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Abstract: Ecology, status, conservation and management of the leopard and the cheetah in Kenya. Detailed description of the status of the two species. The author estimates the number of cheetahs up to three times as high as Myers (1979) did, so up to 3600 individuals.

THE LEOPARD *Panthera pardus*
AND
THE CHEETAH *Acinonyx jubatus*
IN
KENYA

ECOLOGY

STATUS

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P.K. HAMILTON

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REPORT FOR

THE U.S.FISH & WILDLIFE SERVICE

THE AFRICAN WILDLIFE LEADERSHIP FOUNDATION

AND

THE GOVERNMENT OF KENYA

P.H.HAMILTON

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So many people have given me valued help one way or another during my leopard studies in Tsavo and Meru National Parks and during my leopard status survey since then that it is difficult to know where to begin. But as full acknowledgements to all those who helped me in Tsavo have already been given in Hamilton (1976) it would be superfluous to repeat them here, and lack of space imposes further constraints. I must, however, record once again my special appreciation of the help and co-operation received from the Director and Trustees of the former Kenya National Parks, the Warden and staff of Tsavo West National Park, Dr. L.D. Mech of the U.S. Fish and Wildlife Service, Dr. J.M. King of Nairobi, and my tracker/assistant Elui Nthengi who was vital to the difficult task of studying leopards.

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CHAPTER 1

INTRODUCTION

The leopard Panthera pardus is the most widely distributed of all the world's large cats (Weigel 1975). It ranges over most of Africa and much of Asia, as far to the north and east as Manchuria and Korea, and it is probably the most numerous. However, because of its secretive, solitary, and largely nocturnal habits it has been one of the last to yield to scientific study.

Until the spoor tracking study of Smith (1977) in Zimbabwe and the radio-tracking studies of collared leopards in Tsavo and Meru National Parks, Kenya (Hamilton 1976; this study), the Serengeti National Park, Tanzania (Bertram 1978), and the Kruger National Park, Republic of South Africa (Bailey, pers.comm.), almost all recorded information on the leopard appeared in popular and semi-popular literature, most of which Turnbull-Kemp (1967) has summarised. In the scientific literature the leopard has featured, usually only incidentally, in studies of other animals sharing the same habitats (Schaller 1967, Schaller 1972, Eisenberg & Lockhart 1972, Muckenhirn & Eisenberg 1973, Bertram 1978) or in broad scope surveys of predation based upon carcase analyses (Wright 1960, Mitchell, Shenton & Uys 1965, Kruuk & Turner 1967, Pienaar 1969, Hirst 1969). Only one study, by Grobler & Wilson (1972), has specifically been devoted to the leopard's diet. Indeed, our lack of knowledge of the species in 1967 is well illustrated by Turnbull-Kemp's book "The Leopard" which is largely devoted to such topics as hunting and photographing the creature, and consideration of it in captivity, heraldry, superstition and witchcraft, and as a man-eater.

In 1981, however, we are further forward. One reason for this has been the development in the 1960s and improvement in the 1970s of radio-tracking systems (Mech 1973). Another has been the stimulus for study provided by increasing concern over the status of the leopard in the 1970s, and the realisation that not very much was known of the species' ecology, particularly its movements, population densities, and social organisation.

In a paper presented at the First International Symposium on the Ecology, Behaviour and Conservation of the World's Cats, Myers (1973) drew attention to the massive volume of the trade in leopard skins and to the simultaneous decline of the species in Africa. This led to a U.S. Fish & Wildlife Service report on the status of the leopard (Paradiso 1972) which resulted in the leopard being listed in 1972 as an Endangered Species under the United States Endangered Species Act of 1969. An "endangered species" is one defined as "in danger of extinction throughout all or a significant portion of its range" (Federal Register 1980). This classification prohibited the importation of any leopards or parts thereof, dead or alive, except under permit, and it effectively stopped the heavy flow of leopards into the United States for the fur trade. It also prevented an American sport hunter from bringing home a leopard trophy shot legally in a country where licensed leopard hunting was permitted. The following year the leopard was also placed on Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (C.I.T.E.S.): Appendix 1 included all species which are threatened with extinction and are or may be affected by trade, and required that valid permits be issued by both exporting and importing countries.

