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Abstract: The status of the leopard in Sub-Saharan Africa is reviewed and evaluated. The results of a study of the leopard's status in a dozen major countries of Sub-Saharan Africa are presented. Population estimates of the leopard are made. The leopard is not (nor was) endangered or threatened in the majority of Sub-Saharan Africa. It may easily number one million and in most of its range has a satisfactory and promising status. Recommendations are made regarding utilization of the leopard as a valuable resource for creating incentives to conserve wildlife in developing countries. It is in the interest of African wildlife generally and the leopard importation of legally acquired trophies, thereby benefiting conservation efforts in Africa. Emphasis need be placed on a system of regulating a potentially beneficial fur-trade.

Notes: Appendices in a separate file (ID 2855)

THE STATUS AND CONSERVATION OF THE LEOPARD IN SUB-SAHARAN AFRICA

FINAL REPORT

by

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Dedication

To Jose Ortega Y. Gasset

for

providing us with the way

C O N T E N T S

Page

Summary: The status of the leopard in Sub-Saharan Africa is reviewed and evaluated. The results of a study of the leopard's status in a dozen major counties of Sub-Saharan Africa are presented. Population estimates of the leopard are made. The leopard is not (nor was) endangered or threatened in the majority of Sub-Saharan Africa. It may easily number one million and in most of its range has a satisfactory and promising status.

Recommendations are made regarding utilization of the leopard as a valuable resource for creating incentives to conserve wildlife in developing countries. It is in the interest of African wildlife generally and the leopard for the U.S. and international bodies to revise regulation so as to permit importation of legally acquired trophies, thereby benefitting conservation efforts in Africa. Emphasis need be placed on a system of regulating a potentially beneficial fur-trade.

PREFACE

Upon reading Myers' report (1976a) I concluded that to consider the leopard as rare, vulnerable or endangered would be as absurd as classifying the lion or wildebeeste as extinct. I was ashamed for having so readily adopted and further contributed to the now widespread belief that the leopard is endangered in Africa. Such a belief was and is scientifically unfounded, and by all present evidence, entirely false. Such action by myself and others can only foster division between scientific conservation and the concerned citizens and societies whose responsiblity it is to manage their wildlife resources. Scientifically based conservation has lost credibility; it cannot withstand succumbing to thoughtless emotionalism and its repercussions if it is to play the necessary role it should.

It would be comforting to believe that the "conserve now, study later" philosophy taken towards the leopard was justified as the time has shown to be for the tiger. In retrospect, this philosophy towards the leopard may have reduced the trend of illicit poaching, although it is doubtful that poaching was ever or is now a limiting mortality factor. Instead, it appears to me that the only gain from all the well-intended efforts has been an increase in funds for conservation groups to further disseminate a falsehood throughout North America, Europe and much of Africa. What has resulted is a volatile conviction on the part of concerned individuals that sympathy and perhaps small donations, are sufficient to conserve wildlife. They are not. There are no easy formulas save that a given species requires suitable habitat to survive. For a particular species this need can be very difficult to provide because of a maze of impinging human factors in competition for land. It is the total compromise of these forces which determines the fate at any moment of a species or community. The art of wildlife conservation is a delicate practice of recognizing existing and potential economic values of wildlife for man. In essence, for the vast majority of species on earth, their status and future depends on real values to humans. With so many human pressures against the land, that is human interests which conflict with wilderness and wildlife, sufficient interests in wilderness and wildlife must be brought to bear or opposing interests win out.

Except for tourism in national parks in very few countries, there are no competitive human interests at present that sufficiently favor the leopard in Africa except for trophy hunting and a legitimate fur trade. As most larger mammals face poorer status in the future from alteration and degradation of the land by exploding human populations, this interest must be reckoned as valid and important to the leopard and, as a top-level predator in ecosystems, to entire wildlife communities as well. While I believe the following report adequately supports this thesis on biological and economic (conservation) grounds, we live in a society convinced that sport hunting is unethical because it threatens wildlife, a belief without foundation and, equally wrong, that the leopard is in dire peril of extinction. As a consequence of alarmist reaction to the spotted-cat fur trade, however sound regarding the tiger and possibly some other species, it may now be impossible to implement positive and effective conservation policy for the leopard. However much national wildlife authorities

The denial of self in favor of ideas and intellect is impossible; it is pure hypocrisy. Without self there could not be life. Without self-interest no problem can be solved. The creation of better citizens is not through the false idea of self-denial, but rather through awareness of the breadth of self-interest. Idealism culminates in a pseudo-morality focused on self-denial, when in fact a philosophy of co-existance (or interdependence) breathes reciprocity (love) into man. As the problems facing the individual today also face all of mankind--for the first time in history--and these problems are grave, it is time to abandon idealism or become extinct.

When a species is important in any way to man then the threat of its loss becomes a real problem. In order for those who see the possibility of costly loss to solve the problem--prevent the loss--they must be realistic in recruiting the necessary assistance from others. For another man to help, in any respect, the problem must clearly become a problem for him, too. Telling him that a (idea of the) species loss is too much to take--that it would be wrong because my ideas of mortality include extinction of a species as bad (and he ought to feel the same!)--can hardly suffice. Idealism has produced terrible problems from such "logic".

There can be little doubt that many more species would have become extinct in North America had it not been for the interest of sportsmen in hunting. They did not help save countless species from possible extinction because of high moral values, but because the loss of the species was a real problem for them as individuals. Leopold's (1948) elegant statement has gone far towards developing a true problematics of conservation because he saw that man *needs* the land and the biotic community. He did not speak from a pious morality but from clear intelligence. Leopold showed us that we must care for the land because it is in our interest to do so. This is not idealism, it is the voice of reality (co-existance), telling it like it is. There is a growing land ethic now *only* because we are more aware through ecology that the condition of the land is a real problem for each one of us.

For endangered species to cease being endangered, sufficient awareness of the possible loss and its consequences has to be created. If we let the "moral" idea go rampant with the force of emotionalism, we shall not be heard. "They" will not listen. The problem must clearly be a real problem or it will not be solved. Whenever we confuse the issue with blanket idealism, only more problems emerge. We in the West have been crying "wolf" for too long. In our love affair with idealism we have forgotten that the word morality derives from the word me or mine. There is no morality beyond self-interest. And, there is no such thing as altruism, only varying degrees of reciprocity. The common argument that it is wrong for man to control the destiny of other creatures is the underlying error of idealistic perception. The *idea* that man should not rule the world is contrary to the fact that he does. For there to be a legitimate conservation, reality must be clearly perceived. Wishing the world were different than it is while ignoring what it is can only compound our ability to solve problems and progress wisely.

The leopard will remain on earth as long as enough men have interest in it surviving. For anyone who wants to see the leopard survive--that is anyone for whom the question is a real problem--there is one and only one solution with maximal possibility. It is to focus all interests to bear on the problem. There are hunters who want there to be leopards so they can enjoy hunting them. There are furriers who want enough leopards to supply them with skins. There are photographers, writers, tourists and bureaucrats who want leopards to be seen. There are idealists who want the leopard around, unmolested or not on someone's back. There are scientists who consider the leopard valuable purely as a source of knowledge. There are farmers and wildlife biologists who value the leopard as a controller of other species which can create problems if unchecked by predation. There are many who want to sell and wear leopard artifacts, and trappers and poachers that want to capture leopards. There are ranchers who value leopards because other men pay them to hunt leopards on their land. There are other groups linked to these.

Obviously we are up to the millions of individuals in whose self-interest is the leopard. There are few species about which so much interest exists. There could hardly be more promise of unity and the geometric advantage of co-operation. The fact is, however, that division prevails; these various self-interest groups are not aligned. United--certainly not uniform!--these groups with common interest could *all* gain mutually and the leopard would come out on top. The opposing interest groups and their degree of self-interest against the leopard would be but a trifle to overcome were the favorable interests to co-operate. They do not, and why not? It is possible to align all the interests favoring the leopard except one--the idealist. It is a fact that the idealistic interest in the leopard actually prohibits conservation and assists the opponents of the leopard, i.e. the idealist is defeating himself.

Thus, for those who the survival of the leopard is a matter of self-interest--a real problem--their enemy is the very group that has caused the leopard to be classified as endangered. The idealists are vehemently determined to keep it there no matter what. There is little chance that they will see how counter-productive their righteousness is and therefore we can only oppose them while unifying our legitimate ranks. This is a sorry and shameful state of affairs, the full implications of which are frightening.

What are the ideas adhered to by those who say they want the leopard but also want it unutilized by other interest groups. Many say that those who hunt do so only to kill, the underlying belief being that it is somehow wrong--immoral--to kill for enjoyment but not for necessity. It is alright to kill fish or flies, or millions or organism by building a new house, or to eat plants that are alive. The defense is that these are necessary. But to the purely ideal mind which supposedly denies self but upholds its moral ideas, none of this killing would be necessary. Suicide is an option to living--except that would be killing! Are highways necessary? The billions of animal's lives destroyed by the construction of opera houses, universities, libraries and stadiudms-are those necessary?

"If you don't eat it, I can't see killing it", one of the most common locutions in the West regarding sport-hunting. Though adapted into the idealist's arsenal this value is, of course, a product of natural selection favoring prudence in the predator. But let us free it from the emotive bands of phylogeny and deal with it at the intellectual plane. Ecologically the best way of nurturing many wildlife communities where it is impossible for larger predators to survive is to promote selective killing and leaving the prey where it falls to be recycled. "Shoot 'em and leave 'em lay" as one colleague said to arouse budding wildlife biologists out of their narrow selves. For the idealist, the most despised form of sport hunting--trophy hunting--is in fact the most favorable from purely intellectual stance.

No matter, "They just kill those poor creatures to bolster their egos!" What happens in the world becomes less significant to the idealist than why, meaning here a personal motive, something happens. This example perfectly exemplifies the idealist's inability to understand and solve problems, and how he expects the world to conform with his view. When the possibilities for human experience, enjoyment and expression are outlawed because they injur my *idea* about what is an acceptable motive behind conduct not influencing my personal development (egoism), the hope for human life will be extinct. Although associated with the Fifth Avenue "intellectual" out to save the world, this is not liberalism. It is total tyranny, the obstruction of individual freedom. It is idealism as "morality".

It does not matter that sport-hunting, which is killing for enjoyment and re-creation, has paid for 95% of all the money spent in the U.S. towards the conservation of *all* wildlife. The idealist does not care that conservation takes money and this requires self-interest; he only knows that the idea of killing animals to help animals does not make sense to him. He does not want to see *what is*, only what, in his mind, *ought to be*. Fine if he can pay the bills, except what about the freedom of individuals to hunt when that activity does not infringe on the rights of others--in other words, it does not limit the number of possibilities for human experience and benefit? Reply: "Unnecessary killing"--the *idea* of sport-hunting is repugnant to him, *so* no one should do it. Our idealist lives in his imagination, the limit of his world and the world he insists we must share.

No, the idealist who says he is for the leopard cannot help us as long as he confuses his ideas of what ought to be (but is not) with what is right now. Right now and throughout all of history it has been self-interest, albeit often in others and the world at large, but self-interest nonetheless, that solved problems. On either his pseudo-intellectual plane or on truly intellectual grounds, his arguments are unreasonable. We must struggle against him for we can not believe the "other" who is not authentic, not legitimate. He still wears leather shoes when he could go barefoot. If this observation should lead him to cease the killing of cattle then they would overrun the range and starve to death "needlessly". The effect on wildlife would be catastrophic. If true to his ideas,

countless cultures would take up another way of life than killing animals and lions would eat soybeans (if that were a possible alternative and it might be). Wild dogs would be guarded so as to prohibit excessive killing of prey, and so on. However, open season on hunters has already been advocated. I could go on.

For our interest, the idealist opposes hunter interest even though it is a proven way to conserve wildlife. It is not sustained use that interests him. He demands no use with a sustained condition. Presently this idea is only an idea. He would exclude great economic forces capable of solving problems of wildlife conservation and content himself with the consequences, however dismal. If a legitimate fur-trade could ensure the leopard's status, the idealist would oppose it because it is "morally" wrong for women to wear leopard coats. The idealist would, I believe, rather see the leopard become extinct than live with the idea of trapping for skins. He needs so many things, not the least of which is pride and recognition (egotism) for the prevention of "needless killing". He finds it "morally" and "intellectually" impossible to see that an interest in using a species could possibly benefit that species and thereby serve his own interest.

For leadership in solving the present problem we cannot rely on the large conservation organizations in the West, be they private or governmental because they are mostly influenced by the great masses of idealists. The group among all the authentic interest groups in favor of the leopard who can take the lead in solving the problem is the hunter-conservationists. Because hunters enjoy hunting so much they have a strong interest in the future and well-being of their prey. There is no greater interest in wildlife than in those who *love* to hunt it. This interest is especially strong regarding the welfare of prey when the "predator" hunts for sport, which is in fact a form of play. The greatest sustaining interest per capita and the most powerful collective force favoring African wildlife is among the hunters who venture to Africa for sport. The extent of this interest, including the conservation money and interest abroad it creates, is related to the economic status of the individuals involved.

Two essential ingredients of sport-hunting favor the leopard and African wildlife: Self-interest of the hunter and economic strength of his society. Wherever there is wealth in the world, there are men in these societies who happily spend their money in the interest of African wildlife. At present, this interest centers in the U.S. Collectively the hunter interest in the leopard and other African wildlife is greatest in the U.S., where these men tend to be influential. And the U.S. is the world's most influential society. Unfortunately for wildlife conservation around the world the U.S. is also the center of blatent pseudo-intellectualism and pious morality. The idealists in America have rapidly squelched the important interests of hunters and other groups there and abroad that favor the leopard and its community, including man. It is the hunters who are now protesting and who must fight with the idealists over what both insist is the same objective: Saving the leopard.

Hopefully, the rest of us will encourage any utilization or non-utilization interests that will favor prospects for the leopard and other species*. I am glad that so many interested groups exist already. The task of wildlife management is to bring these interests together in such a way as to maximally benefit mankind. Wildlife management has its primitive and modern origin in the interest of hunters--first utilitarian, then sport. It seems appropriate then that hunters are in the forefront of solving the problem of the leopard's survival (just as falconers, including raptor biologists, have brought about public interest in preserving the peregrine).

At least the hunters go armed now with the information that the leopard is not endangered, that sport-hunting cannot endanger it, and, that, to any intelligent mind, hunting can be influential in conserving the leopard and its community. The hunters may win the battle although the greater war will continue to rage. Perhaps, and I am hoping now, the battle will be a turning point towards a true philosophy of conservation--and of living**.

* I clearly recognize that some species or populations should not be utilized in the strict sense. But even here, only self-interest is the saving force. Man needs the peregrine falcon for a number of selfish reasons, for example, because he enjoys watching it (a form of utilization), because it can be used as a means of study to monitor the effects of pollution of the (man's) environment and so on. Without these non-idealistic motives, it is not improbable that the U.S. peregrine would already be extinct or destined so.

** The reader who wishes to understand the fundamental questions raised in this essay should refer to the works of Ortega Y. Gasset, 1969.

INTRODUCTION

The status survey of cheetah and leopard by Norman Myers was officially announced at the First International Symposium on the Ecology, Behavior and Conservation of the World's Cats, 15-17 March 1971 (Eaton, 1973). In that conference Norman Myers presented his preliminary results and opinions regarding the effect of poaching for hides on the leopard and other spotted felids of Africa and Latin America (Myers, 1973a). His persuasive presentation and figures pertaining to harvest levels combined with the opinions of some biologists and game authorities from several African countries led to a resolution from all scientists and participants to the U.S. Department of Interior requesting a ban on importation of spotted cat hides into the U.S. This marked the beginning of much heated debate, many popular and semi-popular articles, expensive advertising campaigns, and so on, which eventually aroused public opinion to the point of the U.S. adding the leopard and several other spotted felids to the U.S. list of foreign endangered species. In effect, Myers' call for a "conserve now, study later" policy regarding the leopard, cheetah, jaguar and so on, was instituted, first by the U.S. and later by some European nations and the International Convention.

The general opinion of felid specialists and international conservation groups such as the World Wildlife Fund and the I.U.C.N. was that poaching for leopard skins had reached serious proportions, enough to be endangering the leopard stocks in Africa, possibly in Asia as well. At the time there had been few biological field investigations pertaining to ecology or conservation biology of the leopard save a limited investigation in Ceylon (Muckenhirn and Eisenberg, 1973). In fact there had been so little work conducted on larger felids that there was no scientific framework in which to make even approximate predictions about population dynamics and conservation of the leopard. Generally, we were ignorant of large felid biology and, thusly, equally ignorant of conservation biology. But that has changed in the past five years. During and since Myers' (1976a) investigation of the status of the leopard in Africa and the activities and possible effects of the fur trade and other factors related to status, a range of scientific studies have been conducted on the leopard. These have included several, intensive studies of ecology in South Africa, Rhodesia, Tanzania, Kenya and Zambia, plus studies of reproduction and behavior important to assessing population dynamics and productivity. These and a relatively great number of further field and captive investigations of other larger felids, mostly congenitors of the leopard, have led to scientific-theoretical guidelines about the ecology, social organization, population dynamics and so on of larger felids (e.g., Eaton, 1976a; 1976b). Because of the accumulation of considerable data on the leopard and other polygynous, fundamentally asocial larger felids, we are in a far better position now to evaluate the leopard's status and conservation.

The leopard's ecology supports the assessment that the leopard is a great generalist and amazingly adaptable to a range of habitats, prey and human disturbances. Next to the coyote, the leopard is probably the most adaptable larger carnivore in the world. As such, I believe we are wise to shift our emphasis from how poorly the leopard may be adjusting to man's world to how man might wisely use the leopard to further the status of many, less adaptable species, and also to develop a conservation ethic in developing countries of Africa.

The stance taken by the vast majority of felid specialists as well as serious international conservation groups such as the I.U.C.N. has been that economic incentives that are controllable must not be discouraged or else the wild felids will suffer from a range of stresses on the land by expanding human populations and needs. It is recognized by these same groups that blatent emotionalism against use of wildlife can be as great a danger to the health of feral wildlife populations as overexploitation. With this in mind, I have endeavored from the outset in 1971, when international efforts to conserve the leopard became substantial, to encourage legitimate, controllable offtakes from populations with a satisfactory status so as to create economic incentives conducive to the perpetuation of the leopard, its habitat and the wildlife communities on which it depends. It was neither my nor Myers', nor I believe any serious conservationist's intent in the beginning to curtail legitimate offtake of leopards, but rather to reduce illicit poaching for hides long enough to investigate the status of the leopard and the effects of poaching on its status. Nevertheless, the only other economically major form of harvest, trophy hunting, which has never been indicated as illegitimate, uncontrollable or as possibly having a negative effect on leopard population trends, was discouraged by the ensuing regulations adopted by the U.S. and the International Convention. From the outset I was against this and tried in vain to prevent it (Eaton, 1972; 1976c).

Many members of hunter-conservation groups told me that they had stopped hunting in Africa because they could not legally import their trophy into the U.S., although they could still hunt leopards legally in several African nations. For reasons set out above this troubled me immensely, as it was clear from a range of then current and recent studies that some of these countries surely had satisfactory populations of leopards. The blanket regulations against importation of leopards into the U.S. may have resulted in a decline of legitimate economy favorable to the leopard and other wildlife in Africa. In essence, then, it appeared to me that a legitimate, controllable, biologically inconsequential but conservationally important utilization of wildlife resources was being discouraged by legalistic attempts to discourage poaching and the illicit skin trade.

In July 1976, I was approached by Safari Club International, an international group of hunter-conservationists, who, like the similar Mzuri Safari Foundation and Game Conservation International, have donated hundreds of thousands of dollars to conservation projects including spotted cats and the endangered Asiatic lion (see Eaton, 1973). They asked me to investigate the status of the leopard in Africa and evaluate the role of trophy hunting in the conservation of the leopard.

Safari Club International (S.C.I.) was straight forward: "We want to hunt leopards, but not where they are endangered. We believe that where leopards can be legally hunted we should be allowed to do so without the U.S. Department of Interior preventing us from bringing home our trophies." I agreed to undertake the study.

This report demonstrates that trophy hunting is a form of leopard harvest that should not be discouraged by the U.S. or international bodies where countries permit it. It is also my recommendation that the International Convention should recognize that it is in the interest of many nations and the leopard's future to encourage trophy harvest, and thusly, either the leopard should be elevated in status or current U.S. and Convention regulations need to be altered so as to encourage trophy harvest but discourage poaching for the skin trade. There is no evidence or reason to believe that trophy hunting ever has or would become a front for illicit smuggling operations. To lump them together as if they were connected in any way is an unwise conservation policy that is counterproductive to the well-being of wildlife in Africa.

The question of illicit poaching and the effect of the skin trade on leopards is not the prime subject of this report; however, it must be recognized that the fur trade may never have threatened the leopard. Moreover, it is doubtful that the leopard as a species continent-wide in Africa should ever have been considered or is now or is likely to be in the forseeable future endangered, much less "threatened" or even rare. Certain *local* populations are rare or endangered, particularly in North Africa, which is not included in this study.

There are difficult problems involved with the regulation of the fur trade, legally or otherwise, and these need to be solved in any event. Legalistic efforts have largely been ineffective. The better solution is the encouragement of a bona fide fur trade that will give the leopard and other wildlife a more promising future as valuable resources.

METHODS

I have relied on a wide range of information including several scientific and conservation studies of the leopard to evaluate status and make population estimates. Techniques used are described in the report.

Study of the leopard's status and utilization was conducted in ten major countries(Table 1). Questionnaires (Appendix A) were sent to 82 wildlife biologists (including game department heads), game wardens and professional hunters. The responses received are presented throughout the report. Additional biologists and wildlife officials responded by correspondence. A survey was made of the attitudes of members of the I.U.C.N. cat group regarding utilization of the leopard as a resource (Appendix D).

To evaluate the economic value of the leopard as a trophy species, 2,000 questionnaires (Appendix A) were sent to African trophy hunters in America. The results of 219 responses received so far are included.

A graduate student, R. Mc Vittie, went to southern Africa to acquire data on the leopard and cheetah. Her field study included interviews of ranchers in central South West Africa (SWA), where there have been intense efforts to erradicate larger carnivores. The SWA ranchland was considered an ideal location in which to assess the impact of conflict between ranching interests and the leopard. Unfortunately there was insufficient time to analyze and integrate the data from the SWA study; however, the general conclusions are included.

The reader should interpret italicized passages within parenthesis as my comments and not the author quoted.

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Table 1. Present or most recent profession and country of persons responding to questionnaire regarding status and use of the leopard. (Many have been hunters, wardens and biologists.)

Country	Professional Hunters	Game Wardens & Wildlife Biologists	Other	Total
Kenya	5	5	3	13
Uganda	2	6		8
Tanzania	2	4		6
Ethiopia	0	1		1
Sudan	2	4		6
Zambia	3	4		7
Rhodesia	1	6	1	8
Botswana	1	5		6
South Africa	0	11	2	13
South West Africa	1	1		2
(Other)	0	4		4
	19	51	6	76

THE LEOPARD

General Biology

The leopard (*Panthera pardus*) occurs widely in Africa and Asia. It tends to be secretive and nocturnal, at least where dominant species such as man, tiger (*Panthera tigris*), and lion (*P. leo*) are sympatric. The leopard occurs in a broad range of habitat types and is exceedingly catholic in its feeding habits.

The size of the leopard is variable from region to region but a good average adult weight is about 100 pounds, the maximum for a male being 187 pounds (Turnbull-Kemp, 1967). There is marked sexual dimorphism in size of the sexes, males typically weighing 25% more than females. The leopard is asocial and polygymous. It tends to be territorial and occupy restricted home range. Breeding males have larger territories than females and a male's territory may encompass the territories of several females.

Most leopards are spotted in appearance and populations differ as to shade of the background color and the prominence of rosettes. Melanism is a polymorph most associated with montane forest and rainforest habitats where concealment may be enhanced and/or apostatic selection may obtain (Eaton, 1976d ; Eaton and Sweeney, in press).

The leopard is not very vocal but territorial (breeding) males regularly vocalize, especially crepuscularly and nocturnally. The most noted phonation is a repeated cough or "sawing" composed of about 15 to 20 briefly interspaced roars emitted in descending pitch and intensity.

The leopard tends to be seasonally polyestras but can reproduce year-round (Eaton, 1976d). Sexual maturity is reached at about 30 months, but independence is probably at 24 months. Estrus lasts about seven days and copulation frequency is very high (Eaton, 1976a). The estrus period is three or more weeks. Gestation is 95 days and normally 2-3 kittens are born. Kittens are weaned at 10-12 weeks, being raised solely by their mother.

For details and references the reader is referred to the following: Ewer (1973), Grzimek (1975), Eaton (1976a; 1976b; 1976c), Myers (1976a), Schaller (1972), Kruuk (1972), Turnbull-Kemp (1967), Smithers (1968) and others listed in Literature Cited.

Ecology

The intelligent conservation of the leopard requires an understanding of its ecology. Several important studies are in preparation or unavailable at this writing (e.g., Hamilton, 1975 in Myers, 1976a; B. Bertram, in prep.; T. Bailey, in prep.); however, there are sufficient data to outline those aspects of the leopard's ecology and behavior that are relevant to assessing its status and conservation. Of special importance here are: habitat selection, food habits, competition, and relationships to man including response to human disturbance.

Habitat Selection

"The leopard can come from rainfall areas having an annual fall of less than ten inches of rain, or from regions where the downpour exceeds three hundred inches, from sub-zero temperatures to those of dense and humid jungle or the higher, dry, desert temperatures. Once again there appears to be almost unlimited tolerance" (Turnbull-Kemp, 1967:8).

The leopard occurs in an extremely diverse and varied range of habitats, as Myers (1976a) concluded: in all types found in Sub-Saharan save true desert. For example, its range map includes almost all of Kenya (Stewart, 1963) and in Wankie Park, Rhodesia, it is observed in every type of habitat. Wilson (1975:49) concluded from visual records in Wankie that "the leopard does not appear to be associated with any particular vegetational association " (Table 2).

According to Cloudsley-Thompson, (1969) the leopard is common in the ericaceous zone, at higher elevations that the montane forest, and in alpine zones of East Africa which normally limit other larger mammals. The leopard would appear to have the highest density of biomass of larger carnivores in the Kalahari desert (Labuschague fide Myers, 1976a; Eloff, 1973) (Table 16), where it can live without free water (Gaerdes, 1975; Myers, 1976a).

Myers (1976a) suggests that the leopard achieves higher densities at higher altitudes outside semi-closed forests. On the other hand, leopards appear to have their highest known densities in hilly forested habitats and equational rainforests. Reduced competition -- exploitive or direct (interference) -- may favor the leopard in higher and rainforest habitats, which could account for its prevalence. Mutually acceptable, in these habitats dominant species do not occur and, thus, as in Ceylon without the tiger, leopards probably are much less afraid of man and are observed more readily (Muckenhirn and Eisenberg, 1973).

In any event they have relatively high densities wherever they occur (Table 16). The leopard may achieve higher densities in all habitats than any larger African carnivores except the cheetah and wild dog in open, flat grassland plains.

Table 2. Frequency of occurrence compiled from visual observations of the leopard in the habitats of Wankie National Park, Rhodesia (Wilson, 1975). Wankie has an abundance of the leopard's major competitors, the lion and spotted hyena.

Habitat type	Number seen
Mopane woodland	18
Open grass around pans	4
Broken hilly country	8
Acacia woodland	4
Baikiaea woodland	4
Terminalia-Combretum scrub	11
Riparian thicket	2

Types of habitats in which leopards occur include those listed in Table 16.

Food Habits

Among larger carnivores of Africa the leopard is the most generalized in its diet. Myers (1976a) says that leopards may live off rodents in mountains. The leopard's diet in upper Kilimanjaro at 13,000 feet consists of small rodents (Child, 1965). According to Brown (1971) the density of small rodents can be 40,000 km^2 at lower forested elevations of Kilimonjoro the leopard probably relies mostly on monkeys and small antelope (Child, 1965). On the other extreme, leopards have attacked giraffe. One dragged the carcass of a young giraffe three meters up onto a tree branch (Dagg and Foster, 1976).

The image of the leopard primarily as a predator of antelope is not supported by recent field studies. Larger herbivores are probably the least frequent class of prey and may constitute only a small albeit possibly important, percentage of food. Fecal analyses (Wilson, 1969; Grobler and Wilson, 1972) in Rhodesia indicate that insects, reptiles, birds and small mammals can be important prey.

Kruuk and Turner believe that the leopard's diet is far more varied than their kill statistics indicate. For example, in Ngorongoro, one leopard was observed to kill 11 jackals and two Grant's gazelles in one month. In a comparable area of the Serengeti, 55 leopard kills included only one jackal. Individualized prey selection is to be expected. Specilization in diet of individuals means either a broader fundamental niche for the species and/or higher possible density.

The lion has a more widespread distribution in Wankie Park, Rhodesia. However, 21 species were recorded as lion prey in 437 records, but the leopard, with only 60 records, used 23 species of prey (Wilson, 1975). In Kafue Park, Zambia, 96 records account for 22 species of prey taken by the leopard compared with 19 species in 410 records for the lion (Mitchell et al., 1965). It is very likely that as the number of prey records of the leopard increase, especially if derived from more direct study, a much larger list of food resources actually used will be found. This will not be the case with the other larger carnivores, which have been studied intensely or which are much more readily observed (Table 3).

The leopard in Kruger Park, South Africa, preyed on a minimum of 31 species of mammals and ostriche and python (Pienaar, 1969). It was also known to prey on many species of rodents, birds, reptiles, amphibians and fish.

Table 3. Ranking of the leopard and its major carnivore competitors according to degree of specialization of diet (Sxi^2). A larger figure represents a more specialized diet. The data are most biased for the leopard: of these species it tends to have a more generalized diet than indicated from these studies (see text).

