheetah economic value can provide some form of financial return for stock losses, as there is presently no system of livestock compensation in Namibia.

In Zimbabwe, despite longstanding national protection, it appears that increasing numbers of cheetah are being killed on farms in defense of livestock. In order to encourage farmers not to eradicate cheetah from their land, after prolonged consideration, the cheetah's protection status was downgraded to "controlled" in 1990, and a trophy hunting programme was initiated.

5. The proponent governments believe that the only solution to the problem of securing the conservation of viable free-roaming cheetah populations on farmland is to give the landowner the opportunity of receiving direct financial gain and compensation for losses incurred, thus encouraging him to tolerate, or even welcome, the presence of cheetah on his land. Trophy hunting is a viable option which is proving successful in Namibia. Export of live animals to legitimate international captive-breeding programmes is also an important element of this strategy.

6. The Keeper of the International Cheetah Studbook reports that the majority of the world's captive population originated in Namibia, and Namibia continues to be the major exporter of live wild animals. Efforts to breed cheetah in captivity have largely failed and, according to the International Cheetah Studbook, the sustainability of the world's captive population currently depends on continued importation.

7. The proponents submit for the consideration of the Conference of the Parties the attached draft Resolution to establish an Appendix I export quota system for cheetah, which would permit the export of cheetah hunting trophies and skins, subject to similar restrictions first agreed to for the leopard, Panthera pardus, in 1983, as currently set forth in Resolution Conf. 7.7. In addition, the quota would include the export of live wild-caught specimens to zoological institutions participating in internationally recognized efforts to propagate the species in captivity, in accordance with Article III of the Convention.

# DRAFT RESOLUTION OF THE CONFERENCE OF THE PARTIES

## Quotas for Trade in Specimens of Cheetah

RECALLING that Article VII of the Convention identifies instances in which trade in Appendix-I species may be permitted;

RECALLING that the cheetah Acinonyx jubatus is listed in CITES Appendix I, and is classified as Vulnerable by IUCN;

RECALLING also that the majority of the world's cheetah population is now found in southern Africa;

RECOGNIZING that the conservation of the species presents special problems, in that cheetahs do not fare well in protected areas due to interspecific competition and thus their survival can not be ensured by habitat protection alone;

RECOGNIZING that in a small number of southern African countries killing or export of specimens of cheetah may be sanctioned in defense of property and to enhance the survival of the species;

RECOGNIZING also that Namibia has permitted the capture and export of live specimens of cheetah as a component of a strategy to promote the conservation of the species on private lands;

RECOGNIZING further that captive-breeding programmes have had very little success, and that, according to the International Cheetah Studbook, the captive population currently depends on limited imports of live wild specimens;

RECALLING that the Conference of the Parties have approved since 1983 an Appendix-I export quota system for leopard Panthera pardus hunting trophies and skins (Resolutions Conf. 4.13, 5.13, 6.9 and 7.7);

THE CONFERENCE OF THE PARTIES TO THE CONVENTION

RECOMMENDS

that in reviewing applications for permits to import cheetah specimens, whether whole or nearly whole skins or live animals, in accordance with paragraph 3(a) of Article III of the Convention, the Scientific Authority of the State of import approve permits if it is satisfied that the specimens being considered are from one of the following States which may not export more of the said specimens in any one calendar year than the number shown under "quota" opposite the name of the State:

| State | Quota |
|---|---|
| Namibia | 150 |
| Zimbabwe | 50 |

that in reviewing applications for permits to import whole skins or nearly whole skins of Acinonyx jubatus, in terms of paragraph 3(c) of Article III of the Convention, the Management Authority of the State of import be satisfied that the said skins are not to be used for primarily commercial purposes if:

i) the skins are acquired by the owner in the country of export and are being imported as personal items that will not be sold in the country of import; and

ii) the owner imports no more than two skins in any calendar year if this is authorized by the legislation of the country of export;

that in reviewing applications for permits to import live specimens of Acinonyx jubatus, in terms of paragraph 3(c) of Article III of the Convention, the Management Authority of the State of import be satisfied that the said live specimens are not to be used for primarily commercial purposes if:

i) the importer or destination is a breeding facility recognized by the Management Authority as participating in an international captive-breeding programme aimed at the recovery of the species;

d) that the Management Authority of a State of import permit the import of cheetah skins in accordance with this Resolution only if the skins have a self-locking tag attached which indicates the State of export, the number of the specimen in relation to the annual quota and the calendar year to which the quota applies - for example NB 1/100 1992 indicating that Namibia is the State of export and that the specimen is the first specimen exported by Namibia out of its quota of 100 for 1992 - and if the same information as is on the tag is recorded on the export document;

e) that the Management Authority of a State of import permit the import of live cheetah specimens in accordance with this Resolution only if the animals are marked in a manner recognized by the Conference of the Parties and the international captive-breeding programme for the species (i.e. tattoo or microchip) which indicates the State of export, the number of the specimen in relation to the annual quota and the calendar year to which the quota applies - for example NB 2/100 1992 indicating that Namibia is the State of export and that the specimen is the second specimen exported by Namibia out of its quota of 100 for 1992 - and if the same information as is on the identifying mark is recorded on the export document;

f) that in the case of live specimens or skins of cheetah traded according to the terms of this Resolution, the words "has been granted" in paragraph 2(d) of Article III of the Convention be deemed to have been satisfied upon the written assurance of the Management Authority of the State of import that an import permit will be granted;

g) that each State that exports live specimens or skins of cheetah in terms of this Resolution reports the number of skins and live animals so exported annually to the Secretariat and that the Secretariat submit a report to each regular meeting of the Conference of the Parties; and

h) that the system adopted in this Resolution be reviewed at the ninth meeting of the Conference of the Parties.