Controversy over the status of the leopard continued, however, and in 1975 the U.S. Department of the Interior initiated its own survey, which was actually undertaken by the U.S. State Department through its embassies abroad. The results were of doubtful validity as usually only one person was contacted in each country, but they led the Department of the Interior to continue to classify the leopard as "endangered". Shortly afterwards Myers (1976b) published his painstaking survey of the status of the leopard in Africa south of the Sahara: a study commissioned by the International Union for the Conservation of Nature and the World Wildlife Fund and partly financed by the International Fur Trade Federation which voluntarily imposed a three-year moratorium on the handling of leopard and cheetah skins. Myers' report concluded that although the leopard was under heavy pressure from poaching, it still occurred in reasonable numbers in some African countries and was not in imminent danger of extinction. This was interpreted by the "New York Times" (21/2/74) and the "International Herald Tribune" (22/2/74) to mean that the leopard was "a thriving species" which had been found "in abundant numbers in every African country south of the Sahara" - which was not at all what Myers had said!

Nevertheless, this increased the pressure on the U.S. Fish and Wildlife Service to remove the leopard from its endangered list: a move strongly advocated by Eaton (1976) whose leopard status survey commissioned by Safari Club International flatly contradicted many of Myers' assessments and concluded that "the leopard is not (nor was) endangered or threatened in the majority of sub-Saharan Africa...and in most of its range has a satisfactory and promising status." The validity of this assessment in general and its applicability to Kenya in particular will be examined later. Eaton's survey was followed by another by Teer & Swank (1977). This was commissioned by the U.S. Fish and Wildlife Service and was based, like Eaton's, on a brief questionnaire, with the addition of a number of interviews which relied heavily on government officials. Teer & Swank also concluded that the leopard should be deprived of its status as an endangered species, and recommended that it should be reassigned to Appendix II of C.I.T.E.S. This covers species which are not yet threatened with extinction but which could become endangered if trade is not controlled. Only an export permit from the country of origin is required, and there is no restriction on use for commercial purposes.

Finally, prompted by the feeling that none of the surveys cited had been able to make use of detailed knowledge of the leopard, the U.S. Fish and Wildlife Service asked me to submit a report on the ecology and status of the species in Kenya. This was complemented by requests from the Kenya Government for a survey of the leopard's status and for assessments of the species' importance as a stock-raider and of the value of translocation as a conservation and management policy.

My own research on leopards began in 1971 when Kenya National Parks requested a follow-up study of two radio-collared translocated leopards which had already been released in Tsavo West National Park. Realising that to study translocated leopards before we had any detailed knowledge of an undisturbed population of resident leopards was to tackle the problem the wrong way round, I persuaded National Parks to allow a study of resident leopards in Tsavo first. This they agreed to, and the African Wildlife Leadership Foundation of Washington, D.C. generously provided the funds. The results of this 30-month study were described by Hamilton (1976) and in abbreviated form constitute Chapter 2 of this report. A second study, of translocated leopards in Meru National Park

in 1977-1979, was also funded by the Foundation. The results of this are presented in Chapter 3 which then examines in depth the whole policy and practice of translocation and concludes with some recommendations addressed to the Kenya Government. Chapter 4 presents the results of a detailed survey of the status of the leopard in Kenya, financed by the U.S. Fish and Wildlife Service through the Foundation, and includes consideration of the species' importance as a stock-raider. These results are discussed in Chapter 5 which uses them to draw conclusions about the current status of the leopard in Kenya in particular and in Africa as a whole, and concludes with recommendations addressed to the U.S. Department of the Interior relating to its current proposals (Federal Register 1980) to amend the legislative status of the leopard in the United States. Chapter 6 examines the importance of the leopard as a tourist attraction and as a hunting trophy and includes recommendations addressed to both the Kenyan and the U.S. Governments. Chapter 7 draws upon information given in the preceding chapters to present a suggested policy for conservation and management of the species in Kenya, with recommendations to the Kenya Government.

Finally, because information on a related "endangered species", the Cheetah (Acinonyx jubatus Schreber), has turned up so often during my research on the status of the leopard, and because many interesting points have emerged, I have included this species in Chapter 4 and Chapter 5. The bulk of this report is, however, devoted to the leopard.

CHAPTER 2

ECOLOGY OF THE LEOPARD

2.1. INTRODUCTION

Between 1971 and 1979 the movements and ecology of resident leopards living in the wild were studied in Tsavo West and Meru National Parks by the use of mobile radio-tracking systems operating in the 148.350-148.625 MHz frequency range. The Tsavo study, which took place between 1971 and 1974 and in which twelve leopards were caught, was more detailed and successful than the Meru study, from 1977 to 1979, in which because of the scarcity of leopards as a result of poaching only three were caught. As the methods and results of the Tsavo study have already been described in detail (Hamilton 1976) I propose only to summarise them here, with reference to the Meru leopards where appropriate.