Serengeti (Kruuk & Turner, 1967)	
wild dog	4,586
cheetah	3,938
lion	3,938
leopard	3,203

Serengeti (Schaller, 1972; Kruuk, 1972)	
cheetah	8,330.35
leopard	4,279
spotted hyena	3,727.1
wild dog	3,339.93
lion	2,373.4

East Africa (Wright, 1960)	
wild dog	5,100
cheetah	4,117
leopard	3,039
lion	2,797

Kruger (Pienaar, 1969)	
wild dog	6,091
leopard	5,532
cheetah	4,338
sp. hyena	3,860
br. hyena	2.147.8
lion	1,725.9

Wankie (Wilson, 1975)	
lion	2,474.27
wild dog	2,219.34
leopard	924.74

Kafue (Mitchell et al., 1965)	
wild dog	1,667.53
lion	1,483.94
leopard	993.64

A leopard observed by Fey (1964) was forced to occupy an island by flood waters. It fished for Tilapia, its only source of food. The small island was also occupied by duiker and a bushbuck, which were not killed but appeared very vulnerable. A leopard in Zambia trapped on the island was apparently entirely on a diet of fish to which it had become adapted (Mitchell et al, 1965). Another leopard observed by Fey (1964) followed the paths of buffalo turning over dung heaps and eating beetles.

Data collected on the diet of the leopard has consisted primarily of indirect evidence from observation of carcasses (Schaller, 1972; Kruuk and Turner, 1967; Pienaar, 1969; Wilson, 1975, 1976) rather than hunting leopards or fecal analysis. Conversely, studies of the larger sympatric carnivores have included direct observation of predation; thus, comparisons of diets of the leopard and its competitors must be extremely biased. To be sure, the leopard utilizes a much broader range of food resources than most existing data suggests. Still, overlap of diets may exert a limiting influence on the leopard, especially regarding larger prey species.

It is almost impossible to directly observe hunting leopards (Hamilton, 1974), especially at night and without radio-tracking. Studies of the leopard in Rhodesia (Grobler and Wilson, 1972) offer a comparison of diet determined largely by carcass sightings as opposed to fecal analysis (Table 4). A measure of diet specialization (the sum of the squared percent of each prey species occurrence in the diet- Sxi^2) based on the carcass data over four years in Rhodes Matopos National Park (R.M.N.P.)=2,715.26. The same analysis applied to the prey species determined in 200 scats collected in a few days in the same park=1,350.77. The diet determined by carcasses is almost twice as specialized as diet determined by feces.

To illustrate how biased are most descriptions of leopard diets, the difference in the sets of data from the same leopard population are analyzed. I computed the overlap of the two diet lists in Table 4 as only 6%. By scat analysis the major, relative item in the diet is procavids at 31.7%, compared with only 6.7% in the diet according to carcass sightings. Moreover, only 6.7% of the diet determined by carcasses consisted on animals the size of small mammals or smaller, but by fecal analysis 86.7% of the diet consisted of animals of many taxa smaller than the smallest antelope prey.

Another study of leopard diet was conducted by Wilson (1976) in Eastern Zambia, in an area similar in topography, vegetation and competition to R.M.N.P. Based on analysis of scats, observation of kills and examination of carcasses, Wilson's data provide a measure of specialization=1,305.36, similar to degree of specialization in R.M.N.P. (Table 5).

Table 4. The prey species of the leopard in Rhodes Matopos National Park, Rhodesia as determined by fecal analysis of 200 scats collected in a few days and recorded kills (carcasses mostly) from 1967-71 (Grobler and Wilson, 1972). R.M.N.P. lacks any of the leopard's major competitors.

Species/Taxa	Relative % occurrence in feces	From records of kills No.	From records of kills %
Procavidae	31.7	1	6.7
Muridae	10.7	0	---
Klipspringer	10.0	0	---
Scrub hare	5.5	0	---
Birds	5.1	0	---
Sable	4.4	1	6.7
Duiker	4.4	0	---
Springhare	3.7	0	---
Chacma baboon	2.6	0	---
Red rock hare	2.2	0	---
Greater cane rat	2.2	0	---
Steenbuck	1.5	1	6.7
Snakes	1.5	0	---
Insects	1.5	0	---
Lizards	0.7	0	---
Bushpig	0.2	0	---
Reedbuck	0.2	2	13.5
Porcupine	0.2	0	---
Hedgehog	0.2	0	---
Scorpion	0.2	0	---
Slender mongoose	0.2	0	---
Chameleon	0.2	0	---
Impala	---	7	46.6
Wildebeeste	---	1	6.7
Eland	---	2	13.5
	Sxi^2=1,350.77	15	Sxi^2=2,715.26

overlap of diets determined by fecal analysis and records of kills = 6.0%.

Competition

The fundamental niche of the leopard would appear to be extremely broad based on its selection of habitats and food resources. However, the realized niche of the leopard appears to be reduced considerably by competition with its major competitors (guild members), the lion, spotted hyena--and brown hyena locally in Southern Africa (Eaton, in press)--wild dog and cheetah. The impact of these competitors on the distribution, density and productivity of the leopard results from indirect or exploitive competition for food resources as well as direct or intereference competition of a behavioral nature. Heretofore, indirect or ecological competition has been emphasized (e.g., Schaller, 1972; Kruuk, 1972) and direct, behavioral competition largely neglected (Eaton, 1974; 1975; 1976b). Where all guild members occur, aggression and the threat of aggression by dominant species (lion and grouped hyenas and wild dogs) may more greatly limit leopards than any factor. A theoretical discussion of competition is in Appendix F.

Competition for Food Resources

The potential impact on the leopard of indirect competition for food resources is analyzed by computing the overlap of prey species (Horn, 1966) By using Schaller's (1972) data for lions and leopards from the edge of woodlands in the Serengeti, these species diets overlap-12.6% (Table 6). The lion and leopard show greatest sympatry in the Serengeti at the woodland edge habitat. If lions exert a competitive impact on the leopard, overlap of diet should be least where they are most sympatric. Using Schaller's (1972) data for the lion and Kruuk and Turner's (1967) for the leopard in the Serengeti area as a whole (Table 7), the overlap of diet=30.5%, indicating a narrower niche for the leopard due to the lion in area of greatest sympatry.

The spotted byena also competes with the leopard for food, in the Serengeti National Park (S.N.P.). Using Kruuk's (1972) hyena data from S.N.P. and comparing it with Schaller's (1972) and Kruuk and Turner's (1967) data for the leopard in S.N.P., overlap=28.2% (Table 7). A similar analysis of the prey of wild dogs and leopards in S.N.P. shows an overlap=39.1% (Table 7). The cheetah's diet overlaps the leopard's by 34% according to analysis of Kruuk and Turner's (1967) data (Table 7).

Similar results showing relatively high overlap of diet between the leopard and its major competitors are revealed from analysis of diets in Kruger National Park, South Africa. The leopard and cheetah overlap 49%; leopard and brown hyena overlap 23.6%; leopard and spotted hyena overlap 47.3%; lion and leopard overlap 19.8%; and, leopard and wild dog overlap 49.7%. Overlap in diet of the larger carnivores in Kruger Park is depicted in Figure 1. The leopard and lion overlap 15.5% in Wankie and 10.2% in Kafue. The leopard and wild dog overlap 39.5% in Kafue and 29.5% in Wankie. A summary of diet overlap in several parks is in Tables 7, 8 and 9.

Table 5. Prey of two leopards in Eastern Zambia as determined by fecal analysis and observation of actual kills and carcasses. From Wilson (1976). No lions or wild dogs were present; cheetahs were rare. The study area had an impoverished fauna of larger herbivores due to tsetsee control. "Many rodents" are excluded.

Species	No.	%
Bushbaby	1	1.6
Vervet	3	4.8
Baboon	9	14.5
Sidestriped jackal	2	3.2
Serval	1	1.6
Caracal	1	1.6
Civet	1	1.6
Cheetah	1	1.6
Genet	3	4.8
Duiker	19	30.6
Grysbuck	3	4.8
Reedbuck	1	1.6
Bushbuck	1	1.6
Sable	1	1.6
Klipspringer	1	1.6
Dassies	4	6.4
Cane rat	1	1.6
Python	1	1.6
Guinea fowl	2	3.2
19+	62	Sxi^2=1,305.36

Table 7. Overlap of diet of the leopard and its major competitors in the Serengeti and Kruger parks.

	brown hyena[1]	cheetah	leopard	wild dog	spotted hyena	lion	Totals
KRUGER NATIONAL PARK (Pienaar, 1969)							
brown hyena	--	72	23.6	21	32	29	177.6 (5)
cheetah	72	--	49	49.3	48	21	239.3 (5)
leopard	23.6	49[2]	--	49.7	47.3	19.8	189.4 (5)
wild dog	21	49.3	49.7	--	47	18	184 (5)
sp. hyena	32	48	47.3	46	--	29.4	202.7 (5)
lion	29	21	19.8	18	29.4	--	117.2 (5)
SERENGETI AREA (Kruuk and Turner, 1967)							
cheetah	--	00	34	48	--	24	106 (3)
leopard	--	34	--	34	--	18	86 (3)
wild dog	--	48	34	--	--	17	99 (3)
lion	--	24	18	17	--	--	59 (3)
SERENGETI PARK (Schaller, 1972; Kruuk, 1972)							
cheetah	--	--	50.4	33.8	22	23.2	129.4 (4)
leopard	--	50.4	--	39.1	28.2	30.5	148.2 (4)
wild dog	--	33.8	39.1	--	46.8	45.7	165.4 (4)
sp. hyena	--	22	28.2	46.8	--	46.9	143.9 (4)
lion	--	23.2	30.5	45.7	46.9	--	146.3 (4)
NAIROBI PARK (Wright, 1960; Eaton, 1974; Rudnai, 1974)							
cheetah	--	--	20.0	--	--	15	35 (2)
leopard	--	20	--	--	--	23.9	43.9 (2)
lion	--	15[3]	23.9	--	--	--	38.9 (2)

1 The brown hyena occurs in southern Africa only and is rare (Eaton, in press).

2 Overlap of cheetah and leopard based on 407 kills, 1958-59 (Bourliere, 1964)=75% (Eaton, 1974).

3 By using only the four species that comprise 85% of cheetah kills (Mc Laughlin, 1970) and comparing these with Rudnai's (1974) lion data.

Table 6. Prey of the leopard and lion in the woodland edge of the Serengeti (Schaller, 1972), adjusted only for kills by lions (i.e. stolen and undetermined carcasses excluded).

Species	Lion		Leopard	
	No.	%	No.	%
Wildebeeste	86	38.9	11	6.7
Zebra	52	23.5	2	1.2
Thomson's gazelle	19	8.5	104	63.4
Buffalo	35	15.8	0	---
Topi	7	3.1	3	1.8
Warthog	5	2.2	1	0.6
Eland	3	1.3	0	---
Grant's gazelle	1	0.4	10	6.1
Hartebeeste	4	1.8	2	1.2
Giraffe	1	0.4	0	---
Impala	1	0.4	0	---
Reedbuck	1	0.4	19	11.6
Bushbuck	1	0.4	0	---
Waterbuck	1	0.4	1	0.6
Pangolin	1	0.4	0	---
Ostriche	3	1.3	0	---
Baboon	0	---	1	0.6
Golden Jackal	0	---	1	0.6
Black-backed jackal	0	---	1	0.6
Serval	0	---	2	1.2
European stork	0	---	4	2.4
	221		164	
	Sxi^2=2,409.54		Sxi^2=4,251.34	

overlap-12.6%

Figure 1. Graphic depiction of overlap in diet of the leopard and its competitors in Kruger Park. Computed from data in Pienaar (1969).

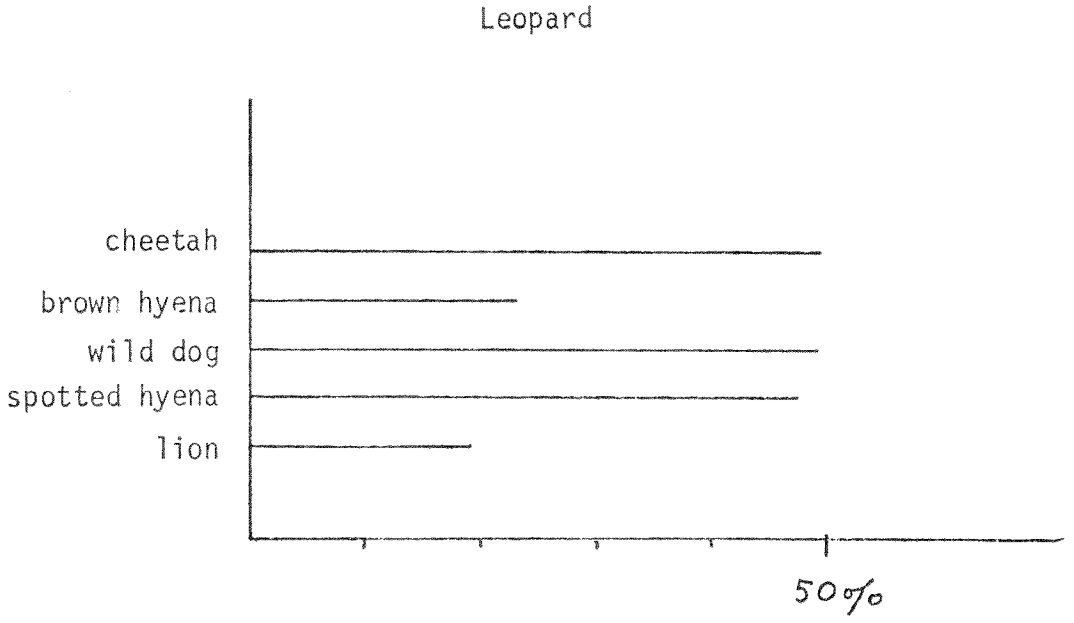

Table 8. The prey of the leopard, lion and wild dog in Wankie Park, Rhodesia (Wilson 1975) and overlaps of diet.

Species	Leopard No.	Leopard %	Lion No.	Lion %	Wild Dog No.	Wild Dog %
impala	14	23.3	6	1.3	18	23.3
reedbuck	5	8.3	3	0.6	3	3.8
tsessebe	0	--	2	0.4	4	5.1
steenbuck	5	8.3	0	--	2	2.5
duiker	4	6.6	0	--	2	2.5
roan	0	--	9	2.0	0	--
kudu	4	6.6	23	5.2	28	36.3
warthog	4	6.6	20	4.5	0	--
zebra	3	5.0	47	10.7	0	--
buffalo	3	5.0	144	32.95	1	1.2
eland	2	3.3	28	6.4	13	16.8
waterbuck	2	3.3	26	5.9	1	1.2
sable	2	3.3	16	3.6	3	3.8
wildebeeste	1	1.6	37	8.4	0	--
giraffe	0	--	40	9.1	2	2.5
bushbuck	1	1.6	0	--	0	--
elephant	0	--	25	5.7	0	--
bushpig	1	1.6	0	--	0	--
gemsbok	1	1.6	1	0.2	0	--
scrub hare	1	1.6	0	--	0	--
vervet	1	1.6	0	--	0	--
baboon	0	--	1	0.2	0	--
banded mongoose	1	1.6	0	--	0	--
ant bear	0	--	1	0.2	0	--
python	1	1.6	0	--	0	--
black rhino	0	--	1	0.2	0	--
tortoise	1	1.6	0	--	0	--
lion	0	--	4	0.9	0	--
civet	1	1.6	0	--	0	--
hyena	0	--	2	0.45	0	--
cheetah	1	1.6	0	--	0	--
ostrich	1	1.6	0	--	0	--
	60		437		77	
	Sxi^2=924.74		Syi^2=2,474.27		Szi^2=2,219.34	

overlap of leopard and lion = 15.5%
overlap of leopard and wild dog = 29.5%

Table 9. The prey of the leopard, lion and wild dog in Karue Park, Zambia (Mitchell et al., 1965), and overlaps of diet.

Species	Leopard No.	Leopard %	Lion No.	Lion %	Wild Dog No.	Wild Dog %
buffalo	0	--	125	30.4	0	--
bushbuck	4	4.1	1	0.2	6	6.25
bushpig	0	--	8	1.9	0	--
duiker	11	11.4	1	0.2	25	26.04
eland	0	--	12	2.9	1	1.04
grysbuck	4	4.1	0	--	0	--
hartebeeste	9	9.3	67	16.3	15	15.6
hippo	0	--	6	1.4	0	--
impala	8	8.3	8	1.9	2	2.08
kudu	3	3.1	4	0.95	4	4.16
lechwe	3	3.1	2	0.48	1	1.04
oribi	3	3.1	0	--	2	2.08
puku	15	15.6	4	0.95	3	3.1
reedbuck	19	19.7	8	1.9	24	25.0
roan	0	--	23	5.6	0	--
sable	0	--	21	5.1	4	4.16
warthog	2	2.08	39	9.5	0	--
waterbuck	0	--	24	5.8	2	2.08
wildebeeste	1	1.04	25	6.0	4	4.16
zebra	0	--	30	7.3	0	--
baboon	2	2.08	0	--	0	--
vervet	3	3.1	0	--	0	--
civet	1	1.04	0	--	0	--
genet	1	1.04	0	--	0	--
serval	1	1.04	0	--	0	--
porcupine	1	1.04	2	0.48	1	1.04
cane rat	1	1.04	0	--	0	--
spring hare	2	2.08	0	--	0	--
hare	1	1.04	0	--	0	--
lion	0	--	0	--	2	2.08
catfish	1	1.04	0	--	0	--
	96		410		96	
	Sxi^2=993.64		Syi^2=1,483.94		Szi^2=1,667.53	

overlap of leopard and lion = 10.2%
overlap of leopard and wild dog = 39.5%

By simply summing percent of diet overlap of guild members, the competitors can be ranked according to the degree that indirect competition for prey may effect their status (Table 7). The leopard tends to rank low or medium on the scale. However, as was shown above, the leopard's diet in these studies is extremely biased relative to the other species. Consequently, the leopard probably tends to overlap least with its competitors than they do with one another. Although the leopard is ecologically a major predator (e.g., Table 10), it is highly probable that indirect competition has less impact on the leopard's status than direct competition with its dominant species.

Wilson's (1976) study area had no lions and wild dogs and cheetahs were extremely rare. Apparently, spotted hyenas do not tend to group much in Eastern Zambia and they rely more on scavenging than killing prey. A reduced number and density of competitors in R.M.N.P. and Eastern Zambia correlates with the leopard's boader niche dimension of diet, although the latter could be largely due to less biased technique. While it is reasonable to assume that leopards everywhere tend to be more generalized in diet than many studies indicate, competition for larger prey may be significant.

It is conceivable that a more generalized diet would result from the extirpation and/or reduction of guild members, as in R.M.N.P. If so, one would expect leopards to utilize more of the medium and larger size berbivores taken commonly in areas of sympatry by lions, spotted hyenas and hunting dogs.

The hypothesis is not testable because R.M.N.P. has an improverished fauna of larger mammals due to extirpation in the recent past. Populations of zebra, wildebeeste, impala, warthog and eland have been reintroduced and are expanding. Here is an ideal location to monitor changes in prey selection and subsequent behavioral and ecological adaptations of a predator as the prey populations shift in numbers and biomass to larger size species. Since the leopard is the only larger predator present, increasing densities of prey should cause leopards to utilize an even broader niche.

Direct Competition

It appears that the dominant species of the leopard exert significant impact on the leopard, not only indirectly in terms of exploitation of common resources, but directly in terms of the leopard's distribution--the threat of attack--as well as loss of food in more exposed habitats. Pienaar (1969) said that despite their hunting skills and the losses inflicted by leopards on the prey community, the leopard ranks below the spotted hyena and brown hyena in the predator hierarchy in Kruger Park. He noted that hyenas (probably referring only to *crocutta)* succeed in robbing a leopard of its kill. Pienaar (1969) said that groups of hyenas were obviously monitoring the daily movements of individual leopards as they appeared almost immediately after the leopard had made its kill and promptly drove it away. Similar observations have been made in East Africa (Kruuk and Turner, 1967; Smith, 1962).

Table 10. Ranking of larger carnivore guild members according to prey biomass killed and scavenged annually in the Serengeti (Schaller, 1972) and percent contributed to total kill in Kruger N. P. (Pienaar, 1969).

Serengeti	Rank	Biomass of Prey
lion	1	5-6 million kg.
spotted hyena	2	3.3 million kg.
leopard	3	0.75-1.1 million kg.
cheetah	4	0.37-0.45 million kg.
wild dog	5	0.18-0.27 million kg.

Kruger	Rank	Percent of Total Kill
lion	1	65.38
leopard	2	16.48
wild dog	3	9.54
cheetah	4	5.82
brown hyena	5	0.48
spotted hyena	6	0.40

Turnbull-Kemp (1967) mentions that there are several records of lions ringing a leopard in a tree until the leopard fled, leaving his kill to the lions. Frechkap (fide Turnbull- Kemp, 1967) recorded a leopard being killed by a lion in Kagera Park, and Taylor (fide Tumbull - Kemp, 1967) mentioned a leopard being killed by a lion, apparently with no motivation other than aggression. Turnbull- Kemp (1967) observed that a large male leopard left his territory when a lion took up residence in the same area. He refers to observers who say that lions not only kill leopards but also eat them.

Guggisberg (1961) records that leopards were twice chased into trees by lions. In Uganda's Albert Park, a lion stole a baboon from a leopard. In the Serengeti Bertram (1974) said that lions appeared to hate leopards, chasing them on sight. He also observed adult and young yielding to hyenas.

A lion killed and partly ate a large female leopard. The leopard had killed a young waterbuck and carried it into a tree. When coming down, it was killed (Trimmer, 1963 fide Watt, 1968).

Shaller (1972) observed that about 20% of the food stolen by lions in the Serengeti came from leopards. In all areas noted, lions kill (but do not necessarily eat) leopards, which demonstrates the great risks from dominants (also, see Behr, 1970).

Wild dog packs also pursue single leopards and kill them and steal their kills (Pienaar, 1969; Estes and Goddard, 1967; Turnbull-Kemp, 1967), although leopards kill solitary wild dogs. Wilson (1975) described an incident in which 25 wild dogs watched a dead impala in a tree. An adult leopard jumped out of the nearby tree and was pursued by the dogs.

Where hyenas are common, leopards are more inclined to carry kills into trees (Turnbull-Kemp, 1967), and hyenas will attack leopards to steal their kills as well as attacking and driving them into dense cover. According to Turnbull-Kemp (1967) wild dogs are even greater enemies of the leopard.

In general, body size correlates with the ability to win interspecific aggressive encounters. Most often these are motivated by competition for resources. According to the body size of the species of larger African carnivores (Table 11), ranking in the hierarchy should be: lion, spotted hyena, leopard, cheetah and wild dog, with the brown hyena placed between the spotted hyena and leopard in localities of southern Africa. Although the wild dog is as much as 25% larger in southern Africa, this does not alter its rank.

Based on accounts in the literature and adjustments made from nonqualified description, I have compiled the interactions of the leopard with its competitors, isolating in each case the numbers of each, the area, the apparent motivation and/or contextual factors associated with the encounter, who attacked or initiated the encounter with whom, who won, the number of observations and the source of information (Table 12).

Leopards are only rarely seen in groups of two or more, and these are surely either mating pairs or family groups. The leopard is asocial and, in all cases found interacted singly with other predators. Fifteen interactions between lions and leopards indicate that lions dominate leopards in one-to-one encounters, and by the fact that lions initiated and won all encounters (Table 12).

The spotted hyena is social (Kruuk, 1972), exhibiting group sizes upwards of 40, but also relying on solitary hunting at times. Of twelve encounters with single leopards, seven were initiated and won by leopards; five were initiated and eight won by hyenas (Table 12). Clearly, numbers of hyenas determines the outcome: single leopards always dominated single hyenas, but lost to two or more hyenas. Although few observations have been made, leopards have dominated brown hyenas (Mills, 1974).

Leopards almost always win against cheetahs (Table 12), but only one case was found of one leopard attacking more than one cheetah (Mills, 1974) (cheetahs tend to group everywhere, Eaton, 1976b). The fact that a single cheetah can dominate a single leopard, even only rarely--11%, suggests that two or more cheetahs would sometimes win against a leopard. Since cheetahs are usually attacked as prey by leopards, grouping by cheetahs should benefit them and cost the leopard in some areas.

Few observations exist of interactions between leopards and wild dogs (Table 12); however, dog groups always dominate a leopard. The dogs initiated all attacks. These records are from southern Africa where dogs are larger and potentially more dangerous, but as wild dog packs in East Africa dominate single lions, they must dominate leopards there too.

Table 11. Weights and weight-ranking of larger carnivores of Africa according to location (in pounds).

Species	Kruger	Kalahari	Serengeti/East Africa	Wankie	Source
lion	480 max.	?	275-450	--	Pienaar, 1969; Schaller, 1972
spotted hyena	140-165	--	113-150	--	Pienaar, 1972; Schaller, 1972
leopard	90-130	--	90-125	--	Pienaar, 1972; Schaller, 1972
cheetah	?	100*	90-125	--	Schaller, 1972; Eaton, 1974; Herdman, 1973
brown hyena	100-130	84	--	?	Pienaar, 1969; Smithers, 1971
wild dog	50-60	?	40	60	Kruuk and Turner, 1967; Estes and Goddard, 1967; Pienaar, 1969

Rank by weight:	Kruger	Serengeti
1	lion	lion
2	spotted hyena	spotted hyena
3	brown hyena, leopard, cheetah wild dog	leopard, cheetah wild dog

* average weight of adults captured in S.W. Africa (not obese); range=90-120.

Table 12. Some directly competitive interactions of the leopard and its major competitors. Many descriptions lack detail. I made certain, probably minimal adjustments in data. When the frequency of interactions between two species were not specified I assigned the following values: "many", "frequent" and "often" were scored "10"; "several" and "few" as "3"; and, "more than one (once)" with no further data as "2". Additional interactions not included below are in the text. They generally agree with the results below. Where known sex of adults is indicated: male=1:0, female=0:1, and if three offspring with female=0:1+3. When group size was not specified, e.g. "pack", 3+ is substituted.

SPOTTED HYENA - LEOPARD

Area	No. hyenas	No. Leopards	Motivation	Initiator	Attacked	Winner	No. observ.	Source
Serengeti	2	1	food	hyenas	leopard	hyenas	1	Kruuk, 1972
Serengeti	1	1	food	leopard	hyena	leopard	1	Kruuk, 1972
Serengeti	3+	1	food	hyenas	leopard	hyenas	"3"	Kruuk & Turner, 1967; Smith, 1962
Kruger	9	1	food	leopard	hyenas	hyenas	1	Pienaar, 1969
Kruger	3+	1	food	hyenas	leopard	hyenas	"3"	Pienaar, 1969
Kruger	1	1	food	leopard	hyena	leopard	"3"	Pienaar, 1969

CHEETAH - LEOPARD

	No. Leopards	No. Cheetahs						
Serengeti	1	1	predation	leopard	cheetah	leopard	1	Schaller, 1972
Serengeti	1	1	predation	leopard	cheetah	leopard	1	Kruuk & Turner, 1967
Amboseli	1	0:1+3	predation	leopard	cheetah	leopard	1	Eaton, 1970b
Eastern Zambia	1	1:0	predation	leopard	cheetah	leopard	1	Wilson, 1976
Kruger	1	1?	predation	leopard	cheetah	leopard	"3"	Pienaar, 1969
Kruger	1	1	?	leopard	cheetah	leopard	1	Pienaar, 1969
Kruger	1	1:0	?	cheetah	leopard	cheetah	1	Pienaar, 1969

WILD DOG - LEOPARD

	No. dogs	No. Leopards						
Kruger	3+	1	aggression	dogs	leopard	dogs	"3"	Pienaar, 1969
Kruger	3+	1	food	dogs	leopard	dogs	"3"	Pienaar, 1969

LION - LEOPARD

	No. lions	No. Leopards						
Kruger	3+?	1	food	lions	leopard	lions	"10"	Pienaar, 1969
Serengeti	1	1	aggression	lion	leopard	lion	"3"	Schaller, 1972
Serengeti	11	0:1	aggression	lions	leopard	lions	1	Schaller, 1972
Serengeti	3+	0:1	aggression	lions	leopard	lions	1	Schaller, 1972

To better understand the relationships of the leopard with these species and their impact on the leopard's status, I tabulated the apparent motivational factors involved in encounters (Table 12). A summary (Table 13) shows that the competition for food accounts for the majority of each species interactions with leopard, except the cheetah which is frequently attacked and taken as prey by leopards (lions and spotted hyenas).

The behavioral interactions of these predators are summarized from data in Eaton (in prep.) according to percent of wins against all competitors. The categories are broken down as far as data allow into single or grouped composition (Table 14).

There is little doubt that grouping is extremely important for all the social species. It permits them to win when they would otherwise lose against the same opponents. Regarding the leopard, its interspecific rank is necessarily low where lions, spotted hyenas and wild dogs abound. Accordingly, the resource base, distribution and numbers of leopards should be reduced.

Competition as a Limiting Factor of the Leopard

Although cheetahs and brown hyenas compete for prey with the leopard, both are uncommon and should exert little impact on the leopard.

In packs, wild dogs should tend to reduce the distribution and density of leopards. The wild dog is rare outside protected areas. It is extremely vulnerable to control by humans due to its relative lack of avoidance of man, preference for openness and conspicuousness enhanced by grouping and diurnal activity. No larger predator in Africa is hated more by humans and none have received as much concerted persecution. The extirpation of the wild dog from huge regions should favor the leopard resulting in higher densities in suitable habitat outside parks.

The most common major competitors of the leopard are the large social species: lion and spotted hyena, both of which overlap considerably in diet and habitat with the leopard.

Both species have been markedly reduced throughout much of Africa, which should favor the leopard. Both are wider ranging and because of their feeding and grouping habits, they are more susceptible to poisoning by livestock interests. In ranching areas, the leopard should be favored by reduction of these competitors.

Table 13. Summary of dominance interactions of the leopard and its major ecological competitors, from Table 12.

Competitor	No. Encounters	No. Initiated and No. & % won by leopard			Motivation*	Notes
		No.	No.	%		
spotted hyena	12	7	7	57	food-100%	leopard won only against single hyena, lost to groups
cheetah	9	8	8	100	predatory-77% ? 23%	cheetah initiated only one attack, probably aggressive, against a young adult leopard
wild dog	6	0	0	--	food-50% aggression-50%	
lion	15	0	0		food-66% aggression-33%	

* "food" indicates that a carcass was the object of competition; interspecific aggression and predation are recognizably distinct among these species (Eaton, 1976b).