## Appendix 4. Cheetah population dynamics model

*Description of the population dynamics model*

The cheetah population dynamics model, created for this document with the considerable assistance of K.P. Erb at the Etosha Ecological Institute, is a deterministic spreadsheet model using Microsoft Excel Vers. 5.0. It starts off with an initial population distribution with second year cubs, sub-adults, and adults of both sexes. The user inputs the initial demographics to make a population of 100. This population is multiplied by a user-defined variable to yield initial population size (e.g., a multiplier of 100 yields an initial population of 10,000 animals, including cubs).

Then births (first year cubs) are added. The number of adult females in the initial population is multiplied by a user-defined variable for the number of cubs produced per female per year.

Sex-age specific natural mortalities are then subtracted. The user defines the maximum permissible rate of natural mortality for each sex-age class. The rate used for each particular year is calibrated according to the percentage of each sex-age class harvested that year. In other words, when the number of adult male cheetahs removed by farmers that year is high, the number of adult male cheetahs dying natural deaths is low. The relationship between removals and natural mortality can be adjusted by the user.

Harvested animals are then subtracted (removals). The number of cheetahs removed each year from 1978-1995 was taken from MET permit office records (Table 6). The number of cheetahs removed annually between 1960-1977 was extrapolated from the anecdotal data reviewed in Chapter 2 Section 4.1. Table 4.1 shows the figures used . The sex-age composition of the removals varies within user-specified boundaries according to the population sex ratio. In other words, when there are more females than males in the population, the percentage of females in that year's removals approaches the maximum level specified by the user and the percentage of males declines toward the minimum. The percentage of males and females that are sub-adults vs. adults is a user-defined input.

The natural mortality and sex ratio-dependent removal functions are discussed in more detail below.

The number of cheetahs removed each year can be increased by a user-defined variable to account for under-reporting of removals to MET. If the user thinks just 50% of removals are reported, a factor of 2 will double the removal level.

Table 4.1. Inputs used for the number of cheetahs estimated to have been removed annually, 1960-1977

| Year | Estimated number of cheetahs removed |
|---|---|
| 1960 | 200 |
| 1961 | 200 |
| 1962 | 200 |
| 1963 | 250 |
| 1964 | 250 |
| 1965 | 300 |
| 1966 | 300 |
| 1967 | 350 |
| 1968 | 350 |
| 1969 | 400 |
| 1970 | 450 |
| 1971 | 500 |
| 1972 | 550 |
| 1973 | 550 |
| 1974 | 600 |
| 1975 | 650 |
| 1976 | 700 |
| 1977 | 700 |

After births have been added, and natural deaths and removals for that year subtracted, the remaining population is cycled over to the next year and the process run through again.

*Population parameters used to make the graphs in Part 2.5*

**Period modeled**

1960-1995

**Initial population structure**

Large cubs (2d year)
- Male: 20%
- Female: 20%

Sub-adults (2-3 years)
- Male: 10%
- Female: 10%

Adults
- Male: 20%
- Female: 20%

Although the sex ratio of the Serengeti cheetah population is approximately 2 adult females per male (Frame 1977: 78, Caro 1994: 399), the sex ratio of the starting population (1960) was set at 1:1. Since sex ratios are equal at birth in cheetahs, the adult disparity in the Serengeti population was put down to different sex-specific rates of dispersal and mortality (Frame 1977). Since the Namibian cheetah population is so large, dispersal-caused sex ratio disparity should not be so pronounced. Moreover, due to the male bias of removals (Chapter 2 Fig. 12) and the increase in removals beginning in the mid to late 1960s, the population's sex ratio soon changes to between 2-3 females per male as removals increase. A lower number of males or higher rates of male natural mortality were unrealistic given the high level of male removals, leading to rapid extinction of males. Unless the cheetah population is much larger than estimated, it appears that in the past heavy removal of males was largely compensatory for natural mortality. In other words, a male cheetah would probably be trapped before it died of old age or accident or disease.

The proportions of sub-adults and 2d year cubs were based on the rates of fecundity and natural mortality discussed below. 1st year cubs are added separately in the fecundity variable.

**Initial population size**

A variety of sizes was modeled, but the one finally selected was a population multiplier of 68, leading to a population of approximately 3,500 adult and sub-adult cheetahs in the early 1960s (6800 cheetah in total, including cubs).