For the convenience of American readers I have accompanied metric measurements by their U.S. equivalents wherever I have deemed this helpful, but I have sometimes rounded off the latter for simplicity; the metric measurement is always definitive.

2.2. STUDY AREAS

Tsavo West National Park covers 9,065 km^2 (3,500 sq.mi.) in south-eastern Kenya about halfway between Nairobi and Mombasa, while Meru National Park, covering 872 km^2 (337 sq.mi.), lies on the Equator in central Kenya about 200 km (124 miles) north-east of Nairobi. Both study areas lie within the arid eco-climatic zone of Pratt, Greenway & Gwynne (1966). This is characterised by a mean annual rainfall of generally less than 700 mm (27.6") and a high rate of evaporation due to a combination of low elevation (mostly below 1200m or 3940') and high temperatures. The characteristic vegetation is dry thorn-bushland with Acacia and Commiphora species predominating.

The vegetation of the two study areas is similar, with the exception of the western portion of Meru National Park where Acacia and Combretum wooded grasslands, interspersed with swamps, predominate (Ament & Gillett 1975). But their topography is dissimilar. Whereas the Meru study was centred on the basically flat plains around Rainkombe in the centre of the Park, the Tsavo study was centred on the rugged Ngulia Range which rises steeply from 750 m (2460') to a height of 1820 m (5970'). Prey animals in the two areas were much the same, with dikdik and game birds common and impala and lesser kudu present in both, but rock hyrax were noticeably more plentiful in the rocky Ngulias.

2.3. MATERIALS AND METHODS

Resident leopards were trapped in metal box traps measuring 2.0m X 0.6m X 0.9m (6½' X 2' X 3') to which they were attracted by a bait hung in a suitable tree above the trap. Baits consisted of an entire small animal, such as a dead goat or baboon, or, more often, of a portion of a larger animal such as a Grant's gazelle or impala. They varied in weight from 4.5 kg to 45 kg (10-100 lb) and were usually placed in shady evergreen trees sited near waterholes or game trails known to be used by

leopards, or at the foot of ravines, rocky outcrops, and passes between hills. After a leopard had fed on a bait for one or, preferably, two nights, the bait was moved from the tree into the trap. A pull on the bait by a feeding animal released the drop door.

Trapped leopards were transferred to a smaller wooden box of known weight for immobilisation, as described by Hamilton (1976). The box was then weighed from a tripod, and the leopard was injected by hand with the desired amount of drug, either directly into the rump through strategically sited holes in the end of the box, or into the root of the tail which was seized through an adjustable 2.5-7.5 cm (1-3") gap under the door. Trapped leopards were immobilised the morning after capture and were allowed to recover alone at the site of capture.

Eight leopards were immobilised with Sernylan (Parke-Davis & Company, Hounslow, Middlesex, England) and Acepromazine (The Boots Company Ltd, Nottingham, England) on thirteen occasions and ten leopards with CI-744 or Telazol (Parke-Davis & Company, Detroit, Michigan, U.S.A.) on eleven occasions. Two old males died under anaesthesia, one with Sernylan and one with CI-744. In both cases death was caused by overheating resulting from drug-induced disruption of temperature regulation and unhelpfully high ambient temperatures. Nevertheless CI-744 was considered to be the drug of choice (Hamilton 1976) as Sernylan had an undesirably long narcotic action and recovery period, and a greater tendency to raise body temperature, depress respiration, and cause convulsions. These drugs are compared in detail by Hamilton (1976) and King, Bertram & Hamilton (1977).

Immobilised leopards were fitted with acrylic or machine belt radio-collars emitting pulsed signals from transmitters powered by 2.8 volts supplied by mercury or lithium cells, as described by Hamilton (1976). The collared leopards were radio-tracked by vehicle, from the air, and on foot, using a single portable Model LA-12 receiver (A.V.M. Instrument Company, Champaign, Illinois, U.S.A.).

Most radio-locations were obtained from a four-wheel drive Land Rover or a Toyota Land Cruiser equipped with a twin-yagi receiving system consisting of two three-element antennae. These were mounted with their elements vertical on a tubular aluminium boom which separated them horizontally by half a wavelength. The boom was supported by a vertical mast which held it 3m (10') above ground level and could be rotated through 360° from inside the cab. Signals from each antenna were brought by 70 ohm coaxial cable to a combining circuit contained in a peak/null box where the sum or the difference of the incoming signals could be selected by throwing a switch, as described by Anderson & De Moor (1971).