Eloff (1974) believes that there four predators--lion, leopard, cheetah and spotted hyena--of the Kalahari overlap much more than they do in East Africa, as they use a smaller range of species. The fact that lions spend great amounts of time and energy to procure smaller mammals such as rodents, indicates that competition between the predators should be more intense. Thus, it is likely that in semi-arid regions, the extirpation of lions, cheetahs or wild dogs (any or all) leopards should be favored. The leopard has higher densities in the KalahariGemsbok Park than any of its major competitors. The broad expanses of several semi-arid regions now devoid of most or all of these competitors should have as high or higher densities of leopards than in similar park habitats with dominants.

In the interior ranchlands of South West Africa, the leopard's dominant competitors have been virtually eliminated over the past several decades (Gaerdes, 1972-73; Eaton, 1976b; R. Mc Vittie, pers. comm.). The cheetah is more common here than anywhere in the world (Eaton, 1974; Myers, 1976b; Gaerdes, 1972-73) and the leopard appears to have a satisfactory status despite control efforts. In other ranching areas where control has reduced or eliminated the lion, spotted hyena and wild dog, the leopard is found in relatively high numbers and has probably been favored by removal of dominants.

Leopards attain their highest densities--the highest density in terms of biomass of any larger carnivores--where dominant species are absent, either because the latter do not occur in some habitats such as forests of the Congo Basin (Myers, 1976a) and/or because the dominant species have been extirpated. In much of the Congo Basin and in R.M.N.P., leopards occur at densities of one or more per square mile, much higher than reported for areas of full guild membership (such as Kruger, Pienaar, 1969; Serengeti, Schaller, 1972; and Wankie, Wilson, 1975).

The fundamental niche of the leopard is broad enough that it can do well in more habitats than any of the guild members; there is perhaps only one habitat for which it is not fundamentally well adapted, the open grasslands and plains that lack any cover such as rock outcroppings or drainages, where wild dog, spotted hyenas and cheetahs may do better. Wooded savanna appears to be the optimal habitat of the lion and spotted hyena (Schaller, 1972). The leopard reaches higher densities in woodland savanna where dominants are absent.

The conclusion is that the realized niche and status of the leopard is largely a function of interspecific relationships with competitive species. Outside protected areas, where competition is reduced, the leopard should obtain wider distribution and higher densities. The conclusion is supported by the study of Muckenhirn & Eisenberg (1973) in Ceylan where the leopard has been the dominant carnivore. The Ceylon leopard appears to attain a relatively high density, is catholic in diet but relies most on larger mammals including *Axis* and *Sus*, and, its behavior reflects its dominant status. It is commonly viewed hunting by day, and is less arboreal than continental populations.

Table 14. Ranking by percent wins of all categories of larger African carnivores engaged in direct interspecific competition (for food, interspecific aggression and predation). Except for the leopard analysis, presented above, the remaining data are compiled in Eaton (in prep.).

Species and category	% of wins
lion group	98
spotted hyena group	51
wild dog group	46
single lion	30
single brown hyena	30
single leopard	28
cheetah group	20
single spotted hyena	19
single cheetah	4
single wild dog	0

Response to Man

The fundamentally broad niche of the leopard and its ability to avoid predation by and co-exist with man account for the fact that the leopard has the highest densities and largest population known for a large predator, with the possible exception of the coyote. The leopard must have the longest and closest association with man and extinct hominids of any larger carnivores. Over many thousands of years, selection exerted by man has probably favored the evolution of behavioral traits in the leopard that reduce conflict between these species. Considering the high densities of leopards and humans for millenia in riverine habitats and the fact that predation by leopards on man is rare (Caras, 1975; Turnbull-Kemp, 1967; Myers, 1976a) but other primates are preferred prey, leopards must actively avoid man. The broad niche of the leopard coupled with its adaptations favoring sympatry with man are the major factors accounting for the leopard's exceptional resilience in co-existing with man and adapting to environments altered by man. The ability to co-exist with man is a significant factor favoring the leopard generally and relative to its major competitors, which decidedly are significantly hurt by man. Competition between man with lion, wild dog, spotted hyena and cheetah, and between man and larger herbivores as prey or competitors with domestic stock, should favor the leopard. The reduced competition with larger carnivores provides more range and resources for the leopard.

Where larger herbivores are reduced, the leopard can rely on a range of small prey. Where livestock occur, the leopard tends to avoid killing livestock, indicating that--like the coyote--its adaptations to man include discrimination of livestock from feral species. Leopards occur in high densities in ranching areas of northwest, East and southern Africa, with only minor depredation on livestock (Myers, 1976a; R. Mc Vittie, pers. comm.; and below).

The point is well illustrated by Fey (1963). A leopard appeared to feed almost exclusively on bushpig but ignored locally abundant, surely more easily captured domestic stock and dogs. Although probably as or more abundant than the cheetah in the central ranchlands of South West Africa and able to kill larger prey, leopards are reported by ranchers as unimportant depredators of livestock (R. Mc Vittie, pers. comm.).

The extreme adaptability of the leopard to man is demonstrated by its occurrence in some of the most deteriorated, populated and seemingly unsuitable landscapes in the world. Blake (1966) reported the following regarding the killing of a leopard in Jordan.

"Nobody had ever seen, or heard of, a leopard before. This is an important point, because with shepherds and nomadic hunters, etc., any report of such a beast would become enshrined in a sort of local folk-lore. Reports of other animals (wolves, for instance) were numerous, although in most cases the event was many years ago. As far as I can judge, therefore, there has been no report of leopards here for about 100 years. About three months after the episode recorded above, I heard, on the Israeli news service, an account of a shepherd who had killed, with a knife, a leopard in the region of Gallilee. I have no

date for this, but no doubt it could be traced as a medical officer was involved in burning the carcase which was thought to have been rabid. Before I left the area in March 1965, traces of another leopard had been seen in the Darejeh and recently (October 1965) I have had a letter from Jerusalem, telling me that one of the men in the Wilderness has reported *seeing* a leopard."

The amount of landscape dominated and primarily influenced by man in which leopards have not persisted must be very small. Myers (1976a) mentioned leopards within and close to several metropolitan areas, apparently with no records of predation on man. The leopard may achieve the highest density of any larger cornivore in densely populated cities. There are 50 reported in Nairobi, where dogs and cats are prey. About six or seven leopards are removed from the city annually by the Game Department (A. Oldfield, pers. comm.). The density of the leopard in Nairobi is 0.62 per km^2, the highest known!

POPULATION ESTIMATES OF THE LEOPARD

IN SUB-SAHARAN AFRICA

It seems that one of the major influences on the recent classification of the leopard as endangered is the elusiveness and secrecy of the leopard in man's proximity. This, coupled with seemingly high fur harvest figures, struck biologists, game wardens and conservationists as "proof" of severe overexploitation. Except for the then very few skeptics with awareness of the leopard's density and secretive nature, individuals with much field experience could not imagine their being the number of leopards poached, much less that the offtake might be insignificant.

A pertinent example of how biased impressions are of the presence and abundance of leopards is the growing conviction of field primatologists that leopards rarely prey on baboons. When examined from the predator's point of view (that is the records of carnivore students) the baboon is a significant prey of the leopard, enough so to easily explain grouping as an anti-leopard defense mechanism. That primatologists -- as human and a conspicuous, dominant of the leopard -- observing baboons by day have not witnessed leopards killing baboons is of course no surprise. In the presence of humans, leopards only rarely reveal themselves, and even less often when hunting.

Studying leopards in Kruger Park, where they were controlled before 1960, Hornocker & Bailey (1974) could not manage to directly observe radioed leopards. In Kenya, working with a skilled ex-poacher, Hamilton (1974) had great difficulty making direct observation of leopards that were radioed (i.e. he knew approximately where they were and often in proximity). The longest visual observation was made of mating leopards, which were noted to be somewhat less wary, though relatively hidden. There is only one park, Serengeti, where leopards can be regularly observed by humans (Moss, 1975).

Elsewhere in the Serengeti, where visitors are uncommon and/or poachers are active, leopards with radios are difficult to observe visually (Bertram, (1974), and in Moss (1975).

The leopard gives humans the impression that it is rare or nonexistant in an area, when in fact it is relatively abundant. This occurs widely (Myers, 1976a) and should be most pronounced where leopards are (or have been recently) hunted by man. Consequently, impressions about the presence or abundance of leopards should be most biased in favor of scarcity outside protected areas.

A good example of the secretive nature of the leopard in even well-protected areas is Wankie Park, Rhodesia. The estimate of larger carnivores includes 500 lions, 500 spotted hyenas, 300 leopards and a maximum of 80 cheetah

(Wilson, 1975). In one 24 hour census, 108 lions, 104 spotted hyenas, 11 leopards and 9 cheetahs were counted. Moreover, I reasonably estimate the leopard population in Wankie to be at least 1,000 while the estimates for the other carnivores are probably closer to being accurate (Table 15).

Impressions of wildlife biologists as to the presence, density of number of leopards in an area seem to almost always be greatly biased (which, again, must partly account for the view that leopards are rare or becoming rare, for example, due to poaching). Levels of harvest and actual field investigations of the leopard both suggest that leopards may be very abundant although seemingly scarce, besides that with increased poaching effort, sightings are likely to decline without a corresponding decline of leopards.

An example is Rhodes Matopos National Park, Rhodesia. The 108,000 acre park had been extirpated of lion, spotted and brown hyena, and cheetah. The leopard too, was hunted before 1967, and may still be poached. Many of the populations of larger herbivores were seriously depleted, but have since been encouraged. The initial survey of larger mammals in 1965-68 reported (Wilson, 1969:6):

"Over the period that the writer had worked in the area including 48 nights of observation, which were conducted from an open landrover and using a powerful spotlight, only four leopards were seen. These night patrols often covered a distance of 20 miles and took from two to three hours. The writer is therefore of the opinion that the leopard is not as common in the Matopos as is generally believed."

During the succeeding three years an intensive study specifically of the leopard in Matopos Park (including the author above: Grobler and Wilson, 1972) indicated a much denser population of leopards. In 1974 (J.H. Grobler, pers. comm.; Grobler, in prep.) the density of leopards was placed at a *minimum* of two leopards per three km^2. While some of the apparent increase (only two generations) could be attributed to increased prey resources (Grobler and Wilson, 1972) the data suggests that leopards were very numerous all along. For one thing leopards in Matopos preyed on few of the increased herbivores (Grobler and Wilson, 1972). In this example, direct sightings of only four leopards were made over many months, while the subsequent special study of leopards found an estimated population of at least 300 leopards, a high density.

Densities and Computation of Populations

I follow the logic applied to another larger felid studied in detail, the puma (*Puma concolor*) (C. Koford, in prep., pers. comm., 1975-76). The puma and leopard are distrinctly different in some respects that make their conservation and management quite different. The puma is a specialist and not nearly so adaptable as the leopard which is a great generalist. However, the technique used by Koford of determining densities and projecting these across habitat types to arrive at estimates of population size should be applicable to the leopard.

Table 15. Estimates of larger carnivores in several African areas. Since these were made, intensive study of leopards in Serengeti and Kruger estimate larger populations of leopards based on realized densities (see text and Table

Area	lion	leopard	cheetah	wild dog	spotted hyena	Source
Serengeti N.P.	1,450	500-600	--	250-300*	--	Schaller, 1972
Serengeti N.P.	1,650	500	500	1,100	6,000	Hendrich's, 1970
Serengeti unit	2,000-2,400	800-1,000	200-250	150-300	3,000**-3,500	Kruuk, 1972; Kruuk and Turner, 1967; Schaller, 1972
Ngorongoro	70	20	0	479	0	Schaller, 1972; Kruuk, 1972
Nairobi N.P.	25-35	8	11-15***	0-3	4-8	Eaton, 1974; Rudnai, 1973; McLaughlin, 1970
Kruger N.P.	1,120	650	263	335	"most abundant" 1,500****	Pienaar, 1969
Wankie N.P.	500	300	80	300	500	Wilson, 1975

* Excludes denned pups
** Excludes pups less than 8 months old
*** Plus 4-11 cubs
**** Schaller's guess (1972)

By relying on the geographic information about amount, distribution and status of habitat types in Myers (1976a) and scientific study of leopard density in these habitat types, absolute minimum, conservative and probably realistic population estimates are made.

A list of densities of leopards in various habitat types from representative countries (Table 16) indicates that leopards normally achieve higher densities than any larger carnivore in Africa. Many of these figures originate from protected areas, and this may be taken to imply that leopard densities outside protected areas would be necessarily lower. For a number of reasons mentioned briefly by Myers (1976a) and discussed in detail above, the opposite trend should prevail. A major limiting influence on leopard density in protected areas is density of dominant species, including especially the lion but also the spotted hyena, which in groups dominate and exclude the leopard from vast areas, and in a few locales, the wild dog.

It is to be expected then that where dominant predators are reduced of absent -- as in Rhodes Matopos National Park, Rhodesia, where leopards obtain the density of at least 2 per 3km^2 -- leopards are more abundant. In most countries of Sub-Saharan Africa lions have been grossly reduced outside of protected areas, and in many have long been extinct (Myers, 1974; 1976a); Schaller, 1972). In areas with intensive livestock agriculture such as Rhodesia and South Africa, lions are very rare if present and the spotted hyena has been most severely affected by poisoning aimed at predators (Eaton, in press). While the leopard freely scavenges and is therefore susceptible to poisoning efforts, it tends to be localized in its movements and has typically a small range. Unlike the wide-ranging spotted hyena, which also groups and is thus more prone to congregating at poison baits, the leopard would normally be much less affected by poisoning efforts. As a consequence of reduced competition from lions and hyenas, the leopard's tendency to avoid preying on humans or livestock and its asocial, territorial and elusive nature, leopards should be relatively favored in livestock country. Still, I have applied densities to such areas that are conservative compared with similar areas under protection.

The densities from various studies (Table 16) should be generally applicable over huge regions that are relatively undisturbed and/or which remain favorable habitat for the leopard.

Myers (1976a) concluded that, "the leopard seems able to maintain a density of 1 to 10 km^2 in moderately (my emphasis) suitable habitats, and up to 1 to 5 km^2 in favorable ones, with perhaps even one to 1 km^2 in exceptionally suitable conditions." The densities used to compute the highest estimates in Table are conservative compared with these.

As there have been no studies of the leopard in West Africa, I have no

Table 16. Densities of leopards in various habitats and areas. (Some figures are home range size that exclude overlap)

Habitat	Area	Max Density Observed	Other Densities	Source
montane forest	Kenya	1/1km^2	--	Myers, 1976a
hilly savanna	Tsavo	1/10km^2 (males)	--	Hamilton, in Moss, 1975
limited riverine bush but mostly *Acacia* grassland savanna	Nairobi Park	--	1/11km^2 ave.	Kutilek, 197 Rudnai, 1974
soda flats, marsh, grassland and woodland	Lake Nakuru Park	--	1/20km^2 ave.	Kutilek, 197
forest, grasslands and swamp	Ruwenzori Park Uganda	1/8km^2	--	park staff, Myers, 1976a
miombo woodland	Tanzania, Selous Preserve	--	1/23 ave.	Myers, 1976a
grassland, rocky outcrops	Serengeti	1/11 (for park)	1/22-26.5	Schaller, 19
woodland	Serengeti	1/13	possibly higher	Bertram, in Myers 1976a Moss, 1975
miombo woodland	Zambia	1/11	1/22	Myers, 1976a
?	Kruger	--	1/7.5	Bailey & Hor ocker in Jos 1975
dense bush	Kruger	1/5	--	Pienaar, in Myers, 1976a
?	Kruger	--	1/10	Hornocker & Bailey; 1974
?	Kruger	2/3	--	Pienaar, in Myers, 1976a
riverine bush	Kruger	1/2	--	Pienaar, in Myers, 1976a
diverse	Kruger, whole park	--	1/19.5 ave	Pienaar, in Myers, 1976a
Othawa Farm	South Africa	--	1/4-5 ave	Robson, in Myers, 1976a
Matestsi Ranch	Rhodesia	--	1/4 ave	Longhurst, i Myers, 1976a
mixed woodland, grassland and sandveld and savanna woodland	Rhodes Matopos Park	--	2/3 ave	H. Grobler, pers. comm., Grobler, in Myers, 1976a Grobler &

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Habitat	Area	Max Density Observed	Other Densities	Source
50% *Baikiaea-Pterocarpus* and *Mopane-acacia* woodland, 35% low mixed scrub; 15% grassland	Wankie Park, Rhodesia	1/10	1/48	Eaton, this study; Wilson, 1975
Metropolitian	Nairobi	--	1/1.5	A. Oldfield, pers. comm.
lowland forest	Ethiopia	2/3	--	Brown and Urban, 1970
miombo woodland	eastern Zambia	--	1/11.7	Wilson, 1976
tropical rain-forest	Zaire	1/1	1/3	Myers, 1976a
forest	southwest Ethiopia	2/3	--	Brown and Urban, 1970
lakes, grass and forest	Wilpattu Park, Ceylon	--	1/8-10 ave.	Eisenberg, 1970
subdesert	Kalahari Gemsbok Park, South Africa	--	1/65 ave. (for park)	Labuschagne, in Myers, 1976a

basis for estimating densities there. However, Myers repeatedly refers to the Sudan-Guinean woodland zone as fundamentally providing favorable or fairly favorable habitat. With very few exceptions, always scewed more conservatively, I applied an average density to much of this zone which seemed reasonably low, a maximum of 1 to 50 km^2, a minimum of 1 to 100 km^2. Several of the countries in northwestern Africa include sizable portions of rainforest, for which it seemed conservative based on figures for equatorial rainforests to use of minimum density of 1 to 40 km^2, a maximum of 1 to 20 km^2. Where the evidence in Myers (1976a) indicated, I allowed for intensive land tenures by reducing the estimates of density, though there are reasons to believe that leopards do well in such areas. Expansive regions of Sahel also occur in this region, and leopard occur in them, but I largely excluded this habitat type. All in all then, the estimated populations for the West African countries, while not projected with the confidence for other regions, should be conservative or realistic, not liberal. Leopards appear to achieve relatively high densities in arid and semi-arid regions of southern Africa such as in the Kalahari Gamsbok Park (Table 16). Outside protected areas, with fewer dominants and/or little human pressure, densities should be comparable even in marginal livestock areas. Thus, the very low densities applied to huge sectors of Botswana, South West Africa and South Africa must be considered as underestimations. These countries surely have much larger populations of leopards.

The estimated total populations, conservatively based throughout, by country and region in sub-Saharan Africa excluding Somalia are presented in Tables 17&18. According to the analysis, there are at least 230,000 leopards, and probably well over 580,000. *It must be emphasized that these figures should be viewed as gross underestimates. The maximum estimates should safely fall within the real population sizes.*

It is clear from Myers (1976a) study that *moderately* suitable habitat may amount to no less than 2.5 million km^2 in the miombo woodland zone of Africa alone. By using his density figure there could be 250,000 or more leopards in just this zone, including most but not all of Angola, Zambia, Mozambique, and Malawi, and portions of Rhodesia. Then with the still pristine tropical rainforest biome making up 1,250,000 km^2 in just the three countries of Congo, Gabon and Zaire, where densities are probably at least one leopard to 5 km^2, there could be another 250,000 leopards also in a secure position for the forseeable future. *Excluding* southern Africa, East Africa, West Africa, and Northeastern Africa, all areas of which have leopards in favorable and moderately favorable habitats of extensive areas up to 500,000 km^2, it is reasonable to say that there are 500,000 leopards at an absolute minimum in Africa today. By including the other regions and with more realistic densities there are possibly one million. For 80% of the Sub-Saharan population, the trend appears stable, not declining (Table 27).

Even if we assumed the most improbable worst, that the leopard were to become rare or endangered due to various human pressures, according to Myers (1976a) it would still occur in "at least half a million km^2 of rugged terrain". He notes that the primary food resources, such as rodents and hyrax, are not likely to decline. The terrain is forbidding to agriculture and poaching is

light. As he indicates high densities in these habitats, which are "favorable" or "moderately favorable" typically supporting no less than one leopard per 10 km^2, there would be at least 250,000 leopards spread over many countries in secure areas.

Table 17. Projections of absolute minimum and conservative populations of the leopard in 31 countries of sub-Saharan Africa based on densities in habitat types. A realistic population is computed using a lower density than the maximum observed density per habitat type (see Table 16).

Country	Size	Area/ Habitat Type	Amount	Maximum Est. Density	Min.Est. Density	Abs.Min. Population	Conserv. Population	Realistic Population
Kenya	582,000	northern arid	200,000	1/10	1/50	4,000	20,000	
		montane forest						
		Aberdares Park	590	1/1	1/10	59	590	
		Aberdares Mts	12,000	1/10	1/20	480	1,200	
		Mt. Elgon	insufficient data					
		add. protected areas	21,000	1/10	1/25	840	2,100	
		remainder	350,000	1/200	1/350	1,000	1,750	
						6,379	25,640	35,000
Uganda	236,000	protected areas	6,000	1/10	1/25	240	600	
		southwest sector Ruwenzoris, swamps, and tropical rainforest	20,000	1/10	1/25	800	2,000	
		northeast sector mountain forests, wooded savanna	20,000	1/10	1/25	800	2,000	
		northwest sector savanna grassland, riverine	5,000	1/10	1/25	200	500	
		remainder	212,500	1/200	1/350	607	1,063	
						2,649	6,163	20,000
Tanzania	942,000	protected areas	34,000	1/10	1/25	1,360	3,400	
		Selous Game Preserve	35,000	1/10	1/25	1,400	3,500	
		miombo woodland	314,000	1/20	1/50	6,280	15,700	
		wooded grassland/bush	235,000	1/20	1/50	4,700	11,750	
		remainder	350,000	1/200	1/350	1,000	1,750	
						14,740	36,100	
Angola	1,247,000	protected areas	24,460	1/10	1/25	980	2,446	
		miombo woodland	748,000	1/20	1/50	14,964	37,400	
		remainder	498,800	1/200	1/350	1,425	2,494	
						17,369	42,340	
Zambia	753,000	protected areas including game mgmt. areas	225,000	1/10	1/25	9,000	22,500	
		miombo woodland	475,000	1/20	1/50	9,500	23,750	

Mozambique	770,930	miombo woodland	616,750	1/20	1/50	15,420	30,837	
		remainder including coastal	154,180	1/100	1/200	770	1,541	
						16,190	32,378	67,000
Malawi	118,000	mountainous/forest	29,500	1/10	1/20	1,475	2,950	
		remainder	88,500	1/100	1/200	443	885	
						1,918	3,835	10,000
Botswana	601,000	protected areas	115,000	1/50	1/100	1,115	2,230	
		Okovango Basin	60,000	1/20	1/50	1,200	3,000	
		remainder	425,000	1/300	1/500	850	1,416	
						3,165	6,646	20,000
Rhodesia	391,000	protected areas	7,400	1/10	1/20	370	740	
		remainder	383,600	1/100	1/200	1,918	3,836	
						2,288	6,676	20,000
South West Africa	824,000	parks, preserves and govt. owned vacated land	197,760	1/50	1/100	1,977	3,954	
		hilly zones	60,000	1/100	1/200	300	600	
		remainder	600,000	1/300	1/500	1,200	2,000	
						3,477	6,554	20,000
South Africa	1,221,000	protected areas	30,000	1/10	1/20	1,500	3,000	
		Cape (see text)				750	1,150	
		Transvaal (see text)				1,500	3,000	
						3,800	7,150	15,000
Senegal	196,000	protected areas	9,400	1/20	1/40	235	470	
		G.-S.woodland	70,000	1/50	1/100	700	1,500	
		riverine and gallery forest	10,000	1/10	1/20	500	1,000	
						1,435	2,970	6,000
Mali	1,240,000	protected areas	3,500	1/20	1/40	88	175	
		G.-S. woodland	300,000	1/50	1/100	3,000	6,000	
		(remainder excluded)				3,088	6,175	15,000
Upper Volta	274,000	protected areas	3,100	1/20	1/40	77	155	
		G.-S. woodland	150,000	1/50	1/100	1,500	3,000	
		(remainder excluded)				1,633	3,265	10,000

Table 17, continued.

Niger	1,267,000	protected areas	3,100	1/20	1/40	77	155
		G.-S. woodland	12,500	1/50	1/100	1,250	2,500
		Sahel	400,000	1/1000	1/2000	200	400
						1,527	3,055	5,000
Tchad	1,284,000	protected areas	53,000	1/20	1/40	1,325	2,650
		G.-S. woodland	300,000	1/50	1/100	3,000	6,000
		(remainder excluded)				4,325	8,650	15,000
C.A.R.	545,000	largely favorable G.-S. woodland	--	1/50	1/100	5,450	10,900	20,000
Nigeria	924,000	protected areas	6,100	1/20	1/40	153	305
		remainder	900,000	1/100	1/200	4,500	9,000
						4,653	9,305	20,000
Camerouns	475,000	protected areas	9,100	1/20	1/40	228	455
		S.-G. woodland	200,000	1/50	1/100	2,000	4,000
		southeast rain-forest	90,000	1/20	1/40	2,250	4,500
		remainder	175,000	1/100	1/200	875	1,750
						4,563	10,705	30,000
Gambia	11,300	riverine	1,500	1/20	1/40	38	75
		intensely used G.-S. woodland	9,800	1/100	1/200	490	980
						528	1,055	2,500
Guinea	246,000	rainforest	10,000	1/20	1/40	250	500
		G.-S, woodland	200,000	1/50	1/100	2,000	4,000
						2,250	4,500	10,000
Sierra Leone	72,000	G.-S. woodland	20,000	1/50	1/100	200	400
		rainforest with secondary & agr.	50,000	1/50	1/100	500	1,000
						700	1,400	3,000
Liberia	111,900	rainforest & mountainous	100,000	1/20	1/40	2,500	5,000	20,000
Ivory Coast	322,000	protected areas	9,000	1/20	1/40	375	750
		rainforest	150,000	1/20	1/40	3,750	7,500
		G.-S. woodland	150,000	1/50	1/100	1,500	3,000
						5,625	11,250	30,000

Table 17, continued.

Ghana	239,000	protected areas	9,000	1/20	1/40	225	450
		rainforest & savanna	50,000	1/20	1/40	1,250	2,500
		G.-S. woodland & cultivated	150,000	1/50	1/100	1,500	3,000
						2,975	5,950	20,000
Sudan	2,500,000	southern sector	500,000	1/20	1/50	2,500	10,000
		dry woodland savanna	690,000	1/100	1/200	3,450	6,900
		humid woodland savanna	350,000	1/100	1/200	1,750	3,500
		montane	7,000	1/50	1/100	700	1,400
		flood plain	250,000	1/250	1/500	500	1,000
		(remainder excluded)				8,900	22,800	80,000
Ethiopia	1,222,000	favorable forest	61,000	1/10	1/20	3,550	6,100
		highlands and parks	549,000	1/100	1/200	2,745	5,490
		remainder	611,900	1/500	1/1,000	612	1,224
						6,907	12,814	30,000
Congo	342,000	southern third wooded savanna	110,000	1/20	1/50	2,200	5,500
		northern two-thirds rainforest	220,000	1/10	1/20	11,000	22,000
						13,200	27,500	55,000
Gabon	268,000	rainforest	--	1/10	1/20	13,400	26,800	50,000
Zaire	2,300,000	rainforest	800,000	1/10	1/20	40,000	80,000	
		miombo & savanna	1,500,000	1/20	1/50	30,000	75,000
						70,000	155,000	300,000

Table 18. Summary of estimated totals of leopard populations in 33 Sub-Saharan African nations, excluding Somalia.

Country	Absolute Minimum	Conservative Estimate	Realistic Estimate
Kenya	6,379	25,640	35,000
Uganda	1,547	3,413	20,000
Tanzania	14,740	36,100	70,000
Senegal	1,435	2,970	6,000
Mali	3,088	6,175	15,000
Upper Volta	1,633	3,265	10,000
Niger	1,527	3,055	5,000
Tchad	4,325	8,650	15,000
C.A.R.	5,450	10,900	20,000
Gambia	528	1,055	2,500
Guinea	2,250	4,500	10,000
Sierra Leone	700	1,400	3,000
Liberia	2,500	5,000	20,000
Ivory Coast	5,625	11,250	30,000
Ghana	2,975	5,950	20,000
Nigeria	4,653	9,305	20,000
Cameroun	4,563	10,705	30,000
Angola	17,369	42,340	87,000
Zambia	18,500	46,250	70,000
Mozambique	16,190	32,378	67,000
Malawi	1,918	3,835	10,000
Botswana	3,165	6,646	20,000
Rhodesia	2,288	6,676	20,000
South West A.	3,477	6,554	20,000
South Africa	3,800	7,150	15,000
Sudan	8,900	22,800	80,000
Ethiopia	6,907	12,814	30,000
Congo	13,200	27,500	55,000
Gabon	13,400	26,800	50,000
Zaire	70,000	155,000	300,000

Table 19. Summary of estimated leopard populations by region.

Region	Absolute Minimum	Conservative Estimate	Realistic Estimate
East Africa	22,684	65,153	125,000
West Africa	41,252	84,180	206,500
Miombo Zone	43,977	124,803	234,000
Southern Africa	12,730	27,026	75,000
Northeastern Africa	15,807	35,614	110,000
Equatorial Rainforest	96,600	209,300	405,000
	233,050	546,076	1,155,500

STATUS OF THE LEOPARD IN SUB-SAHARAN AFRICA

Over the past five years there have been more studies of the leopard in Africa than in the entire preceding history. Besides several ecological investigations in five countries there have been three studies of status and conservation. Myers (1976a) study included Africa below the Sahara; his results are summarized and discussed here. The results of a survey conducted by the U.S.D.I. are presented and evaluated in this report. The present study covered 11 major countries of Sub-Saharan Africa and included a field study in South West African ranchlands. There is still a fourth investigation being conducted by J. Tier and W. Swank, sponsored by the U.S.D.I. (K. Schreiner, J. Tier and W. Swank, pers. comm.).