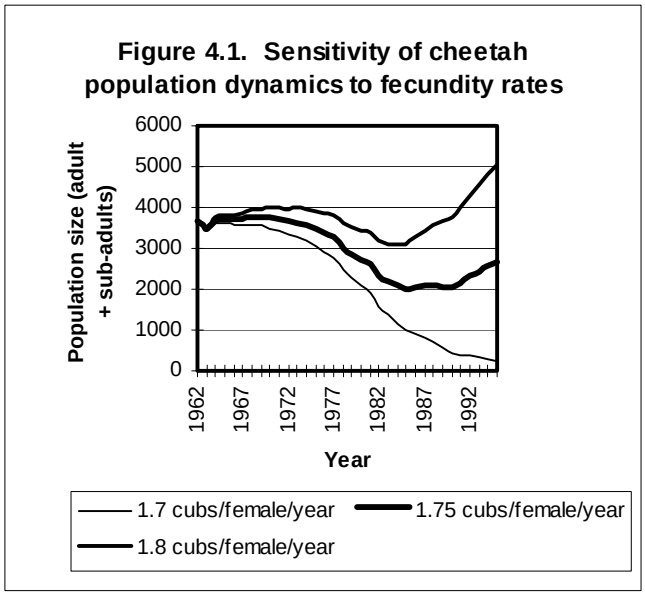
**Fecundity (cubs produced per adult female per year)**

Cheetahs can have up to eight cubs. They have the largest litters of any big cat, and produce more cubs than most small cats as well, leading Caro (1994: 325) to conclude that cheetahs have evolved to reproduce rapidly. Selection pressure for high fecundity has been stronger for the cheetah than for most other felids.

The average litter size of cheetahs in captivity is 3.4. The average litter size of wild cheetahs (avg. two weeks of age) in the Serengeti is 3.5. Data collected by CCF (Marker-Kraus et al. 1996: 59) and Africat (pers. comm.) suggest a litter size between 3.1-3.5. Previously, McVittie (1979) reported farmer-observed litter sizes at 4.2 for young cubs and 4 for large cubs. Marker-Kraus et al. (1996: 59) suggest that this discrepancy implies increased juvenile mortality caused by inbreeding among a smaller population of cheetahs reduced by high levels of removals. However, it is unlikely that inbreeding effects would be noticeable after only a decade, and moreover inbreeding effects are usually considered minimal in populations higher than 200 animals (CBSG 1996: 6). An alternative explanation is that cub survival rates were higher in a population declining under the pressure of high removals (which began in the late 1970s), and are lower now that removals have decreased and competition for resources increases as the population increases.

Caro (1994: 387) fixes the wild cheetah's interbirth interval (length of time between successive births) at 22.5, just about two years. Cubs become independent at the age of 1.5-2 years, and Namibian radio-collared females have been observed to give birth very soon after the dispersal of their previous litter, showing that they became pregnant while still with a litter of old cubs (Morsbach 1985, L. Marker-Kraus pers. comm.). Karen Laurenson et al. (1992) observed the same in the Serengeti.

An average of 3.5 cubs born every two years is equivalent to the production of 1.75 cubs per adult female per year. Increasing (2.0 cubs/female/yr) or decreasing (1.5 cubs/female/yr) this fecundity rate has a strong effect on cheetah population dynamics (Fig. 4.1).




**Natural mortality**

Maximum annual natural mortality rates were set as follows:

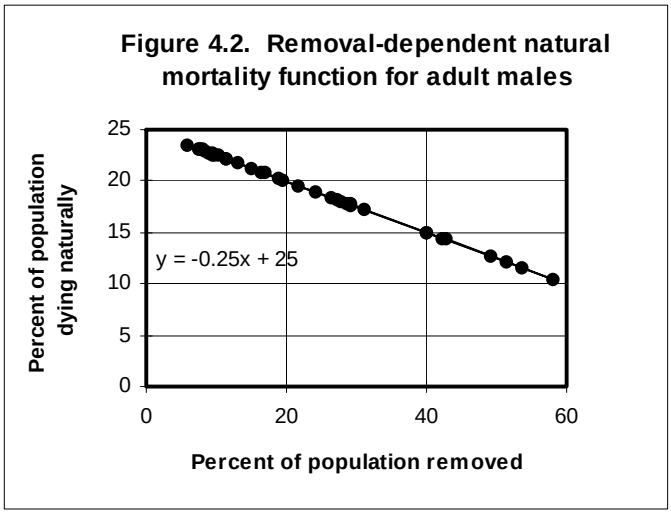
1st year cubs
- Male 50%
- Female 50%

2d year cubs
- Male 10%
- Female 10%

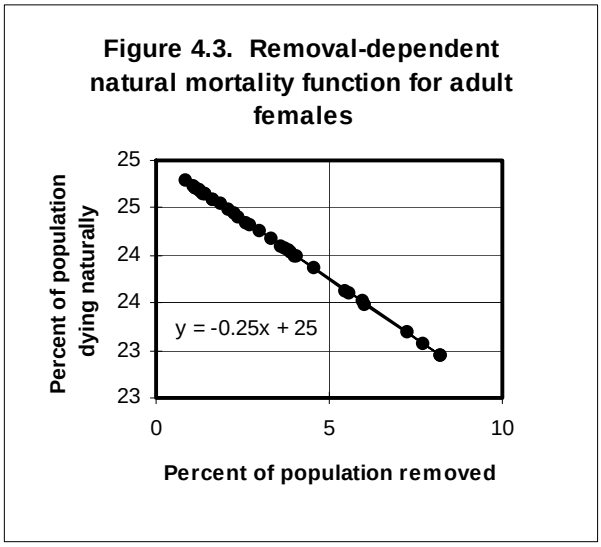
Sub-adults
- Male 20%
- Female 20%

Adults
- Male 25%
- Female 25%

Unfortunately there is no data available on sex-age specific rates of natural mortality in the Namibian cheetah population. As more animals are radio-collared and monitored by the NGOs, though, this sort of information should emerge in the future. None of the radio-collared cheetahs studied by Morsbach (1984-85) died of natural causes. All deaths were due to removals, lending further support to the assumption used in this model that high levels of removals are largely compensatory for natural mortality. A function was added to the model to incorporate this assumption. Natural mortality was reduced as the percentage of each sex-age class removed from the population increased. Figure 4.2. shows the function for adult males. Natural mortality is at its maximum (25%) when no adult males are removed. It declines to close to 10% when close to 60% of the population of adult males are removed in a year. A linear relationship was assumed in the absence of data. The points on the graph show the distribution of annual natural mortality between 1960-1995.