The location of a leopard was determined by triangulation from two or more known points, or radio-tracking stations, which had been plotted on 1/50,000 maps by plane table surveying (Clark 1956). At each point a bearing of antenna direction was taken with a prismatic compass about 8m (26') from the vehicle, far enough to avoid interference from the latter's magnetic field. The indicated direction was also searched with 10 X 40 binoculars, and this sometimes resulted in sightings of leopards. The true bearings were plotted on 1/50,000 maps overlaid by a 1 km X 1 km grid. The point at which two or more intersected represented the leopard's plotted position, which was expressed to the nearest 100m as a six figure map reference.

Collared leopards were also located from the air, using a single yagi antenna projecting forwards, with its elements vertically in line, from the wing struts of a Piper Cub (PA-11) or Supercub (PA-18 150) or a Cessna 185. The aircraft was flown slowly towards the source of the signal, often in a powered glide, until the strength of the signal dropped off sharply as the aircraft passed over the transmitter. Another run from a different direction confirmed the animal's position but was usually unnecessary. The method's potential accuracy was proved by sighting collared leopards four times from the air, but turbulence and rugged terrain sometimes imposed constraints on accuracy, particularly in Tsavo.

Leopards were also radio-tracked on foot, using a single hand-held yagi, as described by Hamilton (1976). The main objectives of this were to locate their resting places, which were investigated the day after being vacated, and suspected kills. A .458 calibre Mannlicher-Steyr rifle was carried for self-defence as elephant, rhino, and buffalo were often encountered at close quarters in dense bush.

2.4. RESULTS

2.4.1. Capture and radio-tracking results

Twelve Tsavo leopards were caught and recaught a total of 22 times in 26 months. Of the twelve caught, one old male died during Sernylan anaesthesia, and the radio-collar of another functioned for only two days. The ten leopards which provided radio-tracking data carried functioning collars for periods of 64-554 days (mean = 264 days) but only three transmitted for more than six months without interruption. Six of the ten acrylic ring collars cracked and broke; on at least three occasions acts of violence, such as struggles with other leopards or large prey, preceded breakage. Two collars which were put on too loose came off intact after one and 158 days. Two acrylic ring and four machine belt collars malfunctioned after 2-167 days. Fortunately collars could usually be replaced as it proved possible to trap five leopards more than once and one as many as five times.

In Meru only three leopards were caught: the male that died under anaesthesia and two females, an adult and a subadult. The adult female's collar transmitted for over a year and the subadult's for seven months. Radio-tracking proved more difficult in Meru because of the flat terrain and dense bush.

2.4.2. Population density

Only in Tsavo were enough leopards trapped to give an idea of the density of the population. This had to be based on much speculation as there was a striking disparity in the sex ratio of the twelve trapped leopards which comprised ten adult males, one subadult male, and one adult female. The probability of trapping males and females in a ratio of 11 : 1 was less than 1% if animals of both sexes were present in the population in a 1 : 1 ratio and were equally susceptible to trapping (Binomial two-tailed test, P = .006). But even individuals of the same sex were not equally susceptible to trapping, and although trapping success suggested that most, if not all, of the adult males in the Ndawe area were caught during the study, most of the females known to be present evaded capture, apparently because of their greater

wariness. In fifteen random encounters in which adult or large subadult leopards were seen in the study area purely by chance, and their sexes were determined beyond doubt, eight were males and seven were females. There is no significant difference between these figures and the 1 : 1 sex ratio they suggest (Binomial two-tailed test, $P > .05$), although the sample size of 15 is too small for the test to exclude sex ratios of 2 : 1 or 1 : 2.

The leopard population of the whole Ngulia area, some 400 km^2 (154 sq.mi.), was unknown. But it was possible to estimate that of a small, well defined portion of the study area comprising 130 km^2 or 50 square miles centred on Ndawe Hill. This 'census area' completely contained the home ranges of seven radio-collared leopards (five adult males, one adult female, and one subadult male) which between them provided over 75% of all radio-locations. Radio-tracking proved that five of these leopards were present in the census area in early June 1973, while sightings indicated that the other two were also present although they were not then transmitting.

But these were not the only leopards in the census area. Uncollared females were seen there on ten occasions and it is believed these widely distributed sightings represented at least four different individuals: maybe more. Although it is not known if all were present in June 1973, it is likely that they were residents. Uncollared females and their spoor were seen in the census area throughout the study and in the same localities more than once. I suggest therefore that not less than five adult females, including the radio-collared Leopard 7, were present in the census area in June 1973.