The results of this study are combined with Myers (1976a) to adjudge status in major countries. Myers provided no explanation of the terms he used to denote status in his report, neither did he summarize status for each country. However, I have gleaned relevant comments regarding status from his study, in an attempt to interpret and summarize status by country, according to what he said. Then the results of this study are presented and conclusions summarized. A separate section presents and evaluates Myers (1976a) results from additional countries not included in this investigation (Appendix G).

EAST AFRICA

Myers (1972:105) earliest results were collected from East Africa. He reported:

> "The preliminary results of these investigations are that the leopard is probably rather more widespread and numerous in parts of Savannah Africa than has been suggested; perhaps it is even much more persistent in tolerable numbers than has been represented. There are valid reports from many parts of East Africa that it is holding out, even in places where, had the pressure of poaching under the inducement of high rewards proved nearly so intensive as has been supposed, there would be little chance for the leopard to survive. For instance, there are leopards not only in the suburbs of Nairobi fringing Masailand, but in the suburbs bordering on Kikuyuland: A stable population seems to be holding out in the Karura forest even with two million impoverished peasants at their back! The same with the environs of Kampala and Entebbe, in the heart of Bugandaland, the same for a list of intensively occupied areas of East Africa and elsewhere. In various habitat types, under varying degrees of pressure, the leopard seems to display an extraordinary capacity to persist."

In his following report, Myers (1973:113) said, "... in East Africa, the leopard is still very widespread and generally maintaining good numbers...". In his final report (1976a), it is difficult to recognize his assessment of status

in East Africa.

Kenya - Myers (1976a)

p.26--"In the Nairobi suburbs, Ngong Hills, neighboring Kamba and Kikuyu country (including Kiambu district with its 600 persons per km^2), Limuru and the Machakos Hills--all areas close to or within heavily-populated--leopards still survive."

p.27--"...despite the existence of areas throughout Kenya with fairly favorable habitats, the present stonghold of leopard is confined to the northern arid zone, which comprises roughly two-thirds of the country..."

p.27-28--"In summary, leopard have declined in numbers and distribution in Kenya during the last decade. They should hold out, however, in many hilly areas of the south, and they could recover to former levels in the north if the considerable trade in skins, which has been maintained for some 15 years (with undoubted over-exploitation in some areas), could be put on a strictly legitimate and properly controlled footing, and if consumers abroad could be persuaded to restrict purchases to legally obtained skins. In other parts of Kenya, poison already presents a greater threat than poaching."

I find it exceeding difficult to interpret Myers' discussion, except to infer that extensive areas remain within and outside parks and reserves in which the leopard may have a satisfactory status.

This Study

The survey returns from nine wardens, biologists and a museum specialist, none of whom have conducted field studies of the leopard in Kenya, indicate that the leopard is not threatened in Kenya, and is probably satisfactory overall (Table 20). The only felid expert, Judith Rudnai, gives a divergent opinion but also wrote me she is not qualified on the subject. Her research has been exclusively on the lion in a limited area, Nairobi Park. Woodley's only indications less than satisfactory apply to settled areas and northeast Kenya, giving most of Kenya a satisfactory status. Other wildlife experts not contacted with questionnaires indicate a satisfactory status in Kenya (Appendix B & E).

The most explicit and thoughtful written responses came from professional hunters (Appendix B), who voice concern for high levels of poaching in certain areas, as well as poisoning by livestock interests. All (and most of the respondents in Table 20) favor trophy hunting as a means of curtailing poaching activity, which is quite reasonable. It must be recognized that the East Africa Professional Hunters Association has from the beginning taken steps to alert governments and the world to poaching and assumed self-constraint in leopard hunting as means of dramatizing the situation (Myers, 1973a). Unlike the poacher, the professional hunter's interest is met by maintaining healthy stocks for sustained yield harvest. Moreover, it is evident throughout these

Table 20. SURVEY RESULTS - KENYA

Respondent	Country	Status	Best regulated use	Experience Type	# Years
J. Barram	Kenya	satisfactory	game	warden	22
P.R. Jenkins	Kenya	pot. endang.	protected	warden	28.5
B. Hern	Kenya	satisfactory	game	warden	6
				pro. hunter	22
F.W. Woodley	Kenya	abundant-parks forests, and reserves	game animal in hunting areas, protected elsewhere	warden	28
		satisfactory south Kenya			
		rare, pot. endangered in settled areas & N.E. Kenya			
		probably satisfactory in coastal areas			
J. Rudnai	Kenya	pot. endang.	protected	wildl. biol.	9
C.E. Norris	Kenya	rare, tending to be abundant	protected	warden	5
M. Sawyer	Kenya	satisfactory	game	wildl. admin.	10
I.R. Aggundey	Kenya	satisfactory	protected	museum spec.	6
M.L. Modha	Kenya	satisfactory	game	wildl. biol.	12
F. Seed	Kenya	satisfactory	game	warden	9
				pro. hunter	20
A.M.D. Smith	Kenya	abundant in places, satis. elsewhere	game	warden	3
				wildl. biol.	3
				pro. hunter	14
A. Dyer	Kenya	pot. endang.	game	pro. hunter	37
P.A. Davey	Kenya	pot. endang. in places, satis. elsewhere	game	safari guide	10
R. Hurt	Kenya	satisfactory	game	pro. hunter	13

results that, save Sudan, professional hunters provided responses comparable to those of wildlife biologists and game wardens.

The estimated population (Table 18) in Kenya could easily range to more than 25,000, most of which occurs in relatively secure areas of favorable habitat.

The leopard in Kenya has a satisfactory status, but unless poaching and world markets are controlled, it conceivably could become rare in parts (see Appendix B).

Uganda - Myers (1976a)

p.28--"Despite this trends (*of increasing agriculture*), the leopard has shown itself to be remarkably persistent. Even along the shores of Lake Victoria where the density of human population tends to be highest, signs of its presence are still to be found..." It is difficult to interpret Myers' assessment of the leopard's status in Uganda, except to say that it may be satisfactory and apparently not exceedingly rare or endangered.

This Study

Responses from seven biologists and wardens in Uganda vary from abundant to potentially endangered (Table 21). The leopard is fully protected there. I believe that the estimated population (Table 18) of 6,163 is conservative by as much as a factor of 5 (e.g. see Appendix B). Without further biological information it is safe to consider the *leopard possibly rare, or satisfactory, but probably not endangered as a whole in Uganda.*

Tanzania - Myers (1976a)

p.28--"So there is a good range of biotypes suitable for leopard. Indeed the species still seems widespread, with signs found by game wardens almost everywhere."

p.29--"In Tanzania as a whole, though leopards will certainly become scarce in areas of expanding agriculture, the future of the species should be assured as long as parks and other protected areas are maintained."

It appears from Myers' report that the leopard has a satisfactory status in Tanzania, and could easily be abundant.

TABLE 21 SURVEY RESULTS - UGANDA AND TANZANIA

Respondent	Country	Status	Best regulated use	Experience Type	# Years
C.K. Otim	Uganda	pot. endangered	protected	warden	7
F.H.O. Opulot	Uganda	rare	protected	wildl. biol.	5
I.F. Drani	Uganda	rare	protected	warden	3
				wildl. biol.	3
M.J. Okua	Uganda	pot. endangered	protected	warden	7
				wildl. biol.	7
B. Hern	Uganda	abundant	game	warden	6
P.S.K.B. Kyeyue	Uganda	satisfactory	game	wildl. biol.	10
A. Omar	Uganda	rare	protected	wildl. biol.	10
A.M.D. Seth Smith	Uganda	abundant in places or satisfactory	game	warden	3
				wildl. biol.	3
				pro. hunter	14
R. Hurt	Uganda	abundant	game	pro. hunter	13
A.M.D. Seth Smith	Tanzania	abundant in places or satisfactory	game	warden	3
				wildl. biol.	3
				pro. hunter	14
J.D. Bygott	Tanzania	probably satis.	protected	wildl. biol.	2
J.P. Hanby	Tanzania	probably satis.	protected	wildl. biol.	2
P.D. Moehlman	Tanzania	probably satis.	protected	wildl. biol.	2
L. Frame	Tanzania	satisfactory	protected	wildl. biol.	4
G. Frame	Tanzania	satisfactory	protected	wildl. biol.	7
R. Hurt	Tanzania	abundant	game	pro. hunter	13

This Study

Few responses were received from Tanzania, where the leopard receives full protection (R. Jingu, Director of Game, pers. comm., 1976). Wildlife officials in Tanzania rate the leopard as abundant and favor game status (Appendix B and E). Two biologists studying large carnivores there rated it as having a satisfactory status. Population estimates are derived from biological field studies in Tanzania (Table 16 and 18); it would be conservative to say there are 40-50,000 leopards in the country.

I rate the leopard as satisfactory, probably abundant in Tanzania.

Conclusion: East Africa

The analysis of the ecology and adaptiveness of the leopard (above) and the probable densities and distribution in suitable habitat imply that the leopard has a satisfactory status in all countries of East Africa. For reasons discussed above, the evaluations of status for some respondents in East Africa are probably biased in favor of a poorer status than actually exists. There are no indications that the leopard's status will significantly change in the forseeable future. Myers'(1976a) implication of poisoning as a major threat, for example, in parts of Kenya, has not been substantiated. The leopard's spacing patterns, response to reduced competition and tendency to avoid livestock plus our study of the leopard in ranching areas of South West Africa indicate that poisoning is not likely to be a limiting factor in East Africa.

MIOMBO WOODLAND ZONE (ANGOLA TO TANZANIA, TAKING IN SUBSTANTIAL PORTIONS OF ZAIRE, RHODESIA, MALAWI AND MOZAMBIQUE AND MOST OF ZAMBIA)

Myers (1976a)

p.29--"The base-line data available on the latter (*effects of human land tenure on miombo woodland wildness making up 85-90% of the region*) suggest that the next ten years will not see great change, and that the biome will remain relatively undisturbed; settlement is likely to be focused on the more open alluvial sectors, so a potential leopard habitat of some 2.5 million km^2 may appear little susceptible to disruption . . . Moreover, the increased 'edge effect' stimulated by shifting cultivation should favor leopard (*and their prey*)..."

From this Myers concludes that the "leopard's density will on the whole probably be reduced by disruptive trends of increasing human settlement", which based on his own presentation is contradictory and surprising. Either leopard numbers, now presently very satisfactory throughout this zone will remain so or will improve, certainly not decline. Even if they did, the leopard would still have to be considered very secure. Using Myers (1976a) own density figures for this region -- *minimum* of one leopard per 20 square kilometers (one per 10 km^2 is probably common) -- in the 2.5 million square kilometers he views as favorable and secure habitat, the region should hold no less than 120,000 leopards.

There are no indications of intensive poaching or deleterious land use trends in the region (below). Estimates based on reliable field studies Tables 16 & 19)*indicate a satisfactory status and probable abundance for the entire region.*

Angola - Myers (1976a)

p.31--"Leopard still exist in virtually all parts of the country even if in low numbers in many regions . . . Meanwhile, the best that can be said is that as recently as the late 1950's, Angola may have had larger populations of leopards than any other Sub-Saharan country with the exception of Zaire, and that, with comparatively low human pressure, much of the country should remain relatively undisturbed for the foreseeable future once the political situation has settled down."

Myers presents no evidence indicating why he says "even if in low numbers," nor is it clear how political upheaval could alter the status of the leopard in Angola. According to his suggestion that the now vacated Portuguese soldiers were the greatest threat to leopards, the situation should improve, not get worse. Even if we allow his *guess* about maximum offtake of leopards amounting to 3,000 -- according to the absolute minimum projection of leopards in Angola

(Table 18) -- the effect would be relatively insignificant. By reading carefully one should be prone to say that there is *every reason to give the leopard in Angola a satisfactory status.*

Zambia - Myers (1976a)

p.31--"Leopards are reported virtually throughout Zambia. They are plentiful in several sizeable areas. The general view of both officials and private conservationists is that numbers should be maintained as long as protective measures remain adequate." Apparently Myers views the leopard as having a satisfactory status in Zambia. Moreover, there is no indication that protective measures have been applied with any effect, or that they need be. Wilson's (1976) study of leopards in crowded Eastern Zambia, where other larger carnivores are reduced or have been extirpated, found relatively high densities and satisfactory status.

This Study

As signatory to the International Convention, the leopard is protected in Zambia. However, the concensus of wildlife biologists and officials surveyed (Table 22) including the Chief Warden, is that the leopard has a satisfactory status and that the best regulated use -- were it legal*-- is as game and fur-bearer (Table 22).

Chief Warden Mukanda believes that poaching is significant and steady, while former Deputy Director and biologist Ansell considers it insignificant. Others including professional hunters not included in the itemized table, consider it significant and steady or increasing. Ansell, a respected biological authority on Zambian wildlife, encourages trophy hunting as a means of curtailing poaching. He provides a discussion of potential policy changes in Zambia as they may relate to the future status of the leopard (Appendix B). Ansell also makes sound recommendations regarding international control of skins and trophy hunting.

The realistic estimate of Zambia is about 70,000, which if anything is conservative. *The leopard in Zambia has a satisfactory status and is probably abundant.* Foreseeable land use and human pressures indicate a stable condition in the future.

Mozambique - Myers (1976a)

p.32--"About four-fifths of the country is *miombo* woodland. Much of this zone is thinly populated, and likely to remain so for at least a few more years, with little modification of wildlands. Both the *miombo* and the coastal plain are suitable for leopard ... Tinley pointed out that considerable sectors of Mozambique are undergoing change: bush and thron-scrub are spreading as a result of over-grazing and over-burning, which enables a stealthy predator like the leopard to extend its range."

* internationally--the leopards are legally hunted in Zambia.

TABLE 22 SURVEY RESULTS - ZAMBIA

Respondent	Country	Status	Best regulated use	Experience Type	Experience # years
P.C. Mukanda	Zambia	satisfactory	game & fur-bearer	wildl. biol.	20
N.H. Chabwela	Zambia	satisfactory	fur-bearer	wildl. biol.	4
W.F.H. Ansell	Zambia	abundant & satisfactory	game	warden	15
				wildl. biol.	12
C. Rieck	Zambia	abundant & satisfactory	game & fur-bearer	wildl. biol.	20+
G. Ambrose	Zambia	abundant	game	pro. hunter	3
M. Fischer	Zambia	satisfactory	game	pro. hunter	3
M. Rowbotham	Zambia	abundant	game	pro. hunter	26

Apparently, *the leopard is satisfactory and probably abundant in Mozambique,* which is the conclusion of Mozambique's leading wildlife authority (Appendix C). The country should have no fewer than 35,000 leopards and 67,000 could be realistic. Assuming the *highest* estimate by Myers of 2,000 leopards taken by poaching is accurate, the minimum estimated population (Table 18) for the country would not have been seriously effected. As poaching has declined and already favorable habitat conditions are improving, future status should remain very satisfactory.

Malawi - Myers (1976a)

p.33--"Leopard distribution seems more or less continuous over the whole 1,000 km from north to south ... G.D. Hayes, who is Secretary of the Malawi Fauna Preservation Society and speaks with 50 years experience in the country, considers that leopard are still widespread, if not always plentiful, in nearly every district, including, for example, the tea area near Blantyre (with its very high human population) and on the outskirts of Zomba ... its present widespread distribution and generally satisfactory status will have declined considerably well before then (end of the century)."

Apparently, at this time, the leopard has a satisfactory status in Malawi, and while Myers predicts it will decline considerably, due to human impacts on the land, he also supports the view that the leopard in Malawi and many other countries persists in *heavily* populated areas, where other species have disappeared.

This Study

No surveys have yet returned from Malawi, however, Principal Game Warden, David Anstey, replied by letter. He said that at present leopard hunting is not allowed. There should be no fewer than about 4,000 leopards in Malawi (Table 18). The terrain and persistence of the leopard in good numbers under intensive land tenures in similar habitat indicate that the leopard is and will remain secure in Malawi. The leopard probably has a satisfactory status in Malawi.

Conclusion: Miombo Woodland Zone

The only possible conclusion to reach based on all evidence is that the leopard has an excellent status in the Miombo Woodland Zone. There are no indications that the leopard will have less than a satisfactory status in this region in the foreseeable future.

SOUTHERN AFRICA

Generally, Myers (1976a) indicates a satisfactory status for the leopard in southern Africa while indicating that poisoning has caused the leopard to become relatively rare in Rhodesia and South Africa. He provides no data for these conclusions. The question of the effect of the livestock industry, the factor Myers (1976a) says has been and will be the major threat to the leopard, is discussed below and in the last part.

Botswana - Myers (1976a)

p.35--"At the present the leopard is widespread (Smithers, 1971) throughout Botswana. Skins are brought in to dealers from all parts of the country, which indicates a sound distribution. In general, the leopard seems to be maintaining itself much better in Botswana than in other countries of the region."

p.36--"Botswana's leopard stocks could surely support an appreciable and sustainable offtake (*of hides*) as there is an established network of reputable traders, and the government has considerable experience of deriving financial returns from wildlife exploitation."

Overall, the leopard appears to have a satisfactory status in Botswana.

This Study

Five surveys returned by wildlife biologists rank the leopard as satisfactory or better, and all favor game status and/or fur-bearing status (Table 23).

The concensus is that poaching is insignificant or significant and decreasing. Trophy-hunting is legal and controlled. All favor trophy hunting and von Richter explains why the U.S. should not prohibit importation of trophy leopards from such countries as Botswana (Appendix E).

The conservative estimates for Botswana suggest a population of only about 7,000 (Table 18). The Okovango Basin area is a gross underestimation, and the density applied to Botswana outside the Okovango and protected areas is probably very low considering that the density of leopards in the sub-desert Kalahari Gemsbok park is 1 to 63 km^2 (Table 16). There may easily be 20,000 leopards in Botswana. *The leopard has a satisfactory status in Botswana* with indications of improving conditions in the future.

Table 23 SURVEY RESULTS - BOTSWANA

Respondent	Status	Best regulated use	Experience Type	# years
A.C. Campbell	satisfactory	game	wildl. biol.	8
			museum	6
W. von Richter*	satisfactory	game & fur-bearer	wildl. biol.	10
R.C. Biggs	abundant & satisfactory	game	wildl. biol.	4
			warden	1
L. Patterson	satisfactory	game	wildl. biol.	5
A. Graham	abundant	game & fur-bearer	warden	2
			wildl. biol.	15
K.P. Carr-Hartley	satisfactory	game	pro. hunter	10

Rhodesia - Myers (1976a)

p.37--"In the opinion of J.V. Wilson of the Bulawayo Museum, few areas have as yet been effectively cleared of leopard, though its numbers have been significantly reduced in the face of recent agricultural expansion. Indeed the leopard seems to have maintained its position better than most wild creatures (*e.g., the lion*) many of which have been grossly reduced in much of the country since 1960."

Myers devotes considerable attention under Rhodesia to the danger of livestock interests' poisoning of predators, including the leopard. Nowhere in the report does he document the actual or potential impact of poisoning, supposedly on the increase, on the leopard, although the reader is led to believe that the effects are drastic. It is unclear in any event what his assessment of status is in Rhodesia, but he implies a poor status.

This Study

There have been several studies of the leopard in Rhodesia; three of the respondents are recognized as authorities on larger carnivores and Grobler spent six years solely studying the leopard. Unanimously they rate the leopard as satisfactory or better, and all favor use as game or fur-bearer (Table 24).

All but one of the respondents considers poaching to be insignificant, and the exception referred to East Africa. Four respondents considered the leopard a nuisance to livestock, but none mentioned poisoning, or that it is a threat to the leopard in Rhodesia. The Director of National Parks and Wildlife Management, G. Child, specifically said that the leopard is *well represented in extensive ranching areas* (Appendix B). While leopards may be poisoned there is no evidence to suggest that poisoning has been or is now a serious threat.

The population estimates for Rhodesia (Table 18) must be considered extreme underestimations considering the *very high*, documented densities found there (Table 16). Leopards are encouraged on about 100 game ranches totalling three million acres (T.W. Coffin - Grey, pers. comm.), which alone could easily account for an additional 2,000 leopards. There could be well over 20,000 in Rhodesia. *The leopard has a satisfactory status in Rhodesia.* In some ranching areas it *may be* the case that in the years ahead, poisoning *could* become a locally limiting factor. Trophy hunting could assist in preventing this possibility (Appendix B & E).

South West Africa (Namibia) - Myers (1976a)

p.38--"All these instances could bring the total offtake (of leopards

Table 24 SURVEY RESULTS - RHODESIA

Respondent	Status	Best regulated use	Experience Type	Experience # years
N.E. Morris	satisfactory	game	wildl. biol.	3.5
A.A. Ferrar	satisfactory	game	wildl. biol.	11
R.H.N. Smithers*	satisfactory	game & fur-bearer	wildl. biol.	20+
J.H. Grobler*	abundant	game	wildl. biol.	6
T.S. Choate*	satisfactory	game & fur-bearer	wildl. biol.	16
J.C. Taylor	satisfactory	game & fur-bearer	wildl. biol.	1
G. Child*	satisfactory	game	wildl. biol.	10+
T.W. Coffin-Grey	satisfactory	game	museum	22
			wildl. biol.	10

for hides) to 400-500 a year. But there are few signs as yet of over-exploitation. The trade in skins began in 1950, and has been conducted with significant quantities since 1960. Several dealers stated that most of their skins came from ranchers who have been regular suppliers for a decade or more, which suggests that the harvest from ranches represents a sustained yield and that leopard in these areas have adjusted to trapping pressure."

Myers adds that the situation described could serve as a model for a management scheme for regulated utilization of leopards. While he believes safeguards would have to be adequate, apparently the leopard has a relatively satisfactory status in Namibia.

This Study

Few survey results were received from South West Africa. One wildlife biologist, R.C. Biggs, rated the leopard as satisfactory and abundant. A professional hunter, V. Grellmann, rated it satisfactory. Both favor game status. Neither considered poaching significant.

The populations estimated indicate at least 6,500 leopards in South West Africa (Table 18), probably several times more and as much as 20,000. *The leopard has a satisfactory status in South West Africa.* Considering the expansive wilderness including relatively favorable habitat outside the ranchlands, and their lack of human pressures and densities, the situation appears secure and stable for the future.

A special study of the leopard's status in South West Africa is in preparation. It supports the conclusion above, and indicates that the leopard fares well in intensive ranching areas.

South Africa - Myers (1976a)

p.39-40--"Leopards have now virtually disappeared from the Orange Free State, the Karroo and the high veld, though occasional individuals still persist close to Pretoria and Cape Town. Natal, except for its game reserves and the Drakensberg escarpment, has been practically cleared of large wild carnivores. The leopard survives, however, in several parts of Cape Province, notably in the mountains paralleling the coast, in the north-west, in the north along the Molopo river and in the Kalahari Gemsbok Park, and in the forest blocks of the south and west. Its numbers have long been thought to be very low, but a recent district-by-district survey has shown that although certainly very sparse locally, the provincial total can be put at 950±200. Nevertheless, the leopard's stronghold now and increasingly in future must be South Africa's parks and reserves ... though artificial forests do not support much wildlife, they nevertheless harbour a good number of leopard... By the end of the decade, the leopard could have been eliminated everywhere in South Africa

except in parks and large reserves, mountain ranges and in forests that still provide plenty of natural food."

As there are no data from South Africa indicating rapid delcine -- in Myers report, D. Hay, Director of Nature Conservation in the Cape, said that numbers are low but fairly stable -- it is puzzling how Myers can conclude that within just a few years the populaticns outside parks and reserves might be eliminated. Widespread forestry practices and much inaccessible terrain including mountains would suggest that such a statement is at present unfounded. It probably is valid to give the leopard a poor status in South Africa as a whole, but it is doubtful if the species can be considered endangered there.

This Study

The picture from South Africa is hardly in line with Myers' implications. Of 15 responses of wildlife biologists, six are from individuals who have intensive experience in the study of large carnivores including the leopard, and of these most qualified persons, only one (the only foreigner, an American, who has least experience and then only in one park) gives the leopard a potentially endangered status outside of parks and reserves. Another considers it rare outside parks and reserves, with the remaining four classifying it as satisfactory in South Africa as a whole. Thus, from what is an amazingly large sample of leopard experts in one country, 66% rate the species as satisfactory (Table 25).

While the leopard is not legally hunted in South Africa, except by depredation permit, nine out of 15 respondents favor game status (or for some populations). Most considered poaching insignificant, but about one-third said it was either significant and steady or decreasing. Only Eloff considers it significant and increasing.

Regarding status in South Africa, Myers (1976a) specifically referred to only two of the persons contacted in this study, Hay and Pienaar. As can be seen from the Table below and in the additional comments received (Appendix B), their assessments are notably lower.

Considering indications that the leopard is fairly numerous in Traansvaal, a conservative estimate was made relative to the Cape figure based on an actual study (Myers, 1976a) (Table 18). The estimate for protected areas is surely low, (see Table 16), and many private reserves with high densities were excluded. Thus, the estimate for South Africa of about 7,000 is surely quite conservative. There could easily be 15,000 or more.

TABLE 25 SURVEY RESULTS - SOUTH AFRICA

Respondent	Country	Status	Best regulated use	Experience Type	# years
F.C. Eloff*	S. Africa	satisfactory	game	wildl. biol.	30
J. Visser*	S. Africa	satisfactory	protected & game	wildl. biol.	17
J. Meester	S. Africa	rare	game	wildl. biol.	26
S.C.J. Joubert	S. Africa	rare	game	wildl. biol.	13
D.E. Wilson	S. Africa	satisfactory	game	wildl. biol.	8
M. Mills*	S. Africa	satisfactory	protected	wildl. biol.	4
J.D.P. Bothma*	S. Africa	rare	game	wildl. biol.	11
U.deV.Pienaar*	S. Africa	abundant & satis.-parks & game reserv. rare-elsewhere	protected fur-bearer, game	wildl. biol.	21
T.N. Bailey*	S. Africa	pot. endangered	protected	wildl. biol.	5
G.L. Smuts	S. Africa	satisfactory	game & fur-bearer	wildl. biol.	7
A.W. Lambrechts	S. Africa	rare	protected	wildl. biol.	7
N. Fairall	Cape only	satisf. & rare	protected	wildl. biol.	16
M.T. Meutis	Natal	rare	protected	wildl. biol.	8
R.C. Biggs	Traansvaal	abundant & satisfactory	game	warden	1
	Natal	rare & pot. endangered	protected	wildl. biol.	4
	Cape	satis. & rare	game		
	O.F.S.	pot. endang. or extinct	protected		

* qualified leopard authorities and/or I.U.C.N. Cat Group members

The leopard is probably rare or potentially endangered in O.F.S., rare in Natal and rare or satisfactory in Cape Province. It appears to be satisfactory in Traansvaal and in widespread preserves throughout South Africa. Overall in South Africa the present status should be rated between rare and satisfactory with present trends being stable.

WEST AFRICA - SAHEL AND SUDANO-GUINEAN ZONES

The sudano-Guinean zone covers an area twice as large as the Sahel, which has recently encountered an aridic trend, apparently ended. The zones form a broad belt across the continent south of the Sahara, passing from desert into scrub-arid scrub, dry steppe and bush and terminating in the south in moist woodland.

Myers (1976a) says that leopards may have stablized or increased recently in the Sudano-Guinean zone, including portions of Sierra Leone, Guinea, Liberia and northern Ivory Coast. In all the sub-Saharan Africa, the west African region probably has the least satisfactory leopard populations; however, *in much of the region it appears that the species status is relatively satisfactory and probably does not deserve endangered status except locally.* Moreover, the regional trend may even be improving due to encroachment of bush from over-grazing and burning, end of the drought in the Sahel portion, increased edge effect in forests from patchy agriculture and so on, all of which favor leopards.

A brief country by country analysis is in Appendix G . It relies principally on Myers (1976a), population estimates and the knowledge of the leopard's adaptability. The general conclusions for the countries in this zone are in Table 27. As I excluded the large Sahel region, where leopards occur, possibly in relatively high densities for aridic habitat, and applied conservative estimates elsewhere, the conclusions should be biased in favor of poorer status.

NORTH EASTERN AFRICA

About 40% of this region is desert or semi-arid. Except for about 20% in the Ethiopian highlands, the rest is Sudano-Guinean woodland with the Sudd swamp in southern Sudan (Myers, 1976a). "A good third (*1,400,000 km²*) of it could provide suitable habitat for leopard, and probably in the past it supported large numbers " (Myers, 1976a:52).

It would appear that at present the region as a whole still supports large numbers.

Sudan - Myers (1976a)

p.52-53--"In general, little wildlife is to be found outside reserves. An exception is the southern border zone, where rainfall rises to 1500mm and is better distributed, and where vegetation patterns are not so susceptible to human disruption. In 1973, wildlife specialists from East Africa reported good numbers of fifteen species of ungulates in these southern territories, and there is no doubt that the 500,000 km² of this region could become (*why become? see following:*) some of the best wildlife country left in eastern Africa when the government establishes conservation programmes. Almost certainly there are plenty of leopard, possibly as many as in Ethiopia, Somalia, Kenya and Uganda together. Most habitats of the region are suitable for leopard, and have been little modified during the troubles of recent years (which had a side-effect of limiting rather than stimulating poaching)."

Sudan has taken progressive steps to conserve and wisely use wildlife resources since Myers' study. The peak offtake of skins from Sudan could hardly have damaged leopards there, and, anyway, it has fallen off to virtually nothing. *Myers indicates no status for the leopard in Sudan, but clearly all evidence suggests a satisfactory and probably stable population.*

This Study

Sudan is the only nation covered in this study in which every wildlife biologist or warden had completely identical responses! All identically checked each of the seven categories of the survey, seen in the two categories included below (Table 26).