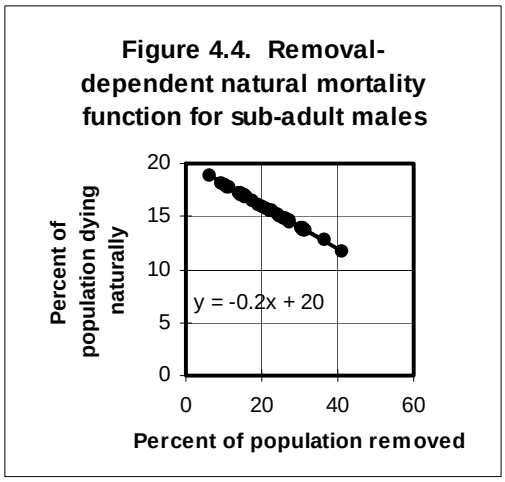



For adult females, which from the data are subject to a lower level of removals (Figure 12), the distribution of annual natural mortality looks quite different, being close to the maximum in most years (Fig. 4.3).




A rate of 50% natural mortality for young cubs was chosen because it was assumed that the Namibian farmland rate would be lower than the rate of approximately 80% found in the Serengeti cheetah population, where cub deaths were mostly caused by lions or hyenas (Laurenson 1994, 1995). It may be unnecessarily high: Morsbach (1986) suspected that natural mortality of cubs was low, finding that only two cubs out of four litters had died of natural causes (drowning in a reservoir and a broken leg) over his three year study period. A much lower rate was selected for second year cubs, which are better able to protect themselves from predation and are in the process of learning to hunt for themselves. A rate of 20% was chosen for sub-adults. While Caro (1994) found that 50% of sub-adult and young adult males in the Serengeti died in intraspecific fights, the Namibian rate was set much lower because it is likely that removals of sub-adults are rather high. They are clumsy hunters and thus more likely to prey on livestock, occasioning farmer retaliation, and as they are just coming into breeding age they are likely to frequent the play trees where farmers set their traps.

Cub and sub-adult removal-dependent natural mortality distributions are also shown (Figures 4.4 and 4.5). The cub removal function is not smooth because first and second year cubs were combined for this graph, and the mortality rates differ between the two.



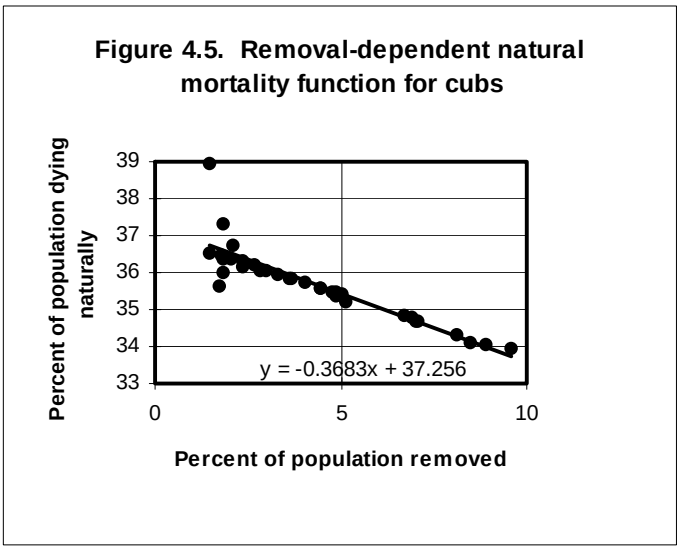
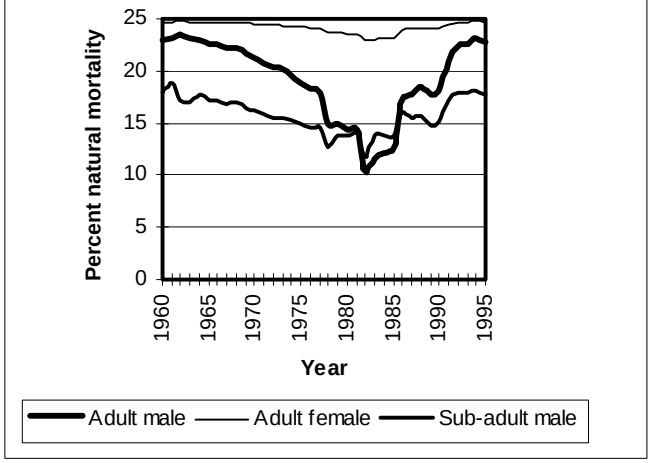



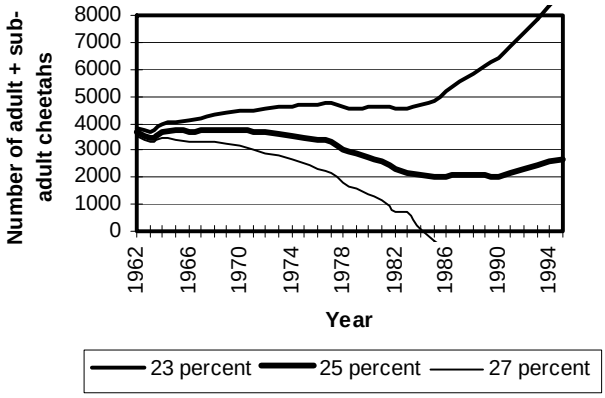

Figure 4.6 compares the changes in natural mortality rates over time for adult and sub-adult males and adult females.