These figures represent a density of one adult resident leopard per 13 km^2 (1/5 sq.mi.), but the number of subadults and dependent cubs can only be the subject of speculation. It is not known how many of the five females believed to be present had cubs, although Leopard 7 can be discounted. Hamilton (1976) suggested that at least two of these adult females might have had a total of four dependent cubs, and knew that there were also at least two independent subadults present. These numbers (five resident adult males, five adult females, two independent subadults, and four dependent cubs) represent a density of one leopard/8.1 km^2 (1/3.1 sq.mi.). This can safely be regarded as a minimum density for the Tsavo census area and is much higher than some of the densities previously reported: 1 resident adult/30 km^2 in Wilpattu National Park, Sri Lanka (Eisenberg & Lockhart 1972); 1 resident adult/40 km^2 or 1 resident leopard/29 km^2 in the Serengeti National Park; and most previous guesses at leopard densities. It is lower, however, than densities of 1 resident adult/6 km^2 or 1 leopard to 4.5-5.0 km^2 reported from the Rhodes Matopos National Park by Smith (1977), and of 1 adult/6.1-10.5 km^2 in the Kruger National Park (Bailey, pers.comm.).

But it is possible, probably likely, that the true density of leopards in the Tsavo census area was greater than Hamilton (1976) suggested. The Tsavo study was discriminatory because it largely excluded females although these were present. Bailey, working in the Kruger, was more successful and caught them in the ratio of 1.8 adult females per adult male (Bailey, pers.comm.). In view of the social organisation of the leopard, discussed later in this chapter, a preponderance of resident females is to be expected. This phenomenon has also been reported in studies of lions (Makacha & Schaller 1969, Rudnai 1970, Schaller 1972, Eloff 1973a, Bertram 1978), cheetahs (Schaller 1972),

tigers (Schaller 1967) and mountain lions (Hornocker 1969, Seidensticker et al. 1973). By contrast the majority of nomadic or transient individuals usually seem to be males.

If it is assumed that the ratio of resident adult females to resident adult males was in fact 1.8 : 1 in Tsavo and that, on the basis of data from other large cats, 55% of these females had dependent cubs, the resident population might have had the following composition:

5 resident adult males
9 resident adult females, of which:
  4 had no cubs
  2 had litters of 3 & 2
  3 had large dependent cubs (2 + 1 + 1)
3 independent subadults

14 resident adults + 12 immature = total of 26 leopards.

This would represent densities of 1 resident adult/9.3 km^2 (1/3.6 sq.mi.) or 1 resident leopard/5 km^2 (1/1.9 sq.mi.) which are equivalent to the high densities in Rhodes Matopos National Park and the Kruger.

In conclusion the density of leopards in the Tsavo census area was not less than 1 resident adult/13 km^2 or 1 resident leopard per 8.1 km^2 but could have been as high as 1 resident adult/9.3 km^2 or 1 resident leopard/5 km^2. Densities of this order must be regarded as high for an essentially solitary large cat. There is reason to believe (Chapter 4 and Chapter 6) that some leopard populations in Kenya may attain densities of up to 1 leopard/2.6 km^2 (1 leopard per square mile) but this is likely to be near the limit and of only localised occurrence and probably includes transients.

2.4.3. Reproduction

The Tsavo and Meru studies provided regrettably little information on reproduction. In Tsavo the only collared female, Leopard 7, was a young adult that had no known cubs during the study. Although the adult female in Meru did have cubs, probably in March 1979, attempts to find them proved fruitless. If, like Joy Adamson's semi-tame leopard in Shaba, she moved her cubs every 2-4 days (Adamson 1980), it is not surprising that they were so difficult to find. I believe from spoor that two were alive and accompanying her in July but that by September only one large cub, which I saw, remained.

Scanty information from various sources suggests that there is no fixed breeding season for leopards in either East Africa (Turnbull-Kemp 1967, Bertram 1978, Adamson 1980) or South Africa (Pienaar 1963) although Eisenberg & Lockhart (1972) found some evidence for seasonal breeding in Sri Lanka. The gestation period is about 90-100 days (Zuckerman 1953, Sadleir 1966, Adamson 1980). Litter sizes range from one to six (Turnbull-Kemp 1967) but data from captives suggests that two or three is usual (Zuckerman 1953; Reuther & Doherty 1968; Eisenberg & Lockhart 1972; Harris, pers.comm.). This seems to apply in the wild too (Pienaar 1963, Bertram 1978, Adamson 1980). However, the observations of Turnbull-Kemp (1967), Schaller (1972), Muckenhirn & Eisenberg (1973), and Bertram (1978) show that usually only one or two well grown young are seen with their mothers in the wild. Cub mortality must therefore be high.