The professional hunters see the situation quite the opposite. In comparing R. Hurt's and A.M.D. Seth-Smith's evaluations in Kenya, where they also have extensive hunting experience, their responses for that country conformed with a number of reputable biologists and wardens. The professional hunters and biologists/wardens who responded for Sudan all checked poaching as significant and increasing, except one hunter who chose significant and steady. Considering

TABLE 26 SURVEY RESULTS - NORTHEASTERN AFRICA

Respondent	Country	Status	Best regulated use	Experience Type	# Years
I.M. Hashim	Sudan	pot.endangered	protected	wildl. biol.	4
H.H. Abdelbagi	Sudan	pot.endangered	protected	warden	8
				wildl. biol.	12
M.A. Bedawi	Sudan	pot.endangered	protected	warden	18
E.O. Hashaballa	Sudan	pot.endangered	protected	warden	3
				wildl. biol.	14
R. Hurt	Sudan	satisfactory & abundant	game	pro. hunter	13
G. Ambrose	Sudan	abundant	game	pro. hunter	6
A. Osman	Sudan	abundant	game	pro. hunter	24
AMD Seth-Smith	Sudan	abundant	game	pro. hunter	14
				warden	3
				wildl. biol.	3

Myers (1976a) favorable assessment, above, and that Sudan has a newly instituted wildlife conservation program the anonymous comments (Appendix B) may be apropos, "...I cannot understand the government closing leopard here this year, except for the fact that they must have been receiving considerable pressure from other countries to do this." Perhaps the new guard is a bit overzealous and wishing to conform with international expectancies.

The populations estimated for Sudan include only the more favorable habitats for the leopard (Table 18), and density figures used are surely very low (Table 16). It is not unlikely that the southern sector alone has well over 50,000 leopards, as this appears to be optimal habitat.

Discounting the responses of the government as unfounded, which I believe to be reasonable based on all the evidence presently at hand, the *leopard has a satisfactory status in Sudan.*

Ethiopia

p.57--"Where blocks of forest still remain comparatively undisturbed, large numbers of unulates, and particularly of blue, de Brazza's, vervet and Colubus monkeys and baboons (*which decidedly are not ungulates*) are still found. In these areas the leopard's traces are so common that its density may sometimes be as high as two per 3 km^2 (Brown and Urban, 1970). Without such concentrations, the high offtake of the last decade could scarcely have been sustained since outside forest areas the leopard has become scarce and locally rare, even though it is still widespread in areas such as the Omo River lowlands and mountainous areas of several provinces."

Note Myers' statment, "How far current - yield (*of skins*) constitutes an increasing proportion of declining populations, is difficult to say." One might first ask if populations are declining. While there are many reasons to believe that the leopard has declined in Ethiopia, at least in certain sectors and habitat types, the species obviously fares well in very much of the country.

Myers has devoted elsewhere (1973b) and in his most recent study (1976a) much inference about declining trends of Ethiopia leopards based on the high offtake of hides. But he himself points out that high offtake can imply high populations, similarly, a decline in yield does not necessarily indicate a decline in numbers, but, as in several countries, probably indicates an adapting leopard population which has become more wary and better able to elude poaching. Thus, considering that poaching has been producing relatively high numbers of leopard hides from Ethiopia for over 15 years, we might just as well conclude that current yields suggest a stable, even an increasing population! Myers does allow that with proper government controls the fur trade in leopards in Ethiopia could be an important, sustained contribution to the national economy.

Overall then, I am led to conclude that *Ethiopia has a satisfactory status with a possible trend of decline but that probably is not serious.*

This Study

Deputy Chief Game Warden L. Berhanu, (warden and biologist for 15 years) is the only respondent to data from Ethiopia. He considers the leopard abundant and best utilized as a game species. He said that poaching is significant and decreasing, and made a plea for the U.S. to cease discouraging legal trophy hunting (Appendix E).

The population estimates are very conservative (Table 18), as the optimal "favorable forest" habitats (Table 16) alone may well support 12,000 leopards or more. I would expect there to be more than 30,000 leopards in Ethiopia. *The leopard has a satisfactory status in Ethiopia*, and given revision of foreign laws to encourage trophy hunting, and, as Myers (1976a) hints, to allow for regulated fur trade, the future of the species in Ethiopia could be assured indefinitely in a satisfactory status.

Somalia

Myers presents a fairly convincing case that for a number of reasons the leopard is truly rare in Somalia and that it has declined markedly in recent years. Probably the most intensive poaching and effect has occurred in Somalia compared with anywhere else in Africa. According to Myers, the level has dropped considerably with strong enforcement of protective regulation by the government. There are however leopards in suitable habitats in several areas of Somalia and given protection the animal should be found there for decades ahead. It is reasonable to conclude that the *leopard is probably rare in Somalia but on an upward trend.*

EQUATORIAL RAINFOREST

Rainforest biome covers almost 10% of Africa and lies mostly in Congo, Gabon and Zaire (Myers, 1976a). The fur trade has been virtually nil in this huge area and land use by man indicate no longer-term trends which could significantly alter the quality of habitat for the leopard. Moreover, the *highest densities of leopards anywhere probably occur in this region* (Table 16).

Congo - Myers (1976a)

p.59--"There is no good reason to suppose the status and prospects of the leopard are anything but satisfactory."

The leopard population in Congo could easily by 55,000 or more (Table 18) and future prospects are excellent. *The leopard is satisfactory and abundant in Congo.*

Gabon - Myers (1976a)

p.61--"...the leopard's status and prospects appear to be as good as in other coastal countries of western Africa many times as large."

The number of leopards in Gabon could easily be more than 50,000, and there is no indication of a decline in the future. *The leopard is satisfactory and abundant in Gabon.*

Zaire - Myers (1976a)

p.61--"...there is good reason to believe that at least in some parts of the rainforest (which totals 800,000 km^2 in Zaire, with another 450,000 km^2 in Congo and Gabon) leopard densities may be as high as one per 3 km^2 and sometimes even higher." (*Or possibly 416,666 leopards or more in this region alone*) "Leopard populations are not likely to be unduly depleted in the foreseeable future."

There are likely to be more than 300,000 leopards in Zaire. The future for the leopard appears very satisfactory. *The leopard is satisfactory and abundant in Zaire.*

STATUS OF THE LEOPARD IN SUB-SAHARAN AFRICA:

CONCLUSIONS

The conclusions reached as to the status of the leopard in 33 countries of sub-Saharan Africa are summarized in Table 27. Eleven of the 13 countries included in this study are rated as satisfactory or abundant and satisfactory. Only two, Uganda and South Africa are rated lower, as rare to satisfactory, neither as endangered, and both probably stable. Uganda probably has a satisfactory leopard population. The interpretation for 20 other countries were 15 as satisfactory, 4 as unknown but probably not endangered and only one as rare, Somalia, where improvement is indicated.

According to U.S. law (and the currently accepted ecological concepts and practices which treat *populations*, not species) a species cannot be classified as endangered in a continent unless it is endangered throughout that continent. But, individual populations for which scientific evidence indicates, can be classified as endangered and given appropriate protection. The four "unknown" countries and Somalia could presently deserve endangered status as a safeguard until more is known or conditions improve. Thus, of 33 countries, only five, or only 15% might warrant endangered status, and these largely from ignorance, which is insufficient for such classification according to U.S. law. I doubt that the leopard is really endangered with extinction in any of the 33 countries.

The following is a personal communication from N. Myers:

"As indicated in detail in the Monograph (*Myers, 1976a*) that arose from a two-year survey throughout Africa south of the Sahara, published in May this year by IUCN and WWF in Morges, Switzerland, the leopard enjoys adequate status in terms of its entire range in Africa. By "adequate", I mean that, while the species is declining in numbers, as are virtually all species of wildlife by virtue of expansion of human numbers and human aspirations, *the leopard does not appear to be losing numbers so rapidly as had been feared, whether through the activities of the international fur trade, or because of habitat loss, or for whatever cause, and the leopard does not appear to be losing numbers at a rate to threaten its survival in the foreseeable future* (my emphasis). It is not nearly so badly placed as the cheetah, and I would be extremely surprised it it were not a good deal more numerous at present, with better prospects for the future, than is the case for the lion, the hippo, the giraffe, and several other species which are not generally thought of as being under threat (though all these other species of course continue to lose numbers at accelerating rates, and their status within only a few more years, at most one decade, must be viewed with concern)."

In keeping with Myers' overall status assessment, the leopard has a relatively satisfactory status in Sub-Saharan Africa. It certainly is not endangered, and in nearly all of the sub-Saharan nations of Africa has a satisfactory status with reasonably satisfactory trend. The leopard is likely to retain a better status in Africa, and probably Asia, than any larger mammal.

Table 27. Summary by country of the status of the leopard in sub-Saharan Africa according to Myers (1976a) evaluation of Myers (1976a) by author, and for 13 countries the preliminary conclusions of this study. A "?" indicates the author's inference.

Country	Myers (1976a)	interpretation of Myers	conclusions/this study
Kenya	not clear; recommends skin trade if properly controlled	satisfactory	satisfactory
Uganda	not clear; persistent even in areas of high human density	probably satisfactory	rare to satisfactory, probably not threatened
Tanzania	not clear	satisfactory, probably abundant	satisfactory and abundant
Angola	satisfactory?	satisfactory and abundant	satisfactory and abundant
Zambia	satisfactory?	satisfactory and abundant	satisfactory and abundant
Mozambique	satisfactory?	satisfactory and abundant	satisfactory and abundant
Malawi	"generally satisfactory"	satisfactory	satisfactory
Botswana	satisfactory?	satisfactory	satisfactory
Rhodesia	not clear	satisfactory but declining	satisfactory
South West Af.	not clear but indicates no current overexpoitation or decline	satisfactory	satisfactory
South Africa	rare?	rare outside parks and preserves, not endangered	rare to satisfactory and stable
Senegal	satisfactory but declining?	probably satisfactory	--
Mali	"declining"	unknown but probably not endangered	--
Upper Volta	"declining"	unknown but probably not endangered	--
Niger	satisfactory?	probably satisfactory	--
Tchad	satisfactory?	probably satisfactory	--
C.A.R.	"fairly satisfactory"	satisfactory	--

Table 27 continued.

Gambia	not clear	probably satisfactory	--
Guinea	satisfactory?	satisfactory	--
Sierra Leone	declining?	probably satisfactory but declining	--
Liberia	satisfactory?	satisfactory	--
Ivory Coast	not clear	satisfactory	--
Ghana	not clear, possibly rare?	unknown, probably not threatened	--
Togo and Dahomey	not clear	probably satisfactory	--
Nigeria	declining	unknown, probably declining but not threatened	--
Camerouns	satisfactory?	satisfactory	--
Sudan	not clear	satisfactory and abundant in extensive areas	satisfactory and abundant
Ethiopia	"declining"	satisfactory, some populations abundant, some declining	satisfactory
Somalia	rare, possibly endangered?	probably rare but increasing	--
Congo	"satisfactory"	satisfactory and abundant	--
Gabon	"satisfactory"	satisfactory and abundant	--
Zaire	satisfactory?	satisfactory and abundant	--

STATUS GIVEN BY THE U.S.D.I. AND THE NEED TO RECLASSIFY THE LEOPARD

The original classification in 1972 of the leopard as endangered by the U.S.D.I. was based largely (see Paradiso, 1972) on the then as yet unpublished proceedings of the First International Symposium on the World's Cats (Eaton, 1973), especially the paper by Norman Myers (1973a) in those proceedings. The decision about the status of the leopard was--we now see--appropriately resisted by the U.S.D.I. personnel on the grounds of lack of evidence plus contrary indications against endangered status (e.g., Goodwin and Denson, 1971; E. Denson, pers. comm., 1972-74). Myers' (1973a) paper was largely rhetoric and harvest figures from importation into the U.S.; his correspondence with wildlife authorities was limited geographically. Nonetheless, then current opinion and mounting public pressure resulted in classification as endangered. Although evidence was meagre, the scientific body of felid conservationists backed a "conserve now, study later" philosophy.

Since Myers' (1976a) field investigation ended (in 1974), the U.S.D.I. conducted its own survey in 1975 to reconsider the status of the leopard in accordance with increasing indications that the leopard was not endangered. The survey also considered whether or not the clouded leopard should be considered as a foreign endangered species. The survey was actually carried out by the U.S. Department of State on behalf of the U.S.D.I., via the foreign embassies, of which few staffs probably have wildlife biologists. Peculiarly, the Office of Endangered Species of the U.S.D.I. is legally restricted to such avenues in dealing internationally (K. Schreiner, pers. comm., 1976), which should be a severe handicap for its staff of otherwise competent biologists.

I have reviewed the responses provided the U.S.D.I. by the State Department; the pertinent comments are summarized (Table 28). The quality of these reports and their usefulness is indicated, but moreover by the fact that normally only one person was contacted in a country. In one case the conclusions reached were based solely on an animal dictionary. In another, the following comment was made; the statement in parenthesis is the State Department's respondent:

> "Leopards (no distinction is made between Panthera Pardus and Neofelis Nebulosa) exist in small numbers in both the Keran and Fazao reserves in Togo." *Neofelis nebulosa* is the clouded leopard, which occurs only in Asia.

While some of the assessments inferred or clearly stated in the survey may be correct, the validity of the survey as well as its interpretation need be seriously questioned. I quote the following letter from Curtis Bohlen, Assistant Secretary for Fish and Wildlife and Parks, U.S.D.I.:

> "Mr. Jonas comments that 'scientific evidence abounds that demonstrates the leopard is not endangered except in limited areas.' We would welcome receiving such evidence. On April, 1975, we published a notice in the *Federal Register* that we were initiating a review of the

Table 28. Status Survey Conducted by the U.S. Department of State for the U.S. Department of Interior.

Country	Date of Reply	Status Suggested or Indicated	Status Inferred by U.S.D.I.
Mauratania	1975	"no recent threat"	endangered
Lesotho	1975	"considered endangerd"	"
Upper Volta	1975	unknown	"
Guinea	1975	no information	"
Egypt	1975	"no leopards"	"
Zambia	1975	"no estimate"	"
Tanzania	1975	"not considered endangered or threatened"	"
Mozambique	1975	"never been considered an endangered species", "quite abundantly found all over the country"	"
Malawi	1975	"threatened"	"
C.A.R.	1975	protected, but status unknown	"
Togo	1975	protected since 1936, but hunted & legally exported	"
Swazi	1975	"no leopards"	"
Spanish Sahara	1975	"no leopards"	"
South Africa	1975	no response	"
Niger	1975	not protected, maybe rare, status unknown	"
Ghana	1975	"hardly every seen", "considered endangered"	"
Senegal	1975	"evidence of a large leopard population", "no actual count", "hunting the leopard is permitted-little is actually done"	"
Gambia	1975	"fairly rare"	"
Dahomey	1975	"few...almost never sighted", "semi-protected"	"
Tchad	1975	unknown	"
Angola	1975	not protected, much habitat	"
Botswana	1975	not clear, but presently closely regulated	"
Cameroun	1975	"protected species", status unknown	"

leopard to determine whether any populations did not qualify as endangered species under the provisions of the 1973 Act. We have been conducting this review for nearly one year. To date, we have not been able to locate any scientific or commercial data which would warrant downgrading any population of the leopard. During the course of this review, all the countries in which the leopard resides were consulted (*the State Department survey in Table 28 , also see Appendix C*). Thirty-seven countries replied to our inquiries, only five of which indicated a possibility that the leopard may not be endangered. None of the five countries provided any data to substantiate their views that the species is not endangered there."

From the 37 countries contacted, I listed in Table 28 all the countries in Africa which replied to the U.S.D.I. The remainder were Asian. Of those in Africa, Egypt, Swazi, and Spanish Sahara reported *having no leopards at all*; the species could hardly be endangered there. Swazi, Lesotho and Togo are very small so that even if leopards were endangered in them, this could hardly favor an endangered classification Africa-wide. Excluding these five, the list in Africa referred to by Bohlen includes only Malawi and Ghana, which could have a threatened or endangered status. Malawi is small but has a relatively satisfactory status according to Myers (1976a) and this study (Table 27). Ghana could conceivably warrant less than satisfactory status but probably not threatened or endangered.

Bohlen's reference to five countries *that did not provide* any data to substantiate their views that the species is not endangered there include Tanzania, Mozambique and Zambia, the responses from which are in Appendix Clearly the leopard could not be classified as endangered on the basis of the U.S.D.I. survey in any of these countries. A State Department report that fails to descriminate between the leopard and clouded leopard and which is completely unclear as to the status of the leopard in the country is interpreted such that the leopard is given an endangered status by the U.S.D.I. On the other hand,when the leading wildlife authority or official (as from Mozambique and Tanzania, see Appendix C) of a nation specifically expresses that the status of the leopard is definitely not threatened or endangered, Bohlen considers the report as unsubstantiated.

Apparently, Bohlen included countries that indicated an unknown or "protected" status as those with endangered leopards. But "protected" in some of these countries means that the leopard is protected as a game animal to be hunted, not that it is endangered. The cottontail rabbit is a protected species throughout the U.S., but it is hardly endangered. It is unfortunate that the survey conducted lacked information from such important countries as Kenya, Ethiopia, Sudan, Uganda, South West Africa, Zaire, Congo and Gabon, all but possibly one indicated to have a satisfactory population of leopards in this study (Table 27).

As the Endangered Species Act of 1973 (16 U.S.C. 1531-1543; 87 Stat. 884) allows the "endangered" classification to be applied selectively to different

portions of the range of a species, the question is not the status of the leopard in Asia or Africa, but precisely according to specific country or even more specifically. It is also the intent of the law that sufficient evidence be utilized in classification or removal from the "endangered" or "threatened" categories. We could hardly consider Bohlen's criteria for evidence and evaluation as sufficient.

Not all is lost, however, as noted in the following letter from Harold O'Connor, Acting Associate Director, U.S.D.I.:

> "In addition we anticipate publication shortly of Dr. Norman Myers' report on the status of the African Leopard. Dr. Myers has spent months on the African continent interviewing knowledgeable persons, and has recently presented his findings to the International Union for the Conservation and Natural Resources for publication. Dr. Myers' data, when available to us, combined with the forthcoming results of our inquiries should enable us to develop a clearer picture of the status of the Leopard worldwide. *If the data indicate that certain populations of the Leopard are threatened rather than endangered, we shall take action promptly to propose such a change in the listing*" (my emphasis).

If O'Connor's statement is to be taken at its face value--now that we have Myers' (1976a) report, as well as this one -- the U.S.D.I. should elevate the status of the leopard in many countries of Sub-Saharan Africa. Also, Keith Schreiner, Chief of the Office of Endangered Species, U.S.D.I. (pers. comm., 1976 to S. Levy) said that a letter provided from the chief wildlife official of an African country which specifically states that the leopard is not endangered there would be sufficient grounds for his Office to reconsider classification. The U.S.D.I. (see Appendix C) already has possession of such letters, and this report contains several which also plead for more reasonable regulations in the U.S. so as not to prevent importation of legally acquired trophies. In the opinion of several head game officials in Africa (Appendix E) U.S. regulations classifying the leopard as endangered have hampered wildlife conservation efforts abroad.

As a signatory to the International Convention, the U.S. is not bound to prohibit importation of legally acquired leopard trophies from foreign nations, but it has chosen to do so anyway. The already existing Lacey Act would have prevented importation of illicit hides into the U.S. but with listing as an endangered species economic hardship has been unduly placed on developing nations economies, not to mention tremendous and unnecessary hardship for normal operations of the zoos of America in shipping and trading leopards, which are very abundant in captivity (Eaton, 1975).

The following quote is from U.S. Senator (Alaska) Ted Stevens (1976). It summarizes the problem of reclassifying a species on the U.S. list of endangered species. Stevens recognizes the difficiencies in the present U.S. system of evaluating status of foreign species.

"But, unfortunately the (U.S.) review process of endangered species is not working as some of us hoped (*and the law stipulates*). The Fish and Wildlife Service has been very slow in reviewing the list and revising it to account for differences in local conditions (*as specified by the 1973 Endangered Species Act*). Of the 405 species on the endangered list when the 1973 act became law, only twenty have been or are being reviewed to determine if they should remain endangered throughout their range. Of particular concern is the status of the leopard. There is strong evidence that the leopard was not in danger of extinction when added to the list, and now 17 of the 19 African, Middle Eastern and Asian wildlife agencies which provided information about endangered species indicated that the leopard is not endangered.

Another very real problem with the endangered species act is the ill-will it has generated abroad. The Lacey Act prohibits the importation of any wildlife taken contrary to the law of the country of origin."

Upon being presented the results of Myers (1976a) and the preliminary results of this study, Bohlen (Appendix C) appeared to change his assessment of the leopard. But within a few days he expressed a contrary point of view that precisely counters the philosophy and intent of U.S. law (letter to Wirth, Appendix C). In essence, one paper (Myers, 1976a) was the evidence placing the leopard on the U.S. list. An extensive study (Myers, 1976a) subsequently conducted by the author of that original paper plus this study are now considered insufficient to remove the leopard. Instead the U.S.D.I. is spending U.S. tax money to conduct still a third study. This is blatent over kill. U.S.D.I. should get its priorities straight. The money they are needlessly spending on a leopard survey could be spent in important ways on really endangered species.

It is my conclusion that now that we have conserved and studied, the evidence (Myers, 1976a; this study) indicates a definite need for reclassification of the leopard to no less than "threatened", and this primarily as a means of controlling illicit smuggling. A more intelligent policy toward evaluation of status is obviously warranted. Equally important, we require an enlightened policy towards the positive benefits from the utilization of the leopard as a valuable resource to many nations and their conservation programs.

FUTURE STATUS OF THE LEOPARD:

CONFLICTS OF INTEREST AND ECONOMIC INCENTIVES

The leopard is not a "common property resource" (Myers, 1976a) nor is it likely to become one. In an interview with S.C. J. Joubert, Chief Research Officer, Kruger National Park, R. Mc Vittie was told that he felt that when the responsibility was given over to everyone, no one assumed responsibility. This is precisely the problem of Myers' theme of common property resourse (see Foreword for an explanation). For most African nations to assume responsibility for the conservation of the leopard, its habitat and their wildlife, the leopard has to be economically valuable. Its conservation will not be effected by the world at large, but it will be managed according to its values where it occurs. At present the leopard in Africa is valued largely by the poacher and a very small number of conservationists and hunters (Table 29). The leopard is highly valued by trophy hunters and it could become a nationally important resource worth managing as a fur-bearer, as in Botswana (W. Richter, 1971; pers. comm., 1976; Butynski, 1975; also see Myers, 1976a). The poachers interest is not sustained yield and conservation of the resource, but maximization of his profit at expense of the resource. Moreover, the leopard has many negative values attached to it by most sympatric peoples. It is feared as a killer of humans, however unrealistic this attitude may be, and as a depredator of livestock. To the meat hunter it is a competitor worth erradicating if possible(Table 29).

It was the general conclusion of Myers (1976a) that poaching of leopards for hides has not been limiting in effect. Poaching may have been important in the decline of leopards only in one country of Africa, Somalia. Somalia is the only nation in Sub-Saharan Africa where it can be said that the leopard is, or was, rare and possibly endangered. Myers (1976a) believes that the U.S. closure was insignificant because equal levels of offtake were maintained, merely being diverted to other markets.

To describe the recent and still widespread international response to the suspected threat of skin poaching to leopards in the vast majority of Africa as alarmist would be mild indeed. This is in keeping with Myers' (1976a) overall assessment that other factors far outweigh poaching in their potential impact on leopards in Africa. At present, conflict with livestock interests is probably not serious (below). The other major factor is habitat change induced by man, and in many countries the leopard may actually benefit by such changes. The future of the leopard is very promising relative to other larger mammals of Africa.

Conflict with Livestock Interests

According to Myers (1976a), the leopard's status remained satisfactory until at least of end of WWII, "thereafter the bread-scale use of prophylactics for humans and livestock triggered an accelerated change...the leopard began to decline over wide tracts of Africa." But where in Myers (1976a), or anywhere, is there evidence for this? He repeatedly says that poisoning has been a serious mortality factor for the leopard causing it "to decline over wide tracts of Africa". Does he mean locally in South Africa, Rhodesia and Kenya? Even in

Table 29. Responses of wardens, biologists and professional hunters regarding the attitudes of people about the leopard in ten nations. Generalized and specific geographical scores are separate.

Country	Nuisance/ danger or threat	Indifference	Valuable	Money/Poaching
KENYA	5	2	3	2
African farmers	3			
Conservationists and hunters			3	
UGANDA	3	3	3	
TANZANIA	1	1	2	
ETHIOPIA	1			
SUDAN		3		4
ZAMBIA	2	2	2	
Villagers	2			
Urban		1		
Conservationists and hunters			2	
BOTSWANA	3	2	2	
RHODESIA	1	1	3	
Livestock owner	4			
Rural/Urban	1		2	
Conservationists and hunters			3	
SOUTH AFRICA	5	5	2	
Farmers	6			
Urban	1	2	1	
Conservationists and hunters			4	
SOUTH WEST AFRICA	1			
	40%	22%	32%	6%

these countries, poisoning is not indicated as limiting. Elsewhere (*New York Times* 23 July 1976) Myers stated "Through the attention of poachers and stockmen, it (the leopard) has been all but extirpated from at least half the countries in Africa." There is no evidence in his monograph (1976a) or anywhere that the leopard is nearly gone from half of Africa's countries, much less that poaching and stockmen have been the cause.

It is probably true that farming of cattle is on the increase in parts of East Africa, West Africa, Rhodesia and South Africa. However, Myers (1976a) pointed out that grazing lands are being taken over by bush or being abandoned in large areas of West Africa and significant portions of such countries as South West Africa and Mozambique. Of course ranchers fear predators and attempt to erradicate them, although Myers (1976a) said that in several countries of West Africa, there is no conflict to speak of between ranching and leopards that occur in the ranchlands, which is the case in South West Africa (this study).

There is no indication of a serious threat at present to the leopard except in some local ranching areas. If control efforts were to become more intense and widespread, and if the leopard were found to be jeopardized, what could offset such a trend? Not conservation, nor probably government, for as long as ranchers incur even very minor losses, they are prone to take control in their own hands and it can hardly be regulated. Attitudes of ranchers towards predators they fear--realistically or imagined--are very resistant and next to impossible to change.

One obvious solution would be to create an incentive for the rancher to value the predator. A number of cattle ranches in Rhodesia hold wildlife and leopards because these are profitable as hunted game (P. Johnstone, pers. comm.; O. Celluci, pers. comm.).

Ranching of game for protein is promising but not for predators that are considered a threat, which, without an offsetting economic incentive, results in control efforts. The only incentives to maintain predators in either domestic and/or wildlife ranching are sport hunting and the fur trade, as in South West Africa--(Myers, 1976a) prior to the U.S. ban on trophy leopards, after which only the fur trade remained significantly active--and Rhodesia.

The problem is not the status of the leopard. It is not even "in danger of danger." Rather the problem is what can the deopard do for itself and other wildlife. By discouraging the use of the leopard, it and the communities that support it are less likely to be conserved in the future. To solve the problems it is necessary to see that it is important to use the leopard as an economically important resource. Otherwise, in time, competing interests could really have

an effect on the status of the leopard and many species. Trophy hunting and the fur trade are essential factors favoring the leopard and all African wildlife in the future.

The fur trade surely can be conducted on a sustained yield basis (it largely has been such even while illicit) and it is time to effect policies and practices to regulate harvest and make it profitable conservation for developing nations. This is how and where our assistance to the leopard needs to lie. Full protection and blatent emotionalism (e.g., see Hamman, 1970) perpetuated by the western world on peoples with different values are counterproductive, and, in the long run, the real threat. Trophy hunting is not a problem as far as regulation is concerned, neither could it overharvest a population. It is so lucrative and inconsequential to population status that it should be encouraged by all countries immediately.

The Value of the Leopard as a Fur Bearer

According to Myers (1976a) the *maximum estimate* of offtake of leopards from poaching, including induced mortality, may have reached 50,000, with about 20,000 skins actually being sold. Using his various figures, the average price paid per skin today could be $200. Thus in a given year, the whole of Africa would gain as much as $4,000,000 from what remains a largely illicit market. Virtually none of this foreign income is taxed, nor does it enter the accounts of game departments except in bribes, including high-level game officials in countries including Kenya. In other words, none of the income is used in any way in the interest of wildlife conservation. Properly controlled it could be an important source of income for maintenance and acquisition of wildlife habitat, conduction of biological research including monitoring of populations and trends and establishment of quotas, control of poaching and so on. The overall effect of a legal market could of course be most important by creating a conservation ethic in the interest of the nations involved, and thus, in the interest of all peoples concerned about wildlife in Africa.

Properly controlled, 10% of a stable breeding population probably could be harvested per year on a sustained yield basis. More research is needed on the productivity of feral leopard populations being harvested, and to evaluate the effects of harvest on population dynamics. Reproductive success may increase under regulated harvest, as in the lion (Eaton, 1974) and many game species. Presently, the data from field studies (Hamilton, 1974; Bertram, 1975; Horn and Bailey, 1974; Moss, 1975) indicate that males are *far more* trap prone, probably as they have larger home ranges and are more mobile. The leopard is polygynous (Eaton, 1976b) so 10% removal, mostly of males, should tend to have minimal impact if any.

At this time it is quite safe to assume that a 10% managed harvest would have no impact on a population. Using the conservative estimates in Table 18, an annual harvest of 54,000 leopards would not seem unreasonable. Probably the Equatorial Rainforest and Miombo Woodland zones could sustain such a harvest.

An annual harvest of about 50,000 leopards could produce about 5,000 coats or their equivalents (Myers, 1976:71). According to current retail values, the income to Africa--if finished products were distributed from there--could be about $50 million with a final turnover of $100 million. Present stocks in Equatorial Africa and the Miombo Woodland probably could *each* produce $20 million annually, although at such supplies income would decline.

If the leopard population estimates are arrived at conservatively as here, and almost all evidence indicates no serious decline throughout most of the leopard's range, then Myers' guess about a maximum of 50,000 leopards killed--*not removed*--by poaching might be completely insignificant in effect. And generally, he concluded this anyway. What is important is to regulate harvest so as to distribute it and prevent over-utilization of discrete populations.

The constraints for a regulated fur-trade will have to be developed. At present, then, the only legitimate harvest is trophy hunting.