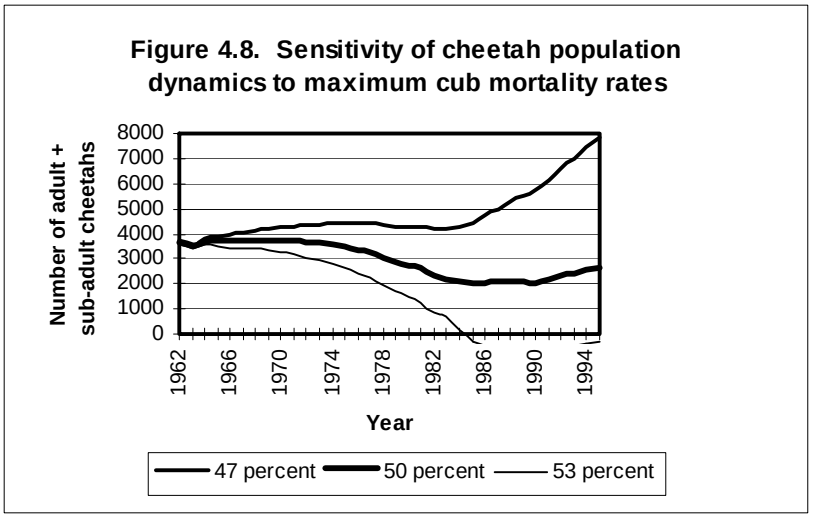
**Figure 4.6. Comparative fluctuations in natural mortality rates**




The sensitivity of the model to changes in maximum adult and first year cub mortality rates is shown in Figures 4.7 and 4.8.

**Figure 4.7. Sensitivity of cheetah population dynamics to maximum adult natural mortality rates**



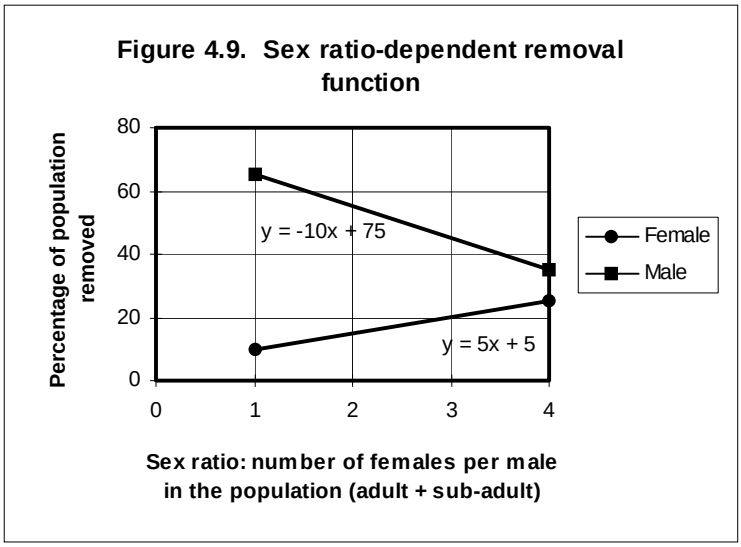



**Sex-age composition of removals**

As discussed previously, the MET Permit Office has not made sex or age a reporting requirement when issuing permits for cheetah removals, so there is no data on the actual sex-age composition of the permitted removals. A function to make sex-age composition of removals dependent on the proportion of each sex-age class in the population was incorporated into the model. The cheetah NGO's sex-age data set (Figure 12) was used to set the boundaries of the function.

The following assumptions were made. 1) Removals were heavily male biased in the 1960s to early 1970s, based on three game dealer's reports who estimated that removals were 90%, 75% and 66% male, respectively (Myers 1975: 42). 2) Removals should always be largely male-biased because traps are set at play trees, and males will visit the trees more than females as they search for available mates. 3) The percentage of removals which are males will decrease as the population's sex structure becomes female-biased since so many males are being taken out. The minimum adult and sub-adult male removal rate and the maximum rates for the other sex-age classes were based on Figure 12.

The sex ratio-dependent removal function is illustrated in Figure 4.9. When the number of adult+sub-adult males is equal to the number of adult+sub-adult females in the population, there is a strong male bias in removals (75%). When the sex ratio declines to four females per male, the maximum percentage of adult+sub-adult females is removed (25% of removals) and the minimum percentage of males (35%). Intermediate sex ratios yield intermediate removal rate values.