The two cubs of Joy Adamson's leopard were born in an almost inaccessible cave high up in the rocks and opened their eyes after a week (Adamson 1980). At about three months leopard cubs are weaned (Turnbull-Kemp 1967, Adamson 1980) and by four months occasionally accompany their mother (this study). Although there are records of leopard cubs killing small prey at five months of age (Turnbull-Kemp 1967) the cub normally remains with its mother until at least one year old (Turnbull-Kemp 1967) and probably for as long as 18 months to two years (Turnbull-Kemp 1967, Bertram 1980). At 21 months Joy Adamson's leopard came into oestrus and at 26 months started to mate. In the Serengeti Bertram's radio-collared female cub left her mother at the age of about 21 months, when her mother came on heat again and mated intermittently, but remained at least temporarily in the same area. By contrast the Tsavo subadult male left his juvenile home range at the estimated age of 30 months and was never seen there again.

2.4.4. Extent of movement

The movements of radio-collared Tsavo leopards are described in detail by Hamilton (1976). The following is merely a simplified summary shorn of statistical analysis and other complications.

The known extent of movement of ten radio-collared Tsavo leopards during the study is shown in Fig.2.1. and Table 2, although it almost certainly under-represents the movements they actually made. I have used the term 'observed range' to represent the total area over which a leopard was known to roam while its collar was functioning. It was calculated by the minimum area method (Dalke 1942) in which the outermost points of location are joined together. Observed ranges of the ten leopards varied from 22.6-120.6 km^2 (8.7-46.6 sq.mi.) and were not necessarily the same as the animals' home ranges.

The 'home range' was the area over which a leopard normally travelled in pursuit of its routine activities and did not include forays or journeys outside this area. In most animal movement studies the minimum area method is used to determine the size and shape of the home range, but it is to some extent artificial and inflexible because it is based on geometric connection of the outermost points of location and may often include areas where the animal was not known to go. There is much to be said for applying a method based upon considered appraisal by the researcher: one which, although based on the minimum area method, takes into account the spatial arrangement of all points of location, topography of the habitat, and all available knowledge of the animal's travel routes, habits, and behaviour. This is essentially an expansion of the 'atypical habitat elimination method' suggested by Ables (1969) but I have used the term 'adjusted home range' here. Provided that any temptation to make the boundaries fit in with preconceived ideas is resisted, I believe that adjusted home range more closely represents the size and shape of leopards' home ranges than other methods. Criticism that it is too subjective can be countered by pointing out that the geometric methods are artificial, inflexible, and waste information.

The adjusted home ranges of seven adult male leopards ranged in size from 19.7 to 59.3 km^2 (7.6-22.9 sq.mi.) with an average of 30.5 km^2 (11.8 sq.mi.), as shown in Table 2 and Fig.2.2. The home ranges of the only collared Tsavo female and of the subadult