Trophy Hunting as a Valuable Conservation Tool for the Leopard

Trophy hunting is an important source of foreign revenues for many countries and their conservation programs. While present American and European attitudes tend to disfavor sport hunting and trophy hunting in particular, there is no evidence from any source that trophy hunting in Africa is harmful to any wildlife or game populations. The survey conducted to U.S. hunters who hunt trophies in Africa indicates that trophy hunting is enormously important to the economics of many nations (Table 30). About 200 hunters were sampled, of which from 35 to 75 hunted in Africa each year from 1970 to mid-1976. They spent a total of $3,917,848 primarily in nine countries during this period, and killed 87 leopards. With *at least* ten times this number of U.S. hunters hunting in Africa per year during this period, the estimated amount of money spent by American hunters alone would be $39 million. With double this number to include European, Asian and Japanese hunters, the amount spent by trophy hunters *in Africa* in 1970 to mid-1976 would be about $80 million, a significant sum for mostly impoverished nations where wildlife has little other economic value (except in the very unusual country such as Kenya). Obviously trophy hunting ranks very high among incentives for wildlife in Africa. For example, the income from the leopard skin trade from 1970 through mid-1976 could not exceed $26 million, or $54 million less than trophy hunting, which unlike the skin trade, is tightly regulated and controlled. Moreover, a significant amount of the money spent in Africa by trophy hunters goes towards wildlife conservation.

From 27 to 67 U.S. hunters *each* paid game departments for licenses an average of $1,194 to $2,663 per safari from 1970 to mid-1976 (Table 31), for a total of $725,663 and about $7 million for all American trophy hunters, and an equal amount by foreign hunters from elsewhere, or $14 million, all of which directly pays for wildlife conservation. Almost all experts, be they I.U.C.N. Cat Group members, game wardens, biologists or game department heads agree that trophy

Table 30 . Responses of 219 U.S. trophy hunters: numbers hunting, amount spent *in African countries* and number of leopards killed from 1970 to mid-1976

Year	Countries Hunted	# Hunters in Sample	Amount Spent in Countries	Total Spent in Countries	# Leopard Killed
1970	Botswana	8	$10,350	$82,800	1
	C.A.R.	1	10,000	10,000	0
	Kenya	10	7,145	71,450	4
	Mozambique	5	4,540	22,700	2
	Rhodesia	1	5,000	5,000	0
	Tanzania	5	7,039	35,199	4
	Uganda	1	8,000	8,000	0
	Zambia	7	8,107	56,750	6
	2 or more	7	9,271	64,900	0
	8	45	$7,928	$356,799	17
1971	Angola	1	$ 5,100	$ 5,100	0
	Botswana	1	4,000	4,000	0
	Kenya	5	5,780	28,900	1
	Mozambique	5	6,800	34,000	4
	Rhodesia	1	6,000	6,000	0
	S.W.A.	1	700	700	0
	Sudan	1	7,000	7,000	1
	Tanzania	6	10,500	63,000	6
	Zambia	6	6,166	37,000	2
	2 or more	7	13,214	92,500	0
	9	35	$ 8,020	$280,700	14
1972	Angola	4	$ 7,250	$29,000	2
	Botswana	5	8,520	42,600	0
	Kenya	10	12,349	123,490	6
	Mozambique	5	6,360	31,800	3
	Rhodesia	2	9,000	18,000	0
	South Africa	1	15,000	15,000	0
	Sudan	1	8,475	8,745	0
	Tanzania	7	10,391	72,740	4
	Zambia	1	10,000	10,000	1
	2 or more	8	12,422	99,380	0
	9	44	$10,238	$450,485	16
1973	Angola	6	$ 8,200	$49,200	3
	Botswana	4	11,750	47,000	0
	Kenya	24	9,153	219,695	4
	Mozambique	6	7,116	42,700	2
	Rhodesia	4	5,750	23,000	0
	South Africa	1	6,5000	6,500	0
	S.W.A.	1	9,000	9,000	1
	Sudan	2	7,799	15,598	0
	Tanzania	9	7,888	71,000	2
	Zaire	1	7,500	7,500	0
	Zambia	2	9,000	18,000	1
	2 or more	15	14,840	222,600	0
	11	75	$ 9,757	$731,793	13

Table 30

Year	Countries Hunted	# Hunters in Sample	Amount Spent in Countries	Total Spent in Countries	# Leopard Killed
1974	Angola	5	$ 8,367	$41,838	3
	Botswana	7	10,785	75,500	0
	C.A.R.	1	4,227	4,227	1
	Kenya	13	12,130	157,700	4
	Mozambique	5	8,340	41,700	1
	Rhodesia	2	1,350	2,700	0
	South Africa	2	5,025	10,050	0
	S.W.A.	1	6,000	6,000	1
	Sudan	1	10,000	10,000	0
	Uganda	1	2,800	2,800	0
	Zaire	1	12,500	12,500	0
	Zambia	5	9,600	48,000	3
	Ethiopia	1	8,000	8,000	0
	2 or more	20	15,830	316,600	0
	13	65	$11,347	$737,615	13
1975	Angola	3	$24,166	72,500	3
	Botswana	5	9,716	48,580	1
	Kenya	22	12,191	268,220	4
	Rhodesia	2	6,650	13,300	1
	South Africa	4	6,591	26,366	0
	S.W.A.	1	4,000	4,000	0
	Sudan	9	11,197	100,775	0
	2 or more	10	12,210	122,100	0
	7	56	$11,711	$655,841	9
1976	Botswana	1	$ 1,310	1,310	0
	C.A.R.	5	12,200	61,000	0
	Kenya	26	11,630	302,405	4
	Rhodesia	4	7,875	31,500	0
	South Africa	5	10,600	53,000	0
	S.W.A.	1	3,000	3,000	0
	Sudan	4	15,750	63,000	0
	Zambia	1	30,000	30,000	1
	Cameroun	1	4,500	4,500	0
	2 or more	10	13,690	136,900	0
	9	60	$11,743	$704,615	5

Table [31]. Of 219 U.S. trophy hunters, how many hunted and the amount they spent on hunting licenses from 1970 to mid-1976.

Year	Number Hunters	Ave. Spent on Licenses	Total Spent in Africa
1970	41	$1,194	$48,954
1971	27	$1,748	$47,196
1972	43	$1,880	$80,840
1973	67	$1,881	$126,027
1974	62	$2,365	$146,630
1975	52	$2,645	$137,540
½ 1976	52	$2,663	$138,476

hunting has no connection with smuggling of hides, that it is important income, that it has no effect on leopard populations and, it reduces level of poaching (Appendix D and E).

Repeatedly, Myers (1976a) recommends harvest of leopards under sufficient controls, so as to create legitimate incentives in developing countries for conservation of the leopard, wilderness and all wildlife. It is hardly imaginable then that serious conservationists could take a stance against the most controlled, limited and economically important form of harvest, trophy hunting. Since Myers (1976a) concludes that the leopard has a better status than the lion, and leopard and big cat experts agree wholeheartedly, then it stands to reason from the following statement of Myers (pers. comm., 1976) that a wise use of the leopard is trophy hunting.

> "Recently, I concluded a two-year study of Africa's big cats and, though they all face serious problems in the rapidly developing continent, only the cheetah is suffering more from habitat loss than the lion. In my judgement, the best way to rescue the magnificent beast may well be, ironically to hunt it. By upgrading the lion's economic value as an object of carefully controlled trophy hunting, it just might be possible to offset its growing liabilities as a competitor with livestock for savannah land... I would like to reiterate that I believe that conservation is often best achieved through positive management measures, including sport hunting;... there must be other areas like the one in Kaputiei in Masailand, Kenya, where Dr. Robert Davis demonstrated that total revenues through sport hunting of leopard and lion alone could generate more income for local Masai than any other available land use."

The Leopard as a Trophy

The leopard is highly valued as a trophy by thousands of American and European sportsmen. However, this does *not* mean that thousands of leopards are killed by trophy hunters in Africa. Quite to the contrary: various estimates and actual figures place the peak harvest of leopards in Africa as a whole at no more than 500 a year (Table 32), although it conceivably could have been closer to 1,000 prior to the U.S. ban. The whole offtake of 150 leopards in East Africa could not possibly have a significant impact on the leopard population (Myers, 1976a).

The leopard ranks higher than most African game species, as indicated by Table 33. It has the lowest hunter success among the "big four" in Botswana. In that country, 684 sportsmen paid $171,000 over three years (1970-1973) to *hunt* leopards, while only 84 of 684 licenses were filled in this period.

While Botswana has a relatively low hunter success, probably because leopards do not readily come to baits there (A.C. Campbell, pers. comm., 1976), the major countries where leopards have been hunted must successfully, including Angola, Zambia, Mozambique, Kenya and Tanzania (Table 30), had a success ratio of 50% or higher. Overall, the hunters surveyed in the study had a success ratio prior

Table 32. Estimates and actual harvests of leopards by trophy hunters in some regions and countries in Africa. License fees have risen since these figures were valid, and several additional countries permit trophy hunting (e.g., Ethiopia, Liberia, Zaire, Kenya, Senegal .

Area/Country	Trophy Harvest/Annum	License Fee	Source
Kenya	75 (1975 343 (1966)		Anonymous by request; Dagg and Foster, 1976
East Africa	150 maximum	----	Myers, 1973 a
Angola		$200	Myers, 1976 a
Mozambique	100	----	Myers, 1976 a
Botswana	30	R.300	Butynski, 1975
Tcad	negligible	$200	Myers, 1976a
Zambia	44		U.S.D. State, 1975
Tanzania	--	$420	U.S.D. State, 1975
Africa	500 maximum	----	Myers, 1976 a
Africa	1,000 max. (pre-1973)	----	this study
Africa	250 max. (post-1972)	----	this study

Table 33. Success of 199 U.S. hunters hunting six major game species in Africa from 1970-73. * indicates higher trophy value.

Species	No.Hunters killed None	No.Hunters killed 1 to 9	Total Kill	Success
Cape buffalo*	112	107	309	1.5
Elephant*	139	80	110	0.5
Zebra	107	102	252	1.2
Lion*	160	59	72	0.36
Eland	143	76	91	0.45
leopard*	162	57	68	0.34
kudu	128	91	123	0.61

to the U.S. importation ban of 38% (Table 34). From 1973 to July 1976, the success ratio dropped off to 19.5% (Table 34), and in 1976 was only 8%. This decline indicates fewer licenses for leopard being purchased by U.S. hunters, even though they can legally hunt leopards in almost every major trophy hunting country surveyed.

What is the impact on African game department revenues from the U.S. ban on importation of leopard trophies? At a current average price of $400 for a leopard license, and with no fewer than 1,000 Americans hunting in Africa per annum, and no more than 20% of these currently buying licenses for leopard, $320,000 is being lost per year. A realistic figure of 1,000 U.S. hunters in Africa per year buying leopard licenses, and killing 400 leopards, would produce $400,000 in fees for game departments of about ten nations, which, including 25% overhead, could salary and equip as many as 500 game guards, the anti-poaching effect of which would be significant in preventing local overexploitations of leopard. Such additional income could actually trade 160 more trophy leopards per year taken by U.S. hunters for protection of thousands of leopards, elephants, rhinoceres and other species presently being poached at high levels in several countries. It would appear then that the U.S. ban on trophy leopards is not only uncalled for from a population point of view but is actually undermining the very intent of protective legislation and policy (Table 35).

Licenses for ten of 18 game species, excluding lion and leopard, sold to recreational hunters (almost exclusively foreign trophy hunters and the majority from the U.S.) in Botswana declined sharply from 12,862 in 1972 to 7,597 in 1973, to 4,164 in 1974 (Butynski, 1975). From 1970 to 1972, the licenses sold were nearly equivalent, indicating a serious decline in number of trophy hunters, which correlates with close in the U.S. of leopard importation. Botswana has not closed leopard hunting during the period from 1970 to present. The factor possibly accounting for decline of trophy hunting could be the inability of U.S. hunters to import leopard trophies (Table 36, also, see Appendix E).

Other benefits of encouraging trophy hunting of leopards include reduction of poaching activities, not just of leopard but several typical bush species including the elephant and rhinocerus. The questionnaire to biologists, wardens and professional hunters indicates that leopard trophy hunting may significantly curtail poaching (Table 37) (also see Appendix E). Considering that about 60% of these same persons indicate leopard poaching to presently be significant and increasing or steady (Table 38), enhanced trophy hunting for leopard may play a vital role in reduction of poaching. One factor that may explain the lack of response from higher-ranking officials in a few countries as well as the attitude of some respondents against trophy hunting is bribery. I have been informed several times that certain officials in game departments receive payment for permitting poaching. If trophy hunting, especially of species such as the leopard, were to increase, some officials might either lose payoffs or be exposed.

Table 34. Success at hunting leopard of 219 U.S. hunters surveyed. Note decline in 1973 after the U.S. ban on importation of leopards.

Year	Number of Hunters	Number of Leopards Killed	% Successful
1970	45	17	37%
1971	35	14	40
1972	44	16	36
1973	75	13	17
1974	65	13	20
1975	56	9	16
½ 1976	60	5	8

Table 35. A comparison of the average amount spent in Africa per safari by hunters who killed and did not kill leopards. From analysis of questionnaires returned by 219 U.S. hunters. Only 8% of the hunters in 1976 killed leopards as opposed to about 40% prior to 1973, when the U.S. banned importation of leopard trophies. The difference in expenditures would be magnified considerably by a comparison of hunters who hunted leopards to hunters who did not hunt leopards after the ban.

Year	Ave Amount Spent by Hunters Who Killed Leopards	Ave Amount Spent by Hunters Who Did Not Kill Leopards	Ave Difference
1976	$11,743	$11,183	$560
1975	$11,711	$10,890	$821
1974	$11,347	$10,907	$440
1973	$ 9,753	$ 9,575	$178
1972	$10,238	$ 9,654	$584
1971	$ 8,020	$ 7,723	$297
1970	$ 8,478	$ 7,928	$550

Table 36: Numbers and trends of leopard and lion licenses sold and filled in Botswana from 1970-74 (data from Butynski,1975).

	1970		1971		1972		1973		1974	
	sold	shot	sold	shot	sold	shot	sold	shot	sold	shot
leopard	208	19	158	21	178	30	140	14	124	8
lion	272	127	159	92	175	85	151	98	140*	62

* estimate

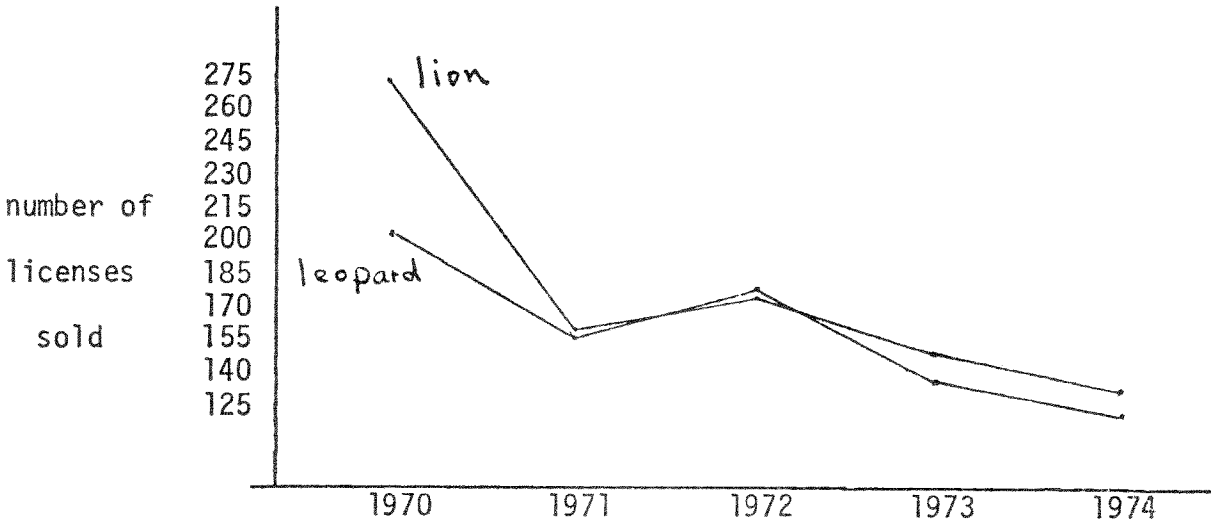

Table 37. Responses of game wardens, biologists and professional hunters in eleven Sub-Saharan countries regarding the effect of sport-hunting on leopard poaching.

Curtails Poaching	Insignificant	Enhancement	No Reply
42.8%	30%	15.7%	11.4%

Table 38. Responses of game wardens, biologists and professional hunters in eleven Sub-Saharan countries regarding current trends in poaching of leopards.

Significant/Increasing	Significant/Steady	Significant/Decreasing	Insignificant
33.7%	23.7%	10%	32.5%

Resolving Conflict of Interest to Favor the Leopard

One is left confused about why Myers (1976a) and the I.U.C.N., whose policy it is not to avoid utilization of wildlife (see Appendix D), favor continued classification of the leopard as endangered. The first reasonable hypothesis is that they fear that recalssification to Appendix II or out of threatened category altogether would invite greater illicit activity by the spotted car fur interest. Secondly, and equally plausible, is that the I.U.C.N. could be afraid of losing western supporters who favor endangered status (and who tend to be against trapping, the fur industry, hunting, and so on: see Foreword.

If the I.U.C.N. fears unregulated skin traffic as a possibly damaging factor then inclusion in Appendix II should suffice for international legalistic protection. However, legal protection does not appear to have significantly effected poaching, or at least is no guarantee against it. Thus, the problem is to work out regulation of the existing fur-trade and legitimization of interests so that conservation and economy are mutually enhanced. To proceed with our heads in the ground from fear of the truth, while avoiding the fundamental problem and its solution, can only prove to be detrimental to all concerned with humanity and a positive stewardship of wildlife resources by and for man.

That it is possible without tremendous investment to conduct a profitable and legitimate trade in spotted cat hides without having population decline is indicated by the experience in Botswana. However, the same country may be losing valuable income and developing less incentive favoring wildlife because of the U.S. ban on importation of leopard trophies. It is so simple and easy to believe we have helped the leopard with blanket protection when we may be harming its future instead. The solutions of the U.S. and International Convention are inadequate because neither has seen the problem clearly. The fundamental problem has not been understood at all; the finer complexities have been disregarded. It never was and is not now justifiable to discourage trophy hunting. As for the fur trade, I suspect that this industry would finance a sufficient study by objective, qualified persons which could lead to establishment of an acceptable means of regulation and exploitation in the interest of all.

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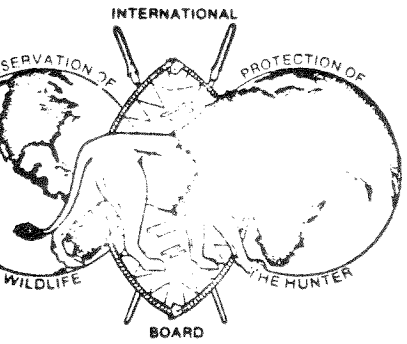
Keywords: 1Afr/conservation/interspecific competition/leopard/Panthera pardus/population/status/trade/trophy hunting

Abstract: Includes the following Appendices:
A - Questionnaires used in the study
B - Status of the leopard in Sub-Saharan Africa
C - U.S.D.I. Status survey of the leopard, 1975
D - Attitudes and responses of members of the IUCN Cat Group regarding utilization of the leopard as a resource important to its conservation
E - Attitudes and responses including leading wildlife authorities and African officials on why trophy hunting of the leopard should be encouraged by the U.S. and international convention regulations
F - Discussion of ideas relevant to the impact of interspecific competition on the status of the leopard
G - Status of the leopard in the Sudano-Guignean zone

Notes: Main report: ID 2172: (Eaton_1977_Status_and_conservation_of_the_leopard_in_Sub-Saharan_Africa.pdf)

A P P E N D I X A

QUESTIONNAIRES USED IN THIS STUDY



Safari Club Internationa

877 SOUTH ALVERNON WAY, TUCSON, ARIZONA
SUITE 205 (602) 795

Dear Hunter:

On behalf of Safari Club International I am conducting an urgent study of trophy hunting in Africa.

The enclosed questionnaire is designed to measure the value of several species as renewable resources. Please complete the forms and return them immediately. A prompt return is very important.

Sincerely,

Randall Eaton

Randall L. Eaton, Ph.D.
Department of Zoology
University of Washington
Seattle, WA 98195
U.S.A.
(206) 543-4486

RE/ch

enclosure

I. Indicate the NUMBER of each of the following species you killed in Africa:

From 1970 To 1973		From 1973 To 1976 (present)
_____	Cape buffalo	_____
_____	Elephant	_____
_____	Zebra	_____
_____	Lion	_____
_____	Rhinocerus	_____
_____	Eland	_____
_____	Leopard	_____
_____	Kudu	_____

II. A. Please check the African countries you hunted according to year:

	1970	1971	1972	1973	1974	1975	1976
Sudan							
Kenya							
Uganda							
Tanzania							
Central African Republic							
Zaire							
Zambia							
Rhodesia							
South Africa							
South West Africa							
Other:							

B. Around each check-mark which represents the year and country in which you killed a leopard, place a circle.

III. Starting now and proceeding back to 1 January 1970, list your respective African safaris and your expenditures:

A. Most recent safari, date: _____

Amount spent in African countries:

Total expenditure: $_____

For hunting licenses: $_____

B. Second most recent safari, date: _____

Amount spent in African countries:

Total expenditure: $_____

For hunting licenses: $_____

C. Third most recent safari, date: _____

Amount spent in African countries: _____

Total expenditure: $_____

For hunting licenses; $_____

D. Fourth most recent safari, date: _____

Amount spent in African countries: $_____

Total expenditure: $_____

For hunting licenses: $_____

E. Attach an extra sheet if necessary.

V. A. Number of years you have hunted: _____

B. Age: _____

C. Age when you first hunted big game in Africa: _____

Name: _____

Citizenship: _____

Address: _____

_____

_____

Phone: _____ Cable: _____

Comments:

THANK YOU!

23 July 1976

TO: Authorities on African Wildlife

FROM: Randall Eaton, Ph.D., Department of Zoology
University of Washington
Seattle, WA 98195, U.S.A.

We are currently attempting to document the status of the leopard in several countries and evaluate the overall effect of trophy hunting. Your cooperation is needed in completing the enclosed questionnaire. Especially critical is an early return by airmail, as the results must be compiled by 1 September. Those of you with experience in more than one country should complete additional forms and return them, too. If you have colleagues or personnel qualified to respond, please distribute the extra forms to them. We urge, again, a prompt reply.

Any relevant data, documents or reports pertaining to the population biology, conservation status, sport hunting, or poaching of leopards should be sent along with the completed forms. If this is inconvenient, you might indicate the reference and how it may be obtained.

Thank you for your cooperation!

LEOPARD SURVEY

1. In my opinion the leopard in _____ (name of country) has a population status of:
   a. _____abundant
   b. _____satisfactory
   c. _____rare
   d. _____potentially endangered
   e. _____unknown

2. The people in the above country regard the leopard as:
   a. _____a nuisance or danger/threat
   b. _____with indifference
   c. _____a valuable species
   d. _____other (please specify) _____

3. In my opinion the best regulated use of the leopard in this country is:
   a. _____as a game animal
   b. _____as a fur-bearer
   c. _____both of the above
   d. _____as a fully protected species

4. In my opinion, the controlled harvest of leopards by sport-hunting has (or would have if not presently legal or developed):
   a. _____adverse effects on populations
   b. _____an insignificant impact on populations
   c. _____a positive influence on populations

5. It is my impression that poaching for the skin trade is currently:
   a. _____significant and increasing
   b. _____significant and steady (not increasing or decreasing)
   c. _____significant and decreasing
   d. _____insignificant

6. It is my opinion that the effect of sport-hunting on leopard poaching is:
   a. _____curtailment of poaching
   b. _____insignificant on level of poaching
   c. _____enhancement of poaching

7. Concerning the foreseeable future of the leopard, I favor U.S. and international regulations which:
   a. _____prohibit all trophy hunting
   b. _____discourage trophy hunting
   c. _____encourage trophy hunting

8. My experience and/or qualifications in judging the population and conservation-management status of the leopard include: (check as many aa applicable)
   a. _____professional hunting for _____ years
   b. _____game warden or enforcement agent for _____ years
   c. _____wildlife biologist and/or administrator for _____ years
   d. _____other (please specify):_____ for years

Additional comments:_____

_____

_____

Name: _____
Title: _____
Affiliation: _____
Address: _____
_____
_____
Cable or phone number: _____

THANK YOU!!

A P P E N D I X B

STATUS OF THE LEOPARD IN SUB-SAHARAN AFRICA

(also see letters in Appendix E)

GENERAL

"Its capacity for adapting to changes in prey species, hunting conditions, carnivore competition, vegetation patterns and human activities, enables it to survive in developing Africa with more success than almost any other large wild animal... The leopard's present status is *much more favourable* (my emphasis) than that of a number of other major mammal species, notably the cheetah, but also the lion, wild dog, three species of hyena and two of rhinocerus, giraffe, hippotamus and crocodile. By 1980, the leopard, compared with several of these species, may enjoy *yet more favourable* (my emphasis) status, a trend which could well continue throughout the years thereafter."

Myers (1976a:9)

"...the leopard is more numerous, more widely distributed, and, in many ways, a more successful animal" (than the lion).

Hamilton (1974:6)

"...the high adaptability of the leopard is reflected in the extent of its distribution not only geographically but also in the wide range of habitats in which it occurs."

Mitchell et al (1965:304)

KENYA

"...certainly the leopard is neither rare or endangered in Kenya."(1973)

W. G. Swank, Ph.D.
Project Manager
Kenya Wildlife Management Project
Food and Agriculture Organization, U.N.

"In the northern frontier region of Kenya the leopard population along the Tana River and north of the Tana is virtually zero and should be closed. This state of affairs has arisen through excessive numbers of leopards being poached by the Somali tribesmen. This has been going on for many years. In the north western region of Kenya there is a poor leopard population for the same reason. On the Cherangani and Aberdare mountain ranges leopard are still very abundant, likewise Mt. Kenya. In the lake shore and Nyanza regions leopards virtually cease to exist through overpopulation. In the Narok district of Kenya the leopard population is still very healthy. Poaching, while widespread, has in my opinion been kept down through the activities of professional hunting parties. Where these parties are operating poachers are loathe to operate.

You may be aware that most of southern Masai area of Kenya has been allotted to professional hunting companies on a concession basis. Each of these concessions has a limited quota. For the most part these quotas are realistic. This state of affairs exists only as far as a few miles east of Lake Magadi in southern Kenya. One of the best leopard areas formerly was along the Tanzania border around Namanga Mountain, bordering the Amboseli National Park. To my almost certain knowledge, leopard have been virtually totally eliminated here. This is because a deadly chemical known as "Coppertox", readil available and cheaply available at any drugstore, can be obtained supposedly wit the specific purpose of using it to "dip" cattle for ticks. This chemical is ordourless and tasteless and when taken orally results in certain death within a very short period. I have seen ample proof that this chemical is being used in baits by the local population in this area. The sad result is not only that the leopard have been eliminated but that the poachers using this method usually wind up with a handful of claws as their only trophy. By the time the leopard carcass has been located the skin has rotted.

As proof of this, you have only to visit the tourist stalls in Namaga township and if you ask quietly you will be shown handfuls of lion and leopard claws for sale."

Brian M.A. Hern
East Africa Professional Hunters Assoc.

"There are fairly healthy populations of the leopard in most of the national parks and national reserves in Kenya."

M.L. Modha, Wildlife Biologist
Department of Wildlife Management and Conservation

"In suitable habitat undisturbed by man, the leopard is common... Only proper and adequate enforcement of existing game laws will save any of our game, let alone the leopard."

P.P.A. Davey
Bateleur Safaris

"Encourage legal hunting in areas where leopards are a nuisance to stock. Encourage other countries to follow the U.S. lead in banning the skins of spotte cats, thereby reducing outlets for poachers."

F.W. Woodley, Warden
Mountain National Parks

"Hunting only to be permitted in areas which sustain healthy populations on a strictly controlled sustained yield quota basis."

J. Barram, Wildlife Adviser
Kenya Wildlife Management and
Conservation Department

UGANDA

"Uganda probably has the best leopard population in Africa outside of Tanzania. This is not because there has been no professional hunting in Uganda but Uganda did close the hunting of all leopard three years ago.

This does not however reflect only on leopard in Uganda. There has been no professional hunting, per se, since 1971. I have conducted one safari in that country, some two years ago, and I lived in Uganda for 10 years.

The north and north eastern regions of Uganda have incredibly big leopard populations and even without bait it is possible to see sometimes 3 or 4 in broad daylight. Nine out of ten baits are struck by leopard within 24 hours. The same situation occurs along the eastern shore of Lake Albert throughout the Kisoro district, and throughout the southern regions of Ankole."

Brian M.A. Herne
East Africa Professional Hunters Assoc.

TANZANIA

"The leopard is not an endangered species in Tanzania and in fact is very common in most areas."

B.D. Nicholson
for Director of Game (1973)

"We can thus say that in Tanzania the leopard is not an endangered or threatened species."

W.J. Mapunda
for Director of Game

ZAMBIA

"First, I should point out that I left Zambia in 1974 and am now at the above permanent address. Since I left the policy, and more particularly perhaps, the actual enforcement of that policy, may have changed to a considerable degree. For example, I believe that no game management areas ("G.M.A.'s") are now specifically reserved for the safari companies, whereas when I was there they had exclusive hunting rights allocated over many of the best game areas. I believe that this had the effect of limiting poaching, including of course poaching of leopards, because the safari firms would be constantly moving about over these

places in the course of their hunting and would tend to see that no one else hunted there, in their own interests. If the safaris now have to share the same areas with hunters from within Zambia the effect would be first to increas the number of permits and raise the allocated leopard quota and secondly to reduce the deterrent effect that was present when the safaris were the only legally entitled hunters. Leopards in Zambia have had some sort of protection for many years and as a result poaching at what may be called village hunter level is probably not very much and certainly not critical for the species. But the urban hunters, including expatriates stationed in Zambia, pose a more serious threat, not only from poaching, but from perfectly legal hunting if the allocated quota is too high, and fixed on any other basis than the offtake whic the population can sustain without depletion of the viable breeding stock."