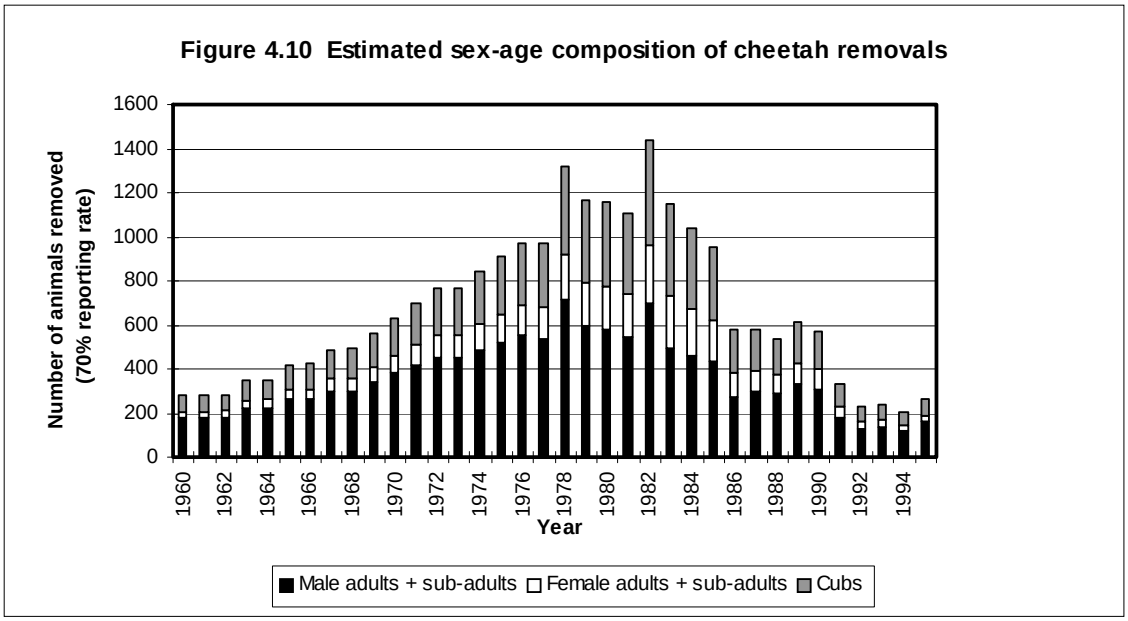

Of the proportion of adult+sub-adult males and females removed, the proportion of sub-adults was set at 40% based on the CCF and Africat data (slightly higher than that shown in Figure 12 because it appears that Africat may have underestimated sub-adult females). Because of the difficulty of distinguishing between adults and sub-adults, a user-defined sub-adult removal rate factor was incorporated into the model.

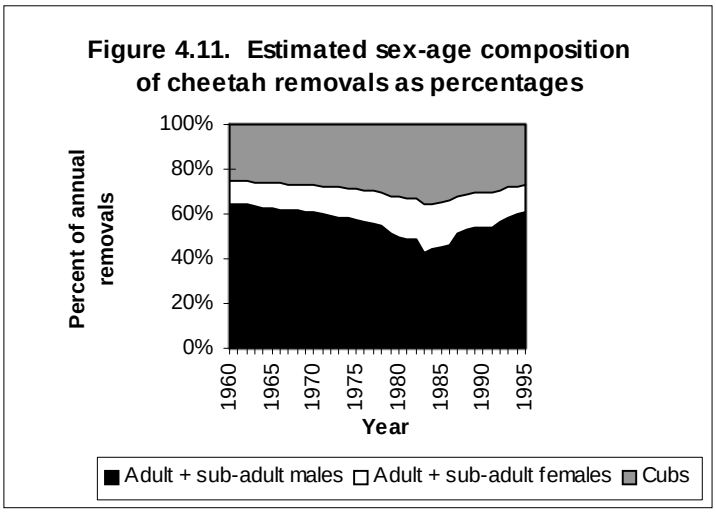
This function results in an estimated sex-age composition of cheetah removals from 1960-1995. This is shown in Table 4.2 and Figures 4.10-11. Figure 4.10 shows the data as the numbers of cheetahs removed. Figure 4.11 shows the data as the proportion of each sex-age within the total number removed. The model predicts that male removals are at their lowest, and female and cub removals at their highest, in the early 1980s when removals were at their highest.

Table 4.2. Sex-age composition of cheetah removals predicted by the population's sex ratio