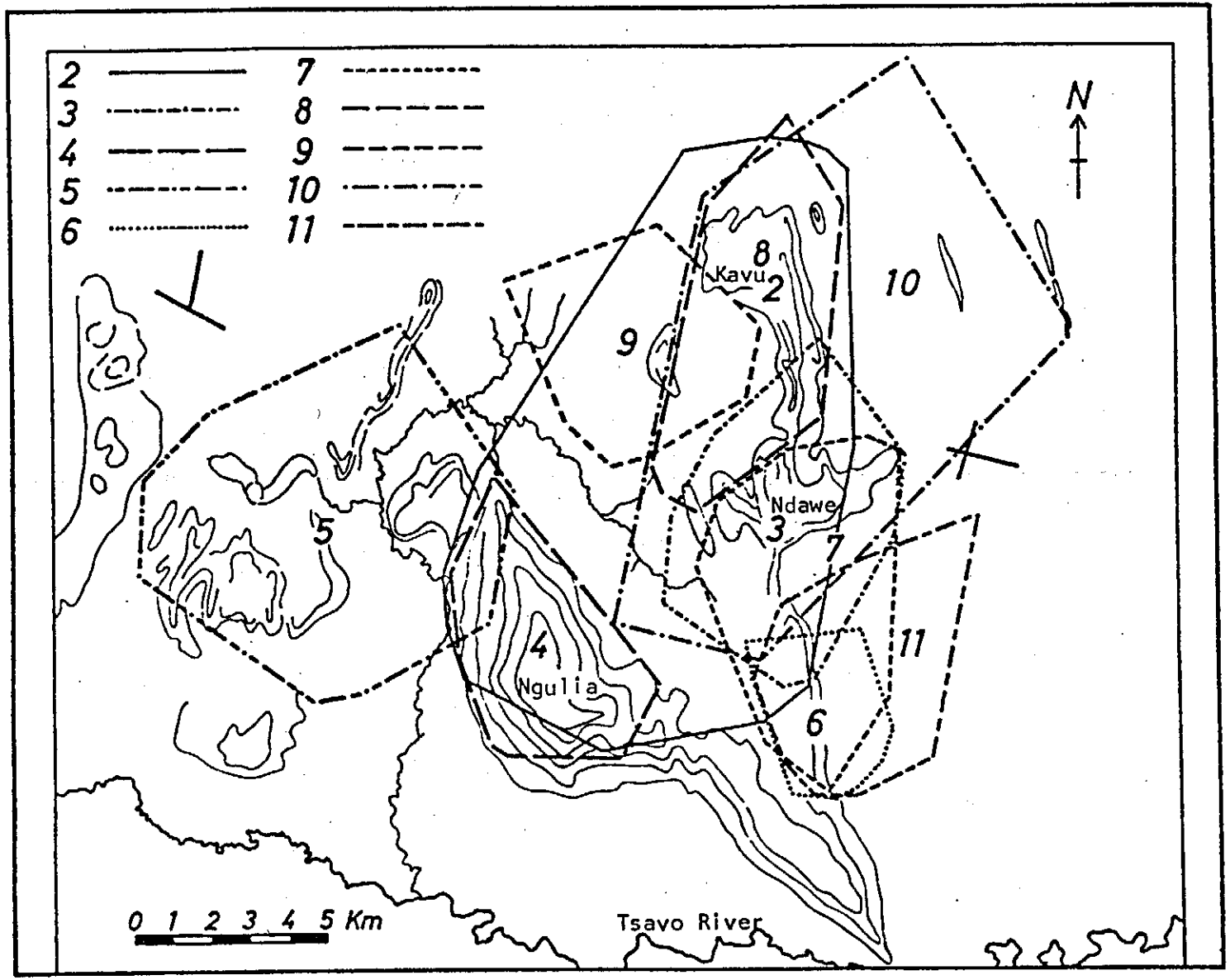

FIG.2.1. OBSERVED RANGES OF TEN RADIO-COLLARED TSAVO LEOPARDS, AS DETERMINED BY THE MINIMUM AREA METHOD USING ALL LOCATIONS. (From HAMILTON 1976).