"The question of U.S.A. Regulations on import of leopards and leopard products has to be considered from the viewpoint of the species throughout its very extensive range, and this varies tremendously. When I left Zambia the position there was that, excluding the small urban and industrial areas, and the relatively limited areas of commercial agriculture, most of the country was still with a low human population, and as potential leopard habitat it varied from reasonably good to just about ideal (the latter in the Kafue National Park for example). So it is not surprising that the leopard population could fairly be described as from satisfactory to abundant over much of Zambia. Furthermore the very tight laws were backed by a system of enforcement which, while by no means perfect, was at least adequate. In these circumstances the leopard situa was as good as in any country and incomparably better than most."

"On balance, then, I would be inclined to favour a complete ban on imports --if you don't have buyers you won't have sellers. It is true that even if the U.S.A. clamped down on the trade (for it is this and not the safari hunters tha is the real threat) other countries might not follow suit, though some probably would follow the example set. Egret feathers went out of fashion and leopard skin coats might well do the same. A by-product, so to speak, might be that banning other spotted cat skins might be easier, and a complete ban on all such skins would certainly be more effective than to ban some and not others--customs officers might well be able to pick up a spotted cat if there were a general ban but could not be expected always to distinquish a leopard, from a serval, or an ocelot and so on. Theoretically it would be possible I suppose to have an approved list of countries where exploitation for safari hunting was controlled and from which an agreed number of trophies could be imported by successful hunters..."

W.F.H. Ansell
former Deputy Director
National Parks and Wildlife

MOZAMBIQUE

"The leopard has never been considered an endangered species in Mozambique...it is well known that leopards are quite abundantly found all over the country" (*according to Chief Veterinary Officer, Mozambique's leading wildlife authority, also chiefly relied upon by Myers, 1976a).*

Department of State to
U.S.D.I., 1975

RHODESIA

"Leopards now belong to land owners and may be shot or trapped if causing stock losses, or may be cropped as a game trophy. I foresee a diminished population on ranches but large reservoirs of leopard on adjacent forest and national reserves. Leopard not endangered in Rhodesia."

T.W. Coffin - Grey
National Museums of Rhodesia

"The illegal ivory and skin racket in East Africa, Ethiopia, South Sudan, etc., at the convenience of officials and Presidents has caused populations of game animals there to fall drastically. Here in Rhodesia we've got leopard *to spare*!"

A.A. Ferrar, Wildlife Ecologist
Department of Parks and Wildlife

"Leopards survive even in degraded tribal areas but are considered a nuisance. Most farmers feel similarly but some are exploiting its value. It is not endangered and is not very visible so little conservation and tourism value is realized."

Thomas Choate, Ph.D.
University of Rhodesia

"There is no indication that the leopard is endangered in Rhodesia where occasional specimens still occur close to some of our larger towns and cities. Where numbers have declined this is not primarily attributable to hunting, but rather to the indirect effects of human developments on the species' habitats and natural prey. The species is well represented in extensive ranching areas and especially in forest and wildlife areas which cover some 15 - 20% of the country.

Any measure designed to prohibit the legitimate controlled exploitation of leopard populations is likely to be counter productive towards their conservation.

While the species can be used, it is a valuable resource, justifying legal and other protective action, but if this value were to be aimed at, it would be reduced, in most of its range, to no more than a problem animal in conflict with reasonable human interests. Failure to recognise this pragmatic consideration can only mitigate against genuine efforts to conserve the species in Rhodesia and for this reason we favour the free flow of legally obtained trophies. This applies mainly to animals limited by sportsmen, who pay heavily for the privilege to do so, but should extend to landowners in order to prompt them to tolerate and even encourage the species on their land."

G. Child, Ph.D. Director
National Parks and Wild Life Management

SOUTH AFRICA

"In South Africa the leopard is a tenacious animal which has managed to survive in even heavily built-up areas, e.g. Witwatersrand, and ranges widely on private farms in spite of the fact that it is regarded as vermin by many farmers."

S.C.J. Joubert Ph.D., Chief Research Offic
Kruger National Park

"Outside conservation areas the leopard may be regarded as one of the most successful carnivores surviving in remote areas or dense ravines."

E. Moolman,
National Parks Board

"Satisfactory in its present range which is presently quite extensive and very likely to remain so."

G.L. Smuts, Ph.D. , Senior Research Office
National Parks Board

"The situation of the leopard in South Africa is complicated. All the Provincial Nature Conservation Departments are aware of the need for conserving this animal which is classified as rare. Today its habitat is largely restricted to the extensive areas of state land where it receives total protection."

Douglas Hey, Director
Department of Nature and Environmental Conservation
Cape of Good Hope

"Leopard will always be killed and controlled in these (*South Africa and South West Africa*) countries due to the stock farming industry. However, they will always hold their own in suitable habitat and terrain. Leopard are vermin here and even if they enjoy a more protected status there is little hope of controlling it since no compensation is paid out to landowners suffering depredations.

It is impossible to census leopard accurately but judging from the numbers removed by landowners every year and the fact that leopard are still present over a fair portion of parts of the country the I.U.C.N. (*International Convention*) embargo on legally removed leopard is ridiculous. If leopard are considered vermin in parts of R.S.A. and S.W.A. how can the country agree to the banning of their importation into the U.S.A. when they cannot stop their removal here. Trophy hunting of leopard might serve to make landowners more conscious of a commercial value on the animal and thus some return from his depredations."

R.C. Biggs
Wildlife Biologist and Professional Hunter

SUDAN

"The Sudan has an extremely high leopard population, and I cannot understand the Government closing leopard here this year, except for the fact that they must have been receiving considerable pressure from other countries to do this. The last time I hunted leopard in the Sudan, which was in 1975, we had a total of five leopard feeding off six baits, which is a very high average."

Anonymous by request

ETHIOPIA

"The above opinion (*abundant status, game animal best regulated use, etc.*) is true and is supported by the very fact that we issue sport hunting license for leopard. Since in my country we consider the status of leopard as plentiful and not threatened, we still issue licenses for sport hunting on leopard. However, poaching of this animal is going on at a decelerating rate than in the past."

Lealem Berham, Chief Game Warden
Wildlife Conservation Organization

APPENDIX C

U.S.D.I. STATUS SURVEY OF THE LEOPARD, 1975

Summary: *Reports of no substance from some countries are interpreted by the U.S.D.I. to indicate endangered status. Reports specifying not endangered or threatened based on leading and recognized authorities or wildlife officials are considered too insubstantial for the U.S.D.I. to reclassify the leopard accordingly. (See letter from Bohlen and text.)*

DEPARTMENT OF STATE

AIRGRAM

P750111-1126

Original to be Filed in _____ Decentralized Files.

(4L) FILE DESIGNATION

UNCLASSIFIED — A-099

HANDLING INDICATOR — NO.

TO : Department of State

cc: Paradiso/Duval
SE/Skoog/Ruhr
LE/Parsons

E.O. 11652: N/A
TAGS: SENV, TZ

INFO :
DEPT PASS:

FROM : Amembassy DAR ES SALAAM DATE: July 4, 1975

SUBJECT : Endangered Species Act of 1973: Tanzanian Status Review for Leopard

REF : 1 Dar Es Salaam A-110, June 18, 1974

INT

FOR DIRECTOR, FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR

The Game Division in the Tanzanian Ministry of Natural Resources and Tourism has provided the following information in regard to the status of leopards in Tanzania. --

1. The clouded leopard (Neofelis Nebulosa) is not indigenous to Tanzania.

2. Most leopards (Panthera Pardus) are found within game areas, particularly Game Reserves and National Parks of Tanzania. These areas are considered to be well protected and hunting in them is strictly controlled.

3. Tanzania's 1974 Wildlife Conservation Act (see the airgram under reference) greatly restricts hunting of leopards. Legal steps are taken and high penalties imposed on illegal hunting of leopards.

4. Those who wish to hunt leopards have to channel their inquiries through the Tanzania Wildlife Corporation. Hunting will be allowed only for a period of six months, now that the ban on all hunting has been lifted, from July through December. Moreover the special license fee for a leopard is now T.Shs. 3,000/= ($420.00) per animal,

Enclosures: 1. Letter dated June 24, 1975 from Ministry of NRT
2. The Wildlife Conservation Act No. 12 of 1974

UNCLASSIFIED

FORM DS-323

by:	Drafting Date:	Phone No.:	Contents and Classification approved by:
SASuttmanji:njk	7-3-75		ADCM:HCMcDougall

cos: ECON:HRI
CONSERVATION
LEO:PPardus (substance)

which is considered exhorbitant by local hunters.

5. The Tanzania Government anticipates that the strict measures introduced on hunting of leopards will greatly increase the leopard population within a few years.

6. Therefore, the leopard is not considered as an Endangered or Threatened species in Tanzania.

The above views are spelled out in a letter transmitted as Enclosure No.1 to this airgram. Enclosure No. 2 is a copy of the Wildlife Conservation Act, 1974.

CARTER

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF NATURAL RESOURCES AND TOURISM

ram: "MALIASILI", DAR ES SALAAM.
hone: Dar es Salaam 27011.
ly please quote:

No. NRT/C/140/2/254

GAME DIVISION,
NATIONAL BANK OF COMMERCE,
CLOCK TOWER BUILDING,
P.O. BOX 1994,
DAR ES SALAAM.

24 June, 1975.

assy,
United States of America,
. Box 9123,
ES SALAAM.
tention - Mr. Robert D. Aitken)

STATUS OF LEOPARD AND CLOUDED LEOPARD

I acknowledge with thanks receipt of your letter dated June, 1975 on the above subject.

I would like to inform you that the clouded leopard ofelis nebulosa) is not found in Tanzania. We only have leopard (Panthera Pardus).

Most leopards in Tanzania are found within Game Areas rticularly Game Reserves and National Parks. These areas greatly protected and hunting is under strict control.

Our Wildlife conservation Act (No. 12 of 1974) greatly stricts hunting of leopards. Legal steps have been taken end high sentence penalities are imposed on any illegal ting of leopards. All those who feel like hunting leopards ve to channel all their activities through the Tanzania ldlife Corporation. More over leopard fees is now T.Shs. 00C/= per animal, and hunting will be only for a period of months (when hunting ban is lifted).

The strict measures taken up by the Tanzania government conservation of such precious and rare animal species ticipates that in few years time the population of leopards ll greatly increase.

We can thus say that in Tanzania the leopard is not an angered or threatened species.

Mapunda

(W. J. Mapunda)
for: DIRECTOR OF GAME.

130

DEPARTMENT OF STATE

AIRGRAM

P750124-1801

HANDLING	CLASSIFICATION	SAGB REFERENCE NO.
	UNCLASSIFIED	A-84

A-84

TO: DEPARTMENT OF STATE
(FOR INTERIOR)

FROM: Amconsul LOURENÇO MARQUES

DATE: July 15, 1975

E.O. 11652: N/A

TAGS: SENV, XA, XB, XF

SUBJECT: MOZAMBIQUE - Status Review for Leopards

REF: A-3438 of May 15, 1975

cc: SE/Paradiso/Nowak
LE/Parsons

59

DEPT. DISTRIBUTION

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MB			

SUGGESTED DISTRIBUTION:

The Mozambique Veterinary Department, Division of Wildlife Service, Lourenço Marques was asked by this post to determine if leopards should be reclassified as a threatened or endangered species in this country, and that a review of the status of this animal be made in accordance with the Notices appearing in the U.S. Federal Register, Volume 40, No. 77, pages 17611 and 17612, of April 21, 1975.

The Mozambique Veterinary Department made the following statement on the subject:

(a) The leopard (Panthera pardus) has never been considered an endangered species in Mozambique;

(b) Leopard hunting has always been authorized in Mozambique although regulated by the game laws;

(c) Though no census estimates are available of leopards in Mozambique, it is well-known that leopards are quite abundantly found all over the country;

(d) In view of the above, the Mozambique Veterinary Department holds that the leopard should not be considered an endangered species in Mozambique; however, it continues to be protected in accordance with the existing game laws of the country.

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CLASSIFICATION

DRAFTED BY	DRAFTING DATE	PHONE NO.	CONTENT AND CLASSIFICATION APPROVED BY:
ECON: DJSoares Rebel/vsgl	7/8/75		COMM: [illegible]

CLEARANCES:

1

The post will appreciate that the above information be transmitted before July 25, 1975 to the Director, Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C. 20240.

WALKER

EMBASSY OF THE
UNITED STATES OF AMERICA
P.O. Box 1617
Lusaka, Zambia.

June 10, 1975.

Director, Fish & Wildlife Service
U.S. Department of Interior
Washington, D.C. 20240

Dear Sir:

I refer to the request in Department of State Airgram A-3438 of May 15, 1975 regarding the status review for the leopard being carried out by the Fish & Wildlife Service. The Department of Wildlife, Fisheries, and National Parks of Zambia's Ministry of Lands and Natural Resources classifies the leopard (Panthera pardus) as a protected species. Hunting of the leopard in game management areas is permitted upon procurement of a hunting license and game area permit for leopard. When taken, the leopard must be registered with the Department of Wildlife, Fisheries, and National Parks, whereupon a certificate is issued allowing the hunter to transport the trophy out of the country. In 1973, 45 leopards were taken legally, 44 by licensed safari hunters and one by the National Park Service. Figures are not yet available for 1974, although the number is not expected to differ appreciably from the figures for previous years. The leopard is currently being hunted in Zambia. The Wild Life Conservation Society of Zambia, a private non-profit, educational organization, concurs in the decision to allow limited hunting in game management areas.

A fair amount of poaching in game areas does occur, although the number of cases is declining as enforcement improves. In 1973, 1374 arrests were made, most of these cases concerning the illegal taking of ivory.

Zambia subscribes to the Washington Convention on Endangered Species and has passed a National Parks and Wildlife Act aimed at the control of poaching. Due to the limited funds of the Department of Wildlife, Fisheries, and National Parks no estimate of the leopard population is available. Reports on the quality of trophies taken are made by the safari companies operating in the area.

The clouded leopard (Neofelis nebulosa) does not occur in Zambia.

Stephen Gerritson

cc: Lindsay Grant, OES/ENP/EN

DEPARTMENT OF STATE

AIRGRAM

FOR RM USE ONLY

A-016 UNCLASSIFIED

NO.

HANDLING INDICATOR

TO : Department of State

From: Amembassy N'Djamena

FROM : E. O. 11652: NA

DATE: June 2, 1975

TAGS: SENV, XA, XB, XF, CD

SUBJECT : Status of Leopard in Chad

REF : State A-3438

According to the head of the Chadian Hunting Service, the leopard and the panther are only partially protected under article 14/63 of the Act of March 28, 1963. In practical terms, the Hunting Service does not know whether the number of leopards in Chad is decreasing or increasing. COMMENT: The above statements well illustrate the GOC's inadequate knowledge of its wildlife for its protection and development.

LITTLE

1975 JUN 17 PM 3 24

RECEIVED DEPARTMENT OF STATE JUN 16 9 46 AM 1975

F A D R DOCUMENT ANALYSIS

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FORM DS-323 4-62

Contents and Classification Approved by: DCM:RADwyer

O:DHester:lk Donald Hester

DEPARTMENT OF STATE

AIRGRAM

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HANDLING INDICATOR UNCLASSIFIED

RECEIVED DEPARTMENT OF STATE
JUN 18 10 09 AM 1975
FADRC DOCUMENT ANALYSIS

A-71 NO.

TO : Department of State

E. O. 11652: N/A
TAGS: SENV, XA, XB, XF, SG

FROM : AMEMBASSY DAKAR DATE: June 13, 1975

SUBJECT : Endangered Species Act of 1973: Country Status Review for Leopard: Senegal

REF : A-3438, 5/15/75

DEPARTMENT PLEASE PASS TO DEPARTMENT OF INTERIOR FOR FISH AND WILDLIFE SERVICE.

El Hadj Sene, Chief of Hydrology and Forests, Ministry of Rural Development of Senegal, is the responsible Senegalese Government official for zoology and wildlife. M. Sene has replied to the Embassy that the Leopard (Panthera pardus) is found in three of Senegal's regions-Casamance, Sine-Saloum, and Senegal Oriental- in the south and southeast of the country, a sparsely populated and seldom visited, relatively inaccessible area. The clouded leopard (Neofelis nebulosa) is not present in Senegal.

El Hadj Sene reports that while the Government has evidence of a large leopard population, no attempt has been made to make an actual count. The number of leopards in Senegal appears to fluctuate depending on the season (wet or dry), and the animals range over a considerable area in Senegal and into neighboring Guinea, Mali and Guinea-Bissau.

Hunting the leopard is permitted but very little is actually done. There is also very limited commercial exploitation of the leopard in this country. The leopard occasionally threatens livestock in the area where it is found, but this is not a serious problem at this time.

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AGGREY

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FORM 10-64 DS-323

Drafted by:	Drafting Date:	Phone No.:	Contents and Classification Approved by:
LAB:JPDodd:mk	6/12/75		DCM:ACDavis

Clearances:

Department of State

TELEGRAM

Dayrunner
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Skoog

LE/Parsons

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.O. 11652: N/A
AGS: SENV, XA, XB, XF
UBJECT: US DEPT INTERIOR COUNTRY STATUS REVIEW FOR LEOPARD

EF: STATE A-3438

. EMBASSY REGRETS TO INFORM DEPT OF INTERIOR THAT NO INFORMATION
N LEOPARD (PANTERHERA PARDUS) IN GUINEA IS AVAILABLE.

. SHOULD MEANINGFUL FIGURES BECOME AVAILABLE, EMBASSY WILL SO
NFORM INTERIOR PER REF.
ARROP

U.S. FISH AND WILDLIFE SERVICE
RECEIVED
JAN 10 1975
International Activities

UNCLASSIFIED

RE: Curtis Bohlen Meeting on
Reclassification of Leopard.

Dear Mr. Levy:

On October 14, I had a private meeting with Curtis Bohlen, Deputy Assistant Secretary of Interior, concerning the status of the common leopard in international trade. Enclosed is an outline of the points covered during that meeting.

I presented him with a copy of Dr. Randall Eaton's (*preliminary*) study on the leopard, along with a copy of the meeting outline. Appropriate pages were marked and passages underlined in the study for discussion. We covered each of the points listed. The following are the results of that meeting:

1. Mr. Bohlen conceded that the leopard is indeed not "endangered" in most of sub-Saharan Africa. He contends the main reason for keeping the leopard on the endangered lists is to discourage poaching and illegal trade of skins. I suggested control could be accomplished through specific regulations when the leopard is moved to the "threatened" list.

2. Mr. Bohlen is in favor of a hearing on the reclassification of the leopard, under U.S. law, from endangered to threatened. However, this will require public hearings, according to Bohlen, and he is short of staff to hold such hearings; hence, they could not take place before next year.

3. The U.S. position at the International Convention in Switzerland will be not to make any changes in the lists under the Convention at this meeting. The U.S. will then push to reconsider the lists under the Convention at the next meeting, possibly one year hence. At that time the U.S. would consider supporting reclassification of the leopard to "threatened" if proposed by an African nation. (Mr. Bohlen did indicate he would talk to African representatives attending next month's meeting for their opinions in this regard.)

4. The U.S. cannot now propose reclassifying the leopard at this year's Convention because all such changes had to be proposed in writing by mid-June of this year, according to Bohlen.

5. Mr. Bohlen indicated that he would welcome the help of SCI in lining up African nation support for leopard reclassification.

6. The U.S. position to guide our delegates in Switzerland will not be available to the public for review, and only broad principles from it will be discussed at the meeting on October 22 here in Washington.

Mr. Bohlen was most open and receptive to the information presented during our meeting. He asked me which reclassification should be undertaken first--the U.S. list or the international list. I suggested that if the U.S. were to downgrade the endangered status of the leopard first, it would be an incentive to African countries to come forth with similar proposals. He agreed.

It seems this two-step approach would be the best course to follow since reclassification of the leopard cannot be considered this year anyway. In addition, the suggestion that an African country come forth with the proposal is in keeping with the SCI position that parties to the Convention defer to in-country management decisions. In the event the Interior Department does move to reclassify the leopard under U.S. law, and this occurs sometime next year, it will fit nicely into the timetable for the next international convention, especially if it is held a year from now.

In my opinion, progress along the lines of this scenario will not take place unless a constant spotlight is kept on the issue by your organization. If members of your group have any contacts with African officials who could have some input, either direct or indirect, upon the delegates of any African country attending the Convention, it would be most timely to try to get one or more of these delegates to approach Mr. Bohlen in Switzerland.

Sincerely yours,

Michael E. Strother

Encl.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

OCT 22 REC'D

In Reply Refer To:
FWS/OES
FWS 6335

OCT 20 1976

Dear Mr. Wirth:

This responds to your letter of October 1, 1976, regarding the concern of Mr. Joe Jonas, Jr. about a possible need to reclassify the leopard from Endangered to Threatened status. Because of our small staff and limited funding, we have had to work on a priority basis over the past several years. Quite frankly, we consider determining the status of unlisted endangered species, which might become extinct if no action is taken to list them, as higher priority in our efforts than species like the leopard which are already protected. We have, therefore, concentrated our attention on such unlisted species and we feel certain that you would concur in this course of action.

Please be assured, however, that we are continuing to assemble information on the leopard. You and Mr. Jonas may be interested to know that we recently issued a contract to Dr. James Teer of Texas A & M University to make an extensive survey of leopard populations, with a particular objective being an evaluation of the question of whether the importation of trophies from carefully regulated sport hunting might be allowable. The results of this investigation should be available within a year, and will assist us in making decisions on whether to reclassify the leopard and issue special regulations for the species.

If I can be of further assistance, please let me know.

Sincerely yours,

Curtis Bohlen

Deputy Assistant Secretary for Fish and Wildlife and Parks

Honorable Timothy E. Wirth
U.S. House of Representatives
Washington, D.C. 20515

A P P E N D I X D

ATTITUDES AND RESPONSES OF MEMBERS OF THE I.U.C.N. CAT GROUP REGARDING UTILIZATION OF THE LEOPARD AS A RESOURCE IMPORTANT TO ITS CONSERVATION

Summary: *In principle and specifically regarding the leopard in Africa, the complete concensus of the members of the IUCN Cat Group yet contacted and reviewed, including five who have studied the leopard's biology and status is Africa, is support and encouragement of trophy hunting.*

"We have heard what is the concern of the IUCN and other conservation groups in the preservation of wildlife and habitat, but it should be pointed out that we are in no way against use of wildlife by man..."

Paul Leyhausen, Ph.D., Chairman,
Cat Specialist Group, Survival Service
Commission (1973:329)

"I certainly favor use of wildlife for economic value in developing countries."

Carl Koford, Ph.D., Member,
Cat Specialist Group

Being convinced that we must, as Myers (1976a:71)said referring to the leopard, support the "principle of making Africa's wildlife pay its way," I queried several members of the IUCN Cat Group about trophy hunting of leopards. The following questions were asked; responses received to date are listed.

Question

1. Do you in principle favor the economic use of the leopard where this use can be legitimately regulated, in other words, without directly or indirectly contributing to a population decline?

Responses

"Yes" - Theodore Bailey, Ph.D., who recently completed a study of the leopard in South Africa while associated with University of Idaho.

"Yes" - Carl Koford, Ph.D., who has conducted several studies of spotted cats in Latin America and the puma in California.

"I am very much in favor of legal off-take through sports hunting where the population permits such. The problem is not so much with the legal off-take but with the illegal hunting (not referring to trophy hunting but poaching, by farmers, etc.)

Wolfgang von Richter, Ph.D., who
has engaged in studies of carnivores
in South Africa and Botswana

Question

Do you agree that it is wise to encourage legitimate trophy-hynting but discourage illicit skin-poaching where the leopard is not endangered?

Responses

"Yes" - T. Bailey
"Yes" - Carl Koford
"Yes" - W. Richter, see response above

Question

Your further comments and suggestions on this matter would be appreciated.

Responses

"In both cases (questions above) discourage poaching and *increase* population studies of the leopard" - T. Bailey

"In many undeveloped countries, wildlife is valued *only* for its economic value. (If it has none it will probably be eliminated by hunting--*Koford does not refer to trophy hunting here*--or habitat loss). Conservation funds can be raised *only* from these economic returns (at least in nearly all of Latin America). Hence, where animal populations can stand it and nonconsumptive values (ecological, touristic) not great, it seems good conservation to allow supervised hunting of trophy animals and importation (not sale) of the trophies" - C. Koford.

"It should be possible to differentiate between legally obtained skins by sports hunting and the illicit trade, by issuing a bona fide hunter an export/import permit on production of his hunting license. Likewise the export/import of skins by individual non-hunters, accompanied by a certificate from the country of origin, testifying that the skin was legally obtained, should suffice... I find it however irrational to prohibit import of leopard skins which have been hunted legally assuming that the country where hunting takes place keeps a constant check on the population" - W. Richter.

Responses of other Members of the IUCN Cat Group

"Goodness knows what we (*South Africa*) would do with a thousand more leopards... limited trophy hunting could be allowed in some areas without adverse effect. I can't see why trophy hunting or other exploitation should be disallowed in some adjacent countries in our north." (pers. comm. 1976)

John Visser, Member, IUCN Cat Group, who has been studying wild felids in southern Africa for many years.

"In my opinion the best regulated use of the leopard in this country is as a game animal." (Pers. comm., 1976)

Fritz Eloff, Ph.D., Member, IUCN Cat Group who has been conducting studies of larger carnivores including the leopard in southern Africa for years.

A Statement by Myers (1976) Regarding Trophy Hunting of the Leopard

"Published figures indicate that the total continent-wide offtake by sport (*trophy*) hunters had not exceeded 500 a year during the past few years. In areas of sound leopard density, sport hunting could be encouraged as a highly lucrative form of land use..."

A P P E N D I X E

ATTITUDES AND RESPONSES INCLUDING LEADING WILDLIFE AUTHORITIES AND AFRICAN OFFICIALS ON WHY TROPHY HUNTING OF THE LEOPARD SHOULD BE ENCOURAGED BY THE U.S. AND INTERNATIONAL CONVENTION REGULATIONS

Summary: *Leading wildlife authorities and chief officials of Kenya, Tanzania, Rhodesia, Ethiopia, and Botswana specifically state that the leopard is neither threatened nor endangered, and they favor encouragement by the U.S. of trophy hunting of the leopard. The Chief Game Wardens of Kenya, Zambia, Uganda, and Ethiopia, the World Wildlife Fund of Kenya, the East African Wildlife Society and East African Professional Hunters Association, all support the thesis that hunters be allowed to import any legally acquired trophies into the U.S.*

TANZANIA

"As a Division, we have raised the question of importation of leopard skins from this country into the United States. We have requested the Ministry of Natural Resources & Tourism to take this matter up through the embassy on the following grounds:-

(1) The leopard is not an endangered species in Tanzania and is in fact very common in most areas.

(2) It has a bearing on whether a percentage of tourist hunters visit the country or not. Consequently the availability or otherwise of the species effects game area revenues and over all foreign exchange earning in the safari industry.

(3) Continued cropping of meat animals without balanced cropping of carnivora creates management problems which could lead to the unproductive killing of carnivora for control purposes which would create further problems in its wake.

(4) The danger to any species is from uncontrolled exploitation, legal or illegal. Controlled exploitation within established management programmes is necessary, and beneficial to the country economically.

(5) Since tourist trophy hunting represents the highest per capita return in the industry with the lowest infra structure investment, it is of major importance as an insurance policy for the future of game areas outside of the National Parks system.

(6) The arbitrary ban on leopard trophies, regardless of their origin or purpose will result in a decline in the economic viability of many areas, create fresh management problems, and so could be a retrograde step in so far as the future of these areas is concerned."

B.D. Nicholson
for DIRECTOR OF GAME

KENYA

"The situation with regard to leopard in Kenya, is most worrying, as the poaching here is extremely high. Leopard are still numerous, and in fact we had six leopard feeding on my last safari, which ended a week ago. However, unless the poaching is stopped, this specie will no doubt shortly become extremely rare.

The whole problem is that we receive the brunt of the criticism as we are doing it legally and openly, whereas the poachers are hardly ever caught, whereas only about 75 leopard are shot legally a year in Kenya we have no idea how many are shot illegally a year, but I would venture to say, it must be in the region of 1,000 a year. The reason for this high figure being, a leopard is extremely easy to trap or snare, and when I work out how many leopard we have feeding on baits on every safari (average 5 or 6), there is no question that a poacher could take all these animals if he were hunting them,

whereas a trophy hunter, would only take a large male, and will often return from safari without.

The only way to stop this poaching is to kill the market, and as far as I understand there are still a few countries in Europe which allow the illegal importation of leopard skins. This is obviously where our poached skins go to. I am not sure about the market situation in the East, i.e. Hong Kong.

I have notices on many occasions that areas which have been closed to leopard hunting, have been poached out in very short order. The reason for this being that the poacher cannot differentiate between a hunting party and a Game Department vehicle, and the fact that cars are entering remote areas is a large deterrent to would-be poachers. Stop the hunting in an area, and the poacher has a free-for-all.

One sad Point, is that the Game Department does not have sufficient funds to patrol areas adequately, but we are hopeful the new concession system which is now operating in Kenya, whereby the concessionaire is partly responsible for the anti-poaching in his area, will greatly reduce poaching."

(Kept anonymous by request)

"If leopards through *controlled* (sport) hunting are shown to be a useful part of the countries economy it will give the local government an *economic* reason to protect them for this purpose, instead of considering them a predatory nuisance."

A.M.D. Seth-Smith, B.Sc. (Oxf.)
Professional Hunter,
Nairobi

"U.S.A. import prohibition has no impact on poachers. Sport hunters are the only remaining effective game wardens."

A. Dyer
Professional Hunter
Nanyuki

"Mr. Jonas is attempting to counteract the legislation in the United States placing the leopard on the rare and endangered species list with a complete ban on importation. I am in agreement with this move because certainly the leopard is neither rare or endangered in Kenya.

Proponents for closure to importation of the leopard readily admit that the species is not endangered but want to use the legislation to curtail illicit trade in leopard skins.

In my opinion going about it in this manner erodes the original intent of the law and makes about as much sense as closing all banks because some of them are robbed."