| Year | M cubs | M subad | M adult | F cubs | F subad | F adults | Total |
|---|---|---|---|---|---|---|---|
| 1960 | 25 | 51 | 77 | 25 | 8 | 12 | 199 |
| 1961 | 25 | 51 | 77 | 25 | 8 | 12 | 199 |
| 1962 | 26 | 52 | 77 | 26 | 9 | 13 | 202 |
| 1963 | 32 | 63 | 95 | 32 | 11 | 16 | 249 |
| 1964 | 33 | 63 | 95 | 33 | 11 | 17 | 252 |
| 1965 | 39 | 75 | 112 | 39 | 13 | 20 | 298 |
| 1966 | 40 | 75 | 112 | 40 | 14 | 21 | 301 |
| 1967 | 46 | 86 | 129 | 46 | 16 | 24 | 348 |
| 1968 | 47 | 86 | 129 | 47 | 17 | 25 | 351 |
| 1969 | 54 | 98 | 147 | 54 | 19 | 29 | 401 |
| 1970 | 61 | 109 | 164 | 61 | 22 | 33 | 450 |
| 1971 | 69 | 120 | 180 | 69 | 25 | 37 | 500 |
| 1972 | 76 | 130 | 195 | 76 | 28 | 42 | 547 |
| 1973 | 77 | 129 | 193 | 77 | 29 | 44 | 550 |
| 1974 | 85 | 139 | 209 | 85 | 32 | 48 | 599 |
| 1975 | 93 | 149 | 223 | 93 | 36 | 54 | 648 |
| 1976 | 102 | 157 | 235 | 102 | 40 | 60 | 696 |
| 1977 | 104 | 154 | 231 | 104 | 41 | 62 | 696 |
| 1978 | 142 | 205 | 307 | 142 | 57 | 86 | 939 |
| 1979 | 133 | 170 | 254 | 133 | 57 | 85 | 831 |
| 1980 | 134 | 164 | 246 | 134 | 58 | 87 | 824 |
| 1981 | 130 | 155 | 232 | 130 | 57 | 85 | 789 |
| 1982 | 170 | 200 | 300 | 170 | 74 | 111 | 1025 |
| 1983 | 148 | 140 | 210 | 148 | 69 | 104 | 819 |
| 1984 | 131 | 132 | 198 | 131 | 60 | 90 | 743 |
| 1985 | 118 | 124 | 186 | 118 | 54 | 80 | 680 |
| 1986 | 71 | 77 | 115 | 71 | 32 | 48 | 413 |
| 1987 | 65 | 84 | 126 | 65 | 28 | 42 | 410 |
| 1988 | 60 | 82 | 122 | 60 | 25 | 37 | 384 |
| 1989 | 67 | 95 | 142 | 67 | 27 | 41 | 438 |
| 1990 | 62 | 88 | 132 | 62 | 25 | 38 | 408 |
| 1991 | 36 | 52 | 77 | 36 | 15 | 22 | 238 |
| 1992 | 24 | 37 | 55 | 24 | 9 | 14 | 163 |
| 1993 | 24 | 39 | 59 | 24 | 9 | 13 | 168 |
| 1994 | 20 | 35 | 52 | 20 | 7 | 11 | 145 |
| 1995 | 25 | 45 | 68 | 25 | 9 | 14 | 186 |

* Totals do not always add to the number shown in Chapter 2 Table 7 because of the rounding off of percentages

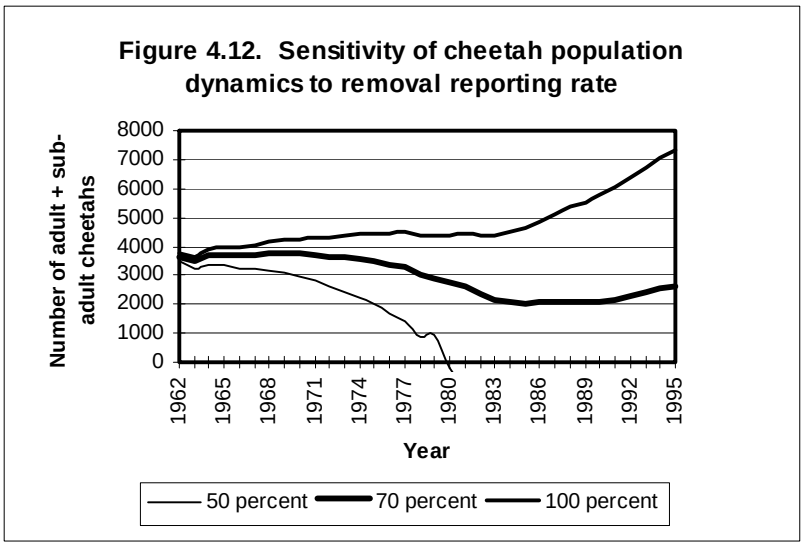



The sex-age composition of removals in the 1990s is not in proportion to the sex-age composition of the Africat- and CCF-handled cheetahs in the same period. As stated previously, it is thought that this data may be artificially female biased, as farmers may be more likely to contact the NGOs when faced with the prospect of killing a trapped female with cubs, as opposed to adult or sub-adult males. With this model, it was virtually impossible to achieve a scenario where the male population is still very low in the 1990s, resulting in a lesser degree of male removal. The fecundity rate must be set low (or cub mortality set high) and male natural mortality strongly increased, otherwise males tend to recover when removals decline.

**Removal rate factor**

As discussed previously, it is widely believed that cheetah removals reported to MET are under-reported to some degree. The model incorporates a factor to compensate for under-reporting. An input to increase removals by 1.4 (70% reporting rate) was selected for this exercise based on the 1982 data referred to previously in this chapter in the section on cheetah removals. The sensitivity of the model to the removal rate factor is illustrated in Figure 4.12.




*Limitations of the models*

A model is only as good as the data that is put into it. Except for the removals, much of the data inputs used in this document are best described as educated guesses. This is not necessarily a bad thing: modelers often encourage biologists to make "educated, insightful guesses" about the parameters their models require (Harris and Allendorf 1989, CBSG 1996). Models can help to highlight aspects of population biology in need of further research. They can also help to indicate what level of priority such research should be assigned. They help managers to grasp more clearly what is happening with the populations under their charge, and they help define probabilities. For example, the cheetah population dynamics model indicates that the cheetah population should recover quickly when removal levels drop.