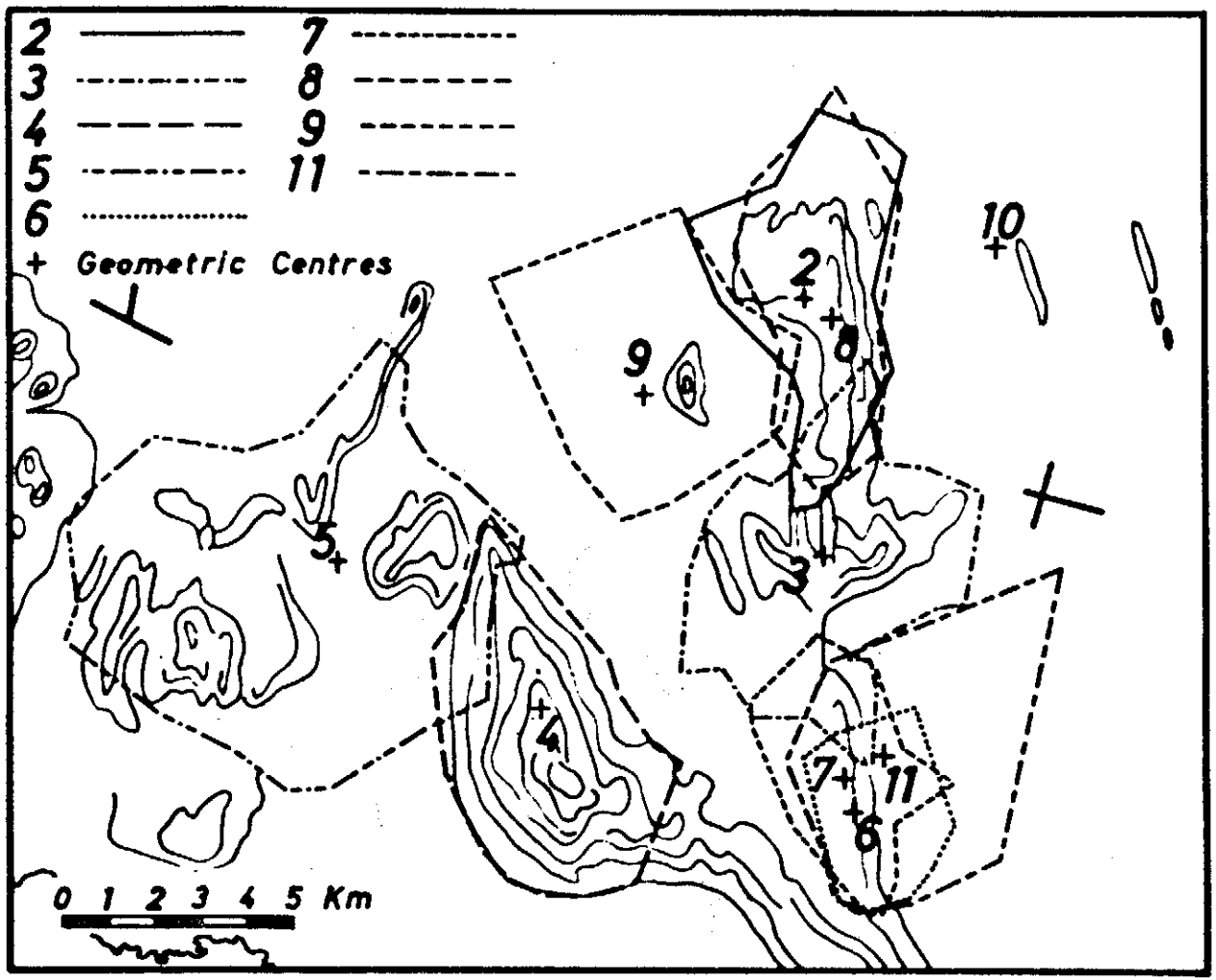

FIG.2.2. ADJUSTED HOME RANGES OF NINE RADIO-COLLARED TSAVO LEOPARDS.
(Information insufficient for Leopard 10).

TABLE 2. Observed ranges and home ranges of ten radio-collared Tsavo leopards.

Identity of leopard	3	7	2	5	6	8	11	4	9	10
Age & sex of leopard	AD ♂	AD ♀	AD ♂	AD ♂	SUB ♂	AD ♂	AD ♂	AD ♂	AD ♂	AD ♂
Observed Range (km^2)	36.2	35.5	120.6	63.4	11.5	31.4	26.3	22.6	25.0	104.4
Home Range (km^2)										
Minimum area	34.6	14.4	29.1	63.4	9.1	17.9	21.0	22.6	25.0	27.1
Adjusted	30.1	13.9	21.5	59.3	10.2	19.7	28.7	27.1	27.1	
No. of locations	263	187	172	96	91	83	41	34	30	20
Length of period used to determine HR (months)	22	14	18	11	8	7	5	2½	4	3

Note: For further details of methods used to calculate home range size see Hamilton (1976).

male were much smaller: 13.9 km^2 (5.4 sq.mi.) and 10.2 km^2 (3.9 sq.mi.) respectively. In comparison the home range of the Meru adult female covered 26.7 km^2 (10.3 sq.mi.), while that of the Meru subadult female comprised 15.3 km^2 (5.9 sq.mi.) from October-December 1977 and 32.5 km^2 (12.5 sq.mi.) from January-April 1978. I believe these differences reflect the lower density of leopards in Meru.

Not all the Tsavo leopards remained within their own home ranges during the study period. Three adult males and the female made detected forays outside. Leopard 2, for example, made eight known forays between March 1972 and September 1973. These varied in duration from one day to two months but usually lasted from 1-3 weeks and were separated by intervals of from four days to eleven weeks. They usually followed a similar pattern of movement, taking him westwards to the Ngulias. On at least two occasions his forays immediately followed hostile encounters with male leopards 8 and 3. Two other males, 8 and 11, both made large kills during their forays, which might have been made for this purpose. The female, Leopard 7, made only two known forays in 14 months but in both she accompanied a neighbouring adult male, Leopard 3, into his home range for a few days; she was probably in oestrus and may have mated with him.

Neither of the two Meru females made known forays outside their home ranges. However, the home range of the subadult, who was living on her own, did shift from the Rainkombe area, where she was probably born, to the eastern portion of the Park: a change that may have represented the dispersal of a young animal seeking to establish her adult home range. Similarly, Leopard 6, the Tsavo subadult male, left his juvenile home range at the age of about 30 months. He initially moved some 15 km (9.3 miles) to the northwest, but failure of his radio-collar halted further monitoring of his search for a new home range.

2.4.5. Occupancy of the home range

Leopards were not found in all parts of their home ranges equally often. There were usually sectors of concentrated use; on average about 75% of a leopard's locations fell within about 50% of its home range. But although leopards did spend more time in certain areas, in general they covered the greater part of their home ranges frequently and thoroughly. This is well illustrated by Leopard 3, the best studied Tsavo male and one whose movements