W.G. Swank, Ph.D.
Project Manager
Food and Agriculture Organization of the United Nations
KENYA WILDLIFE MANAGEMENT PROJECT

ETHIOPIA

"Since in my country we consider the status of leopard as plentiful and not threatened, we still issue licenses for sport hunting on leopard. However, poaching of this animal is going on at a decelerating rate than in the past. When we find out that this animal is threatened, we will let you know the type of protective measure we are going to take and also the cooperation steps to be extended from you. Therefore we don't see the reasons why United States ban leopard trophies possessed legally from any concerning government."

Lealem Berhanu
Deputy Chief Game Warden
Wildlife Conservation Organization

ZAMBIA

"But countries where legislatures allow for trophy animals to be legally taken out on licenses should be allowed to do so and U.S. should allow in such trophies from such countries."

P.C. Mukanda,
Chief Wildlife Warden
National Parks & Wildlife Dept.

RHODESIA

"Thank you for yours of July 18th, 1975, ref: N.I. concerning the leopard

controversy. As you know, there are huntable populations of leopard in this country where, but for its value as a trophy, it would verge on being a problem species, especially in those large sectors of its range where it is in conflict with the live-stock industry.

This country has made its stand in relation to leopard abundantly clear through the Prime Minister's Office to the World Wildlife Fund. Our philosophy follows that adopted by F.A.O., at least until I separated from the organization. We believed that the leopard is not scarce in much of Africa and that its high value provides Governments with a legitimate excuse to conserve it in the face of opposition from their local people. Action, such as that being taken by the United States Department for the Interior, can but negate this value to the detriment of legal measures and, ultimately, the leopard populations themselves. It is in line with the negative type of thinking of the bleeding heart brigade, which sometimes percolates through to such organisations as IUCN, who are inclined to make decisions on sentiment rather than hard facts."

G. Child, Director
Department of National Parks and
Wild Life Management
Rhodesia

BOTSWANA

"Supplementary license fee for a leopard is currently R300 - for resident and non-residents, while tribesmen and residents of Stateland pay between R5 and R20 - for a license.

Being a protected animal, annual quotas are being set for the species for recreational and traditional hunters; the quota for 1974, and 1975, 1976 are respectively 134, 143 and 147. The attached photocopy shows number sold and shot for the last ten years by recreational hunters.

Regarding your circular letter of 14.7 to members of the cat group of IUCN's survival commission I am very much in favour of legal off-take through sports hunting where the population permits such. The problem is not so much with the legal off-take but with the illegal hunting. In addition there will be always the cases where irate stock owner will destroy leopards in defence of property, which may or may not find their way into illegal trading channels.

It should be possible to differentiate between legally obtained skins by sports hunters and the illicit trade, by issuing a bona fide hunter an export/import permit on production of his hunting license. Likewise, the

export/import of skins by individual non-hunters, of accompanied by a certificat from the country of origin, testifying that the skin was legally obtained, should suffice. It is however realised that in the latter case the door is opened for corruption.

I find it however irrational to prohibit import of leopard skin which have been hunted legally assuming that the country where hunting takes place keeps a constant check on the population."

W. von Richter, Ph.D.
Department of Wildlife National Parks & Tourism (and IUCN Cat Group)

"Leopard do not come to a bait in this country except occasionally in the Okovango Delta. Sport hunting can provide significant revenue and so teach conservation to a poor people who need the money, however the fees charged must be realistic and I consider U.S. $450.00 about the minimum."

A.C. Campbell, Director
National Museum

"Leopards appear widespread in Botswana but only a fraction of the country is used for the safari industry. More (*leopards*) per unit area are killed outside the hunting concessions by stockowners."

L. Patterson, Wildlife Ecologist
Department of Wildlife and National Par

"Controlled utilization would be the best way to conserve the species in Botswana, prodived sufficiently large areas are not unduly modified by agricultu No doubt illegal export is occurring, but due to the low population (*of people*) poaching is not a threat. Properly regulated trophy hunting in Africa does not pose any threat to a large population. Professional hunters claim that ban on importation by the U.S. has effected the sale of licenses."

W. von Richter, Wildlife Ecologist
F.A.O.
Department of Wildlife and National Par

MALAWI

"Trophy hunting of any animal *if regulated* cannot of course endanger any species."

D.G. Anstey
Principal Game Warden
Dept. of National Parks & Wildlife

BOTSWANA

"We, as Hunters African and Botswana Hunters, are safari outfitters operating in Northern Botswana. The Department of Wild Life and National Parks of the Republic of Botswana allows us specific quotas of various species to be taken each year in our concession areas. The quotas allowed us of various animals are such that there is no chance of these animals going on the endangered list in Botswana. However, this situation is periodically reviewed should there be any unforseen circumstances arising.

I would suggest that any leopards shot by bona fide sportsmen on safari in Botswana should be allowed to be imported into the United States."

M. St. J. Lawrence
Hunters Africa (Botswana)

"As a hunting organization in Botswana where the quota system is strictly enforced, we feel that there is no possibility of the leopard being endangered.

The embargo on the import of leopards into the U.S. has only penalised the bonafide sportsman whose license fees and contributions are mainly responsible for the operation of the very Game Departments that control leopard quotas and preserve their numbers.

The poacher is no way penalised by these laws and can still kill leopards at will unhindered by your import embargoes.

We definately feel that you should allow bonafide sport hunters to import leopard skins into the United States provided they can produce a hunting license from the country of origin endorsed for leopard."

L.S. Games
Micheletti - Bates Safaris

"The Government of Botswana have a capable Wildlife Department who determine whether or not leopard can be shot on license by visiting sportsmen from all over the world. Visiting sportsmen therefore ridicule your services' attempts to impose your views on an independent African country that is perfectly capable of settling its own problem as to Wildlife conservation. By imposing your own restrictions upon your own citizens that other countries in the world do not see fit to impose simply because they respect the Government of Botswana's ability to look after their own affairs, you are ensuring that other nations have your share of leopard hunting as well as their own.

There is no chance of leopard becoming an endangered species in this country under present circumstances of control as exercised by the Botswana Government. I wish to associate my Company's views entirely withMessrs Hunters Africa's views, as expressed in their letter to you of the 27th, June, 1975.

It is interesting to note that some of the wildlife advisers to the Government of this country are U.S. Citizens paid by the U.S. Government and taxpayer.

They have not seen fit to recommend any restrictions on the hunting of leopards. Your present restrictions on the import of leopard skins to the U.S.A. therefore simply penalises your own sportsmen to their lasting embarrassment, amusement of the rest of the world's sportsmen and the depreciation once more of the U.S.A.'s image overseas!"

J. Kingsley-Heath
Managing Director
Safari South Botswana

SIERRA LEONE

"Local hunters are the real problems living in places hard to control. We are not bothered by the hunter from abroad, who does it for sport, shoots our elephant, for which he will pay in hard currency, and then goes away. It is our own people who are the danger."

Joshua S. Sawyer, Chief
Conservator of Forests,
Sierra Leone (1972:213)

SOUTH AFRICA

"However, as far as the Transvaal authorities are concerned and in agreement with their signing the Convention Agreement, they can see no problems as far as legally obtained leopard trophies entering the U.S.A.

The U.S.A. Department concerned still has first to issue the import permit, but according to the convention if R.S.A. (Transvaal Province) has given approval that the leopard trophy was legally obtained there is no reason why the U.S.A. should not issue an import permit and if they still refuse to, on what grounds is the refusal based? Thus, Transvaal contend that the U.S.A. cannot refuse granting the import permit from any signatory to the Convention, provided evidence is produced that the leopard was legally obtained. This should sort out the leopard obtained in the R.S.A. The prime leopard countries reckon that if satisfactory evidence can be produced that the trophy was legally obtained via the Game Department of the country concerned, then the same should hold true.

If this happens, it will provide for better control over these species on private land. Permits or licenses will still be obtainable for the legal removal of leopard and thus the Transvaal authorities will still issue export permits and be prepared to question why the U.S.A. will not (if they refuse) issue the necessary import permit first.

Thus, as I see it, legal leopard will always be obtainable in the Transvaal. I unfortunately, cannot speak for other African States, but can see no reason why legally trophy hunted leopard cannot enter the U.S.A. from prime occuring areas of Rhodesia, Botswana, Kenya and Tanzania.

The only way to tackle it thus seems via why the U.S.A. will not issue the import permits to legally obtained trophy leopard when signatories to the convention agreement or Game Department controlling these matters and issuing legal permission for their removal, are satisfied in their countries that leopard is not endangered.

Obviously, if leopard were, or became endangered the Authorities will not even allow their legal hunting."

R.C. Biggs
Southern African Professional Hunters

RESOLUTION ADOPTED JANUARY 30, 1976 BY ALL COUNTRIES IN ATTENDANCE AT THE SAFARI CLUB INTERNATIONAL GAME SYMPOSIUM HELD IN NAIROBI, KENYA, EAST AFRICA:

WHEREAS: Wildlife populations vary from region, to region, and

WHEREAS: Most nations have capable game management agencies, and

WHEREAS: A legal hunting season should be prima facie evidence a country considers a species not endangered, and

WHEREAS: The United States under the Lacy Act now has the authority to prevent the Importation of illegally acquired animals and their products, and

WHEREAS: The number of animals taken legally by sportsmen are minimal and of little effect on total populations.

NOW THEREFORE, BE IT RESOLVED

THAT THE UNDERSIGNED DO HEREBY SUPPORT THE PROVISO THAT SPORTSMEN BE ALLOWED TO IMPORT ANY WILDLIFE TROPHIES INTO THE UNITED STATES, TAKEN BY THEMSELVES IN ACCORDANCE WITH THE HUNTING LAWS OF THE COUNTRY OF ORIGIN AND EXPORTED WITH ALL APPROPRIATE LICENSES AND PERMITS.

CHIEF GAME WARDEN - ~~KENYA~~

By: _____

CHIEF GAME WARDEN - ZAMBIA

By: _____

CHIEF GAME WARDEN - UGANDA

By: _____

CHIEF GAME WARDEN - ETHIOPIA

By: _____

WORLD WILDLIFE FUND OF KENYA

By: _____

EAST AFRICAN WILDLIFE SOCIETY

By: _____

EAST AFRICAN PROFESSIONAL HUNTERS ASSOCIATION

By: _____

SAFARI CLUB INTERNATIONAL

By: _____

...the tailwaters of Davis Dam on the Colorado R... Bullhead City. The problem is in reaching them because anglers are not allowed to approach the dam any closer than this boat has. Striped bass anglers at Bullhead City therefore have had to borrow surf fishing techniques from saltwater fishermen to cast 100 to 150 yards.

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Mexican leader raps U.S. law

The U.S. Endangered Species Act, as it applies to American citizens who legally hunt in another country, is "stupid," according to Mexico's director of wildlife.

Mario Luis Cossio, director of the Departmiento de Fauna Silvestre of Mexico, said he is critical of portions of the U.S. Endangered Species Act because, in effect, the United States is telling Mexico that it does not know how to manage its native wildlife.

The U.S. law forbids American hunters from bringing back any portion of an animal the U.S. Congress considers endangered, even though the animal may be abundant in another country and may have been legally taken in that country.

"Every country has the right to manage its own wildlife, even if it is managing it improperly, which Mexico isn't," Cossio said.

He warned that Mexico could open year-around seasons on such species as the whooping crane or the masked bobwhite quail, if U.S. animal protectionists persist in forcing their wishes upon his country.

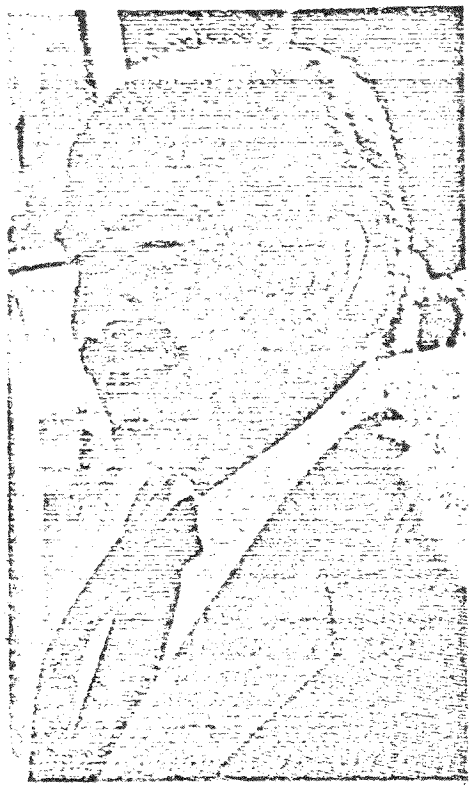
Cossio was in Tucson yesterday to accept two radio-equipped four-wheel drive vehicles given to his agency by Safari Club International. The two vehicles were purchased from Tucson's Precision Toyota and will be used to combat desert bighorn sheep poaching on the Baja California peninsula.

The vehicles were driven to Baja today by Mexican and Safari Club officials.

Cossio, 45, said Mexico has made great strides in educating its people on the value of wildlife during the three years he has headed the federal wildlife department. With the assistance of professional wildlife biologists from Mexico and the United States, along with hunting groups such as the Safari Club, his department is attempting to restore Mexico's native animals, he said.

Wildlife programs under way in his country include construction of waterfowl resting sites, the introduction of elk to Chihuahua and studies to determine the status of Mexico grizzly bears and antelope.

"Before we introduce more 'exotics' such as elk, we first have to re-establish the native animals," he said.



Mario Luis Cossio

'Endangered Species Act interferes'

bighorn sheep, for example, cost U.S. hunters $4,700 each. The money is used to conduct surveys and hire biologists, improve habitat and enforce the federal game laws.

Cossio warns that Mexico's apparent lack of enforcement of its fish and game laws is a thing of the past.

"Every hunter no matter what country he is from must be respectful of game laws," Cossio said. "We intend to enforce our laws to insure that respect."

To critics of Mexico's liberal bag limits that allow hunters to possess up to 25 ducks, Cossio pointed out that the total bag of waterfowl during the four-month Mexican hunting season does not approach a one-day kill of ducks in the United States.

"We feed those birds six months of the

Responses to the Preliminary Report

On the behalf of Carl Koford an unidentified graduate student who recently returned from Botswana and S.W.A. commented that no declining population should be hunted in any event. I must disagree. Most species in the world are declining, but hunting is possibly a factor contributing to decline for only a few. The question is whether or not hunting has any effe on population trends of a species. Regarding the leopard the answer is surely no. For many species an inconsequential harvest can be conducive in terms of economic incentive for management to either retard or reverse a decline caused by loss of habitat.

John Henshaw, authority on wildlife conservation in West Africa, said, "...I would not be at all surprised if most of your conclusions are reasonably close to the truth. Certainly the notion of a trophy import ban--being based on virtually zero data--is quite ludicrous."

A P P E N D I X F

DISCUSSION OF IDEAS RELEVANT TO THE IMPACT OF INTERSPECIFIC COMPETITION ON THE STATUS OF THE LEOPARD

In studies of mammalian predation, emphasis has usually been on intraspecific relations of the predator and its interactions with prey, but very little on interactions with other predatory species. Recent field studies of larger African carnivores provide information on indirect or ecological (exploitive) competition for the same resources as well as direct or behavioral (interference) competition in which aggression or the threat of aggression between species affects priorities to resources. This is relevant to the status of the leopard because competition appears to be the key factor regulating its distribution and density.

Field workers have not been as deliberate in their observations of social dominance (interspecific behavioral) interactions as they have been of predatory relationships. Descriptions of behavioral interactions between competing species are often described loosely without specifying how many of each species interacted or the detailed behavior of the animals involved. On the contrary, detailed compilation of each species prey resources are presented and discussed in attempts to demonstrate that each species does not compete with the other, or at least not very much. For example, in a semi-popular book based on such studies, Wrogemann (1975:104) said, "Cheetah and leopard do not normally compete for food although they prey on more or less the same species." Few field students of predators have been sufficient skeptics of largely accepted competition theory: most argue in favor of separation of niches while none have adequately supported their arguments. Simple and valid techniques exist to analyze niche overlap, and I used these above.

Mc Naughton and Wolf (1970) represent the classical approach to niche, in which dominant species are considered to employ exploitation strategies that result in their having a greater impact on the community. Such an approach is limited in usefulness because it overlooks the role of behavior in achieving dominance. Niche breadths can be the product of behavioral status more than exploitation strategies per se.

Morse (1974) rightly pointed out the nebulous nature of competition theory, which, for the most part, has failed to examine social dominance as the cause of ecological dominance, rather than vice-versa. A species may possess the optimal strategy for utilization of resources among a number of sympatric species in a trophic level. But what good are these if the resources themselves are reduced in availability because a more aggressive species prevents utilizati

In other words, where species compete for similar resources, one of the prerequisites for ecological dominance is behavioral dominance.

In developing these ideas I also assume that with most carnivores--certainly those discussed in detail here--at least in limiting seasons, food resources are often clumped in distribution, referring specifically to kills and/or carcasses.

Any meal may be a carnivore's last. While they are adapted to going relatively long periods between meals, the cost of losing the next meal to another species should at times be limiting in effect (Eaton, 1976b). For the most part, the only real resource for a larger carnivore is an actual carcass. A kill is a clumped and often limiting resource for the larger carnivore of Africa. Defense of that resource is a major factor influencing the status of several species. The importance of direct competition for larger kills is illustrated by the leopard's habit of storing carcasses in trees away from its less arboreal competitors.

In assessing the overlap of niches of larger carnivores, field zoologists have emphasized differential utilization of sex and age classes of prey. The assumption is that the impact of one species on another is reduced by such preferences. When a cheetah captures a wildebeeste calf, it has removed what would have had as an adult a relatively high probability of becoming a preferred resource of the lion. Consequently, I assume here that overlap of food resources and its effects on niche dimensions and ecological (conservation) status of these predators should be based only on the species of prey they utilize.

Similarly, others have argued that differential use of habitats reduces exploitive competition and thus overlap. Without contrary evidence, I prefer to assume that when predators use the same prey species in an area they have an impact on one another's resources (see Eaton, 1974). Interspecific behavioral rank of competing species affects where and when individuals hunt or feed. Differential habitat selection and feeding strategies are influenced by interspecific dominance. Larger predators may reduce direct competition without necessarily reducing ecological competition for resources since most of their prey are mobile and have broad habitat selection normally encompassing some or all of the preferred habitats of the different predators. In essence, the predators utilize the same collective resources when they utilize the same prey species. They may avoid confrontations with dominant species and losing resources by selecting different habitats. Essentially, though, subordinate species exhibit narrower (realized) niches because of direct competition.

Any one of several aspects of interspecific competition--indirect exploitation of resources, theft of food, predation and interspecific aggression (which is distinct from predation)--may be important determinants of the leopard's status. Thus, the realized niche and ecological status of the leopard should be regulated significantly by the number and density of dominant competitors.

APPENDIX G

STATUS OF THE LEOPARD IN THE SUDANO-GUINEAN ZONE

Senegal - Myers (1976a)

p.45--"Leopards are said to persist in much of Senegal, in fair though reduced numbers. They are moderately common in the Casamance River region in the south, especially in riverine and gallery forest patches with their numerous monkeys, small antelopes and other prey creatures. Leopard signs are far from rare along the Senegal River in the north, and tracks are occasionally found even in the Ferlo desert country. The species appears to be plentiful in the 8000km^2 Niokolo-Koba National Park in the south east, living on an estimated antelope population of 25,000, half of them kob (Dupuy, 1971)."

Offtake of leopard hides could be as much as 200 annually, but Myers considers the trade never to have been developed, nor, apparently, serious in its impact. He says (p. 46) "In these circumstances, it is less surprising that leopard still exist in a small patch of forest within 50km of Dakar." According to Myers, earlier estimates of poaching were highly exaggerated. There should be at least 3,000 leopards in Senegal (Table 18), *The leopard appears to have a relatively satisfactory status in Senegal, with no substantiated indications of a trend towards decline or endangerment.*

Mali - Myers (1976a)

P. 46--"The southern quarter of the country lies in the Sudano-Guinean zone the middle third in the Sahel, the rest is desert. The River Niger floodplains once provided large areas of leopard habitat, now much reduced by cultivation. As might be expected, leopards are most often found in the hillier savannah country of western Mali--an indication of their capacity to adapt to man's activities, since these areas are quite densely inhabited... The overall trend as elsewhere in West Africa, points towards a gradual elimination of leopard in all but a very few rugged hill tracts."

Elsewhere throughout Myers' report, as above, he points out that leopards are found in fair numbers in the midst of surprising densities of humans and a range of land uses, including agriculture, that may not disfavor the leopard, and could, according to Myers, enhance it. It is not clear then why he concludes that there is a trend towards elimination. Mali was found to have the most intensive fur trade of nine west African countries visited by Myers--none of which are indicated to have had a serious impact on populations. He said, "Traps of all sorts proliferated, though hunters apparently abandon many traps in the bush--perhaps an indication of declining numbers as well as of *their increased wariness*" (my emphasis).

Myers repeatedly suggests that leopards have been adapting their behavior to poaching effort, and, thus, earlier inferences by Myers (1973a) and others that reduced supply from some countries indicates decline of leopards must be

reevaluated. It is not unlikely that the leopard is capable of adapting to human pressures including poaching nearly as well as the coyote has done in the U.S.

It is impossible to evaluate from Myer's treatment of Mali the status of the leopard there. There could be 15,000 leopards or more in Mali (Table 18). *There is no evidence on which to conclude that it is endangered.*

Upper Volta - Myers (1976a)

p. 46--"Nevertheless the leopard is still widely found in Upper Volta. Provided some natural prey remains available, the leopard can withstand enviror mental impoverishment better than most carnivores... Regrettable however, the drought has put progressively severe pressures on the dwindling stocks of wild herbivores. The leopard looks likely to decline steadily in distributi and status."

Myers found no indication of potentially harmful fur trade in Upper Volta. While he concludes that status is likely to decline, human and climatic activi in the woodland savanna, the leopard's most favorable habitat type in Upper Volta, have resulted in an increase in bush and scrub, and conversion of woodla to thornbush. If anything these trends should decrease human pressures on leopard in this habitat which comprises more than one-third of the country. There could be 10,000 leopards in Upper Volta (Table 18). *There is no indication of endangered status in Upper Volta, and, if anything, conditions appear to be improving for the leopard.*

Niger - Myers (1976a)

p. 47--"...less than 10% (*that is about 126,700 km^2 which very reasonably could account for 2,500 leopards*) of this country falls within the Sudan-Guinean zone with its favorable habitats for leopards. Until recently, however leopard stocks in Niger were moderately sound. Though eliminated in many localities, they have survived well in others... It may however hold out longer than most other large species in the vast country, especially in the extensive mountain areas."

Myers found indications of several hundred leopards killed for hides annually, however, also, an apparent decline of exports. There could be over 5,000 leopards in Niger (Table 18). *The status of the leopard in Niger appears to be satisfactory with no indications of a serious trend towards decline.*

Tchad - Myers (1976a)

p. 47--"Tchad's southern quarter is Sudan woodland (*or over 300,000 square kilometers of favorable leopard habitat, which could account for well over 6,000 leopards*). Leopard are still to be found south of 18° N., i.e. in around one-third of the country (Anna, 1971)."

Apparently there has been an active fur trade in Tchad, buy Myers does not indicate to what extent or that it may have been deleterious. There could be 15,000 leopards in Tchad (Table 18). *Tchad appears to have a relatively satisfactory status; there are no indications of endangerment or trends towards endangered status.*

Central African Republic - Myers (1976a)

p. 48--"Most of C.A.R. lies within the Guinea-Sudan woodland zone (*which is favorable leopard habitat*)... Despite these deficiencies (*inability to patrol vast wildlife lands*) the leopard's status is fairly satisfactory. The country is too thinly inhabitated and underdeveloped, as well as too large, for an adaptable species like the leopard not to persist in good numbers. This conclusion is borne out by all recent scientific visitors. There is no evidence that the fur trade has been an important factor."

Obviously, Myers considers the leopard to have a satisfactory status in C.A.R., which could have over 20,000 leopards (Table 18).

Gambia - Myers (1976a)

p. 48--"The former forest along 300km of the Gambia river was well suited to leoard requirements... Fortunately, the new landscape still support plenty of baboons, warthog, birds and reptiles on which leopard can subsist."

There seem to be inadequate indications of leopard status, but it may be safe to conclude that the species is not endangered in Gambia.

Guinea - Myers (1976a)

p. 48--"Most of the country lies within the Sudano-Guinean zone, while a small area of rainforest survives in the south-east... Habitats and other factors should therefore be well suited to the widespread survival of leopards in fair numbers." *(no indication of fur trade).*

Guinea appears to have a satisfactory leopard population. It could hav well over 7,000 leopards (Table 18).

Sierra Leone - Myers (1976a)

p. 49--"In the north and east there are a few areas still comparatively undisturbed, but their development could be only a question of time. Meanwhile a number of areas in the north--the hilly savannas with their elep grass, and the gallery forests with their numerous ecotones--seem well suite to leopard requirements. Yet the animal is rarely found except in remote parts of localities such as... In the south and east especially on the Libe border, some rainforest remains, but it is steadily being cleared. For the most part it is replaced by cultivation rather than by secondary forest, whi whether in the form of natural regeneration or plantation, offers a new set of niches for herbivores in sufficient numbers to support moderate populatio of leopards."

Myers' statement that the leopard is rarely found except in remote area of the north cannot be inferred to mean the leopard is rare there. Accordin to Myers throughout his report, even wildlife experts typically underestimat leopards as the animal commonly assumes habits and activity patterns that hi it even in high densities. And, as emphasized heretofore, alteration of man biotypes by man may not harm leopards, and can even be favorable. The reduct of many prey species by hunting for meat has led to a surge in cane rats, a frequent prey item of the leopard and a nuisance for farmers.

According to Myers, the leopard's present range includes most of the livestock range, but depredations or complaints are rare, and there seems to be no indication of control of leopards. *Sierra Leone does not appear to have an endangered population of leopards, and its status may be relatively satisfactory.* There could be well over 3,000 leopards in Sierra Leone (Tabl

Liberia - Myers (1976a)

p. 49--"The leopard is believed to be evenly distributed throughout the country, except in farming and mining areas." Predation on livestock appears to be rare, and skin traffic is nil.

The apparent status of the leopard is satisfactory in Liberia, where its numbers could be over 20,000 (Table 18).

Ivory Coast - Myers (1976a)

p. 49--"As about half the country lies in the rainforest belt and half

in the Sudano-Guinean zone, there should be habitats well suited to the leopard provided that they remain relatively undisturbed."

It is unclear what "relatively undisturbed" constitutes; however, in other countries in which rainforest has been disturbed, Myers indicated no necessary harmful effects on leopard number. The same may well apply to the woodland habitats, though Myers concludes the, "it seems unlikely that leopard will be able to hold out in the long run except in a few inaccessible corners." At the same time he says, "Nothing was learned during the survey of the status of the leopard in Ivory Coast." On what basis then, can such far reaching and seemingly contradictory assessments be made about the trend of leopard populations is a puzzle. Based on what is known of habitat types and that the vast majority of the country consists of habitats that are favorable to the leopard, plus indications that changing land tenures might not be harmful anyway, one would be led to tentatively conclude that the *status of the leopard now and in the foreseeable future is probably satisfactory in Ivory Coast.* There could be more than 30,000 leopards in Ivory Coast (Table 18).

Ghana - Myers (1976a)

p. 50--"The Sudan-Guinean zone is now largely a mosaic of cultivation and woodland patches, giving way in the south-west to a mixture of forest and savannah; to the extent that herbivore populations survive, the 'edge effect' of these areas favours the leopard..." Compared with this factor *(hunting of bush meat)*, the trade in skins has been negligible; it was never great and is now moderately controlled."

The only indication of status or trends comes from one source who considers the leopard very rare in many areas. On this basis only it appears, Myers concludes that, "by the 1980's it may hardly survive at all except in the most remote localities." Considering Myers' own documentation of gross underestimates of leopard numbers even by qualified wildlife biologists, it seems a bit much to conclude from one study covering the status of all wildlife in Ghana, that the leopard is headed towards a very poor status in a matter of 6 to 8 years time. Rather, the tenacity and adaptibility of the leopard, the nature of the habitat and land-tenure which appears favorable, including even bush meat hunting that leads to very high populations of cane rats, readily taken by leopards, one would hesitate to make such gloomy prognostacations. It would be more valid to conclude that *the leopard in Ghana probably is not endangered but its status is largely unknown.* There could be more than 20,000 leopards in Ghana (Table 18).

Togo and Dahomey (Benin) - Myers (1976a)

p. 50--"Both countries lie mostly within the Sudan-Guinean zone, which in its undisturbed state offers reasonable leopard habitats." Myers obtained no information on leopard numbers or trends from these countries, but based on expanding human populations in relatively small areas concludes that, "By the

end of the century it is unlikely that the leopard will survive except in a few isolated pockets."

However accurate this preducation may prove, at this time it is reasonab to expect *both countries to have satisfactory leopard populations, and there is insufficient data to indicate trends.*

Nigeria - Myers (1976a)

P. 51--"Although capable of adapting to a wide variety of prey, the leopard therefore looks like being largely confined to protected areas by the end of the decade."

However, this assessment is not based on any knowledge presented on leop numbers or trends. *Status of the leopard in Nigeria appears to be unknown but possibly declining and unsatisfactory.* There could be 20,000 leopards in Nigeria (Table 18).

Cameroun - Myers (1976a)

p. 51--"Although a forest zone occupies rather more than the southern half of the country, it is no more than a mosaic of cultivated areas and small forest patches... most of the 6 million inhabitants live in the south-w ...leopards are reported in fair numbers in the south-east and in scattered relict populations elsewhere... In the north the only areas with satisfactor wildlife communities are said to be at the foot of the Adamaoua plateau, though leopards seem to flourish still in several other mountainous areas and in a few woodland territories."

p. 52--"All in all, however, although habitat disruption is increasing, it seems likely to have only limited impact on the leopard's general status, until the time when Cameroun undertakes massive modification of its remaining forests."

As there is no indication that Cameroun is undertaking a massive modific of its forest, and many other large areas in the country harbor good populati of leopards, we can conclude that *the species has a satisfactory status in Ca with no indications of a trend of decline.* There could easily be 30,000 leop in Cameroun (Table 18).