However, models can be wrong. Not only could the input parameters used in these simulations be way off, but the model itself lacks a number of complex biological variables. There is no allowance for density-dependent reproduction. There is no allowance for random variation in any of the parameters. The model appears to be too sensitive to small changes in input parameters.

Therefore, the graphs in Chapter 2 should not be taken as a representation of what did happen to the cheetah population from 1960-1995, but what could have happened.

It is hoped that these models will be useful for managers in the future. Annual removals can continue to be put in, and the population parameters can be refined as further data is collected by the NGOs and MET. Disk copies of the models can be obtained from the MET Directorate of Specialist Support Services in Windhoek.

Namibia Professional Hunting Association
Namibia Berufsjagdverband
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NAPHA

# COMPACT FOR THE MANAGEMENT OF CHEETAH IN NAMIBIA

This compact is entered into by the undersigned persons and organizations (hereinafter "Landowners"). Others may become a party to this agreement by signing Appendix "A".

Whereas the Landowners have cheetah on their property and feel that giving the species a "game animal" status will enhance its survival,

Whereas cheetah are predators on livestock, valued wildlife and otherwise may constitute a danger and a nuisance to persons and property,

Wheras the Landowners desire to cooperate to assure the survival of the cheetah within Namibia,

Whereas the Landowners agree that cheetah represent a valuable natural resource capable of renewing itself indefinitely if properly managed and conserved and disire to treat it as a valuable game animal rather than a valueless vermint and nuisance,

Whereas they desire to develop and implement a cheetah conservation action plan on their land, the object of which is to enhance the long term survival of the cheetah,

Whereas the CITES parties have recognized that a limited trophy hunting harvest of cheetah is not detrimental to the cheetah, will improve the over-killing of the species, and will provide incentives to maintain the habitats required by cheetah and its prey species,

Whereas the Landowners have tracts of property that can be beneficial to the conservation of cheetah and other species of wildlife upon which they are dependent as food,

Whereas the propagation potential of the cheetah cannot be achieved without the cooperation of the private landowners outside the protected areas,

Whereas the absence of cheetah on private land is dependent upon the tolerance of the landholders particularly because the species consumes other valuable animals which are also dependent upon the landholder,

Whereas the parties to this compact desire to maintain a healthy, stable cheetah population for sustainable use and are limited in the ability to do so without financial renumeration from tourist safari hunting,

The parties, therefore, resolve to enter into the following agreement through responsible and carefully monitored safari hunting. This compact is intended to enhance cheetah welfare and survival and consequently enable cheetah safari hunting which is dependent on that survival and enhancement.

The Landowners hereby agree as follows:

1. The undersigned bind themselves to act to the benefit of cheetah on properties under their control to enhance the welfare and survival of the cheetah population.
2. The undersigned agree to manage activities on these properties in cooperation with the Namibian Government's conservation plan for cheetah, including cooperation in the capture of animals for breeding and reintroduction programs and cooperation in inspections and licensing.
3. The undersigned further agree to take reasonable steps to control the indiscriminate killing of cheetah on their properties and to educate their employees, tenants and others living in the vicinity of their properties on the importance of the conservation of the cheetah.
4. The undersigned agree that those properties currently occupied by cheetah shall be managed so as to remain in appropriate condition as cheetah habitat for as long as the Landowners are parties to this compact. This same provision shall apply to those portions of Landowners' properties which in the future may be required as cheetah habitat, pursuant the population goals agreed upon by members of this compact.
5. Hunting shall be within the limits set by the Namibian Government and the undersigned shall cooperate with the Government for cheetah conservation.
6. The undersigned shall, in consultation with the Namibian Government, assure that cheetah trophies taken on their properties by hunters are properly documented and tagged prior to being removed from the properties, pursuant to the documentation requirements set forth by CITES and the Government of Namibia.
7. The undersigned agree to a minimum levy of N$ 1 000,- above the trophy fee for the taking of a cheetah on their properties. This amount may be modified from time to time by agreement of the undersigned parties of this agreement.
8. The conservation fee shall be collected in cooperation with the Namibia Professional Hunting Association (NAPHA) and kept and administered by the Namibia Nature Foundation (NNF) and shall be used exclusively to enhance conservation of cheetah population in Namibia.
9. The undersigned shall, in cooperation with NAPHA and the Ministry of Environment and Tourism, select a committee on review any proposals from recognized, bona fide organizations or individuals for funding to conduct work on cheetah that will enhance the survival and welfare of cheetah in Namibia.
10. This review committee shall, through NNF, maintain a list of properties on which cheetah are managed pursuant to this compact, and shall supply that list, including any future amendments and annexes thereto, to the Government of the United States and any other Management Authority from any country requesting such information for trophy import purposes.
11. The undersigned shall conduct an annual survey of cheetah on properties under his control and agrees to maintain that population to enhance the survival of the species in Namibia.

**I hereby agree to abide by all the conditions and agreements in this compact, that the information supplied is true and correct and that I agree to maintain the cheetah population on the properties under my control to enhance the survival of cheetah in Namibia.**

SIGNATURE _____ DATE 20. 9. 94

PRINTED NAME _____

POSTAL ADDRESS AND TEL. NUMBER _____

_____

NAME OF ALL FARMS (WITH NUMBER, SIZE AND DISTRICT) OF ALL FARMS UNDER MY CONTROL:

| FARM NAME | NUMBER | SIZE | DISTRICT |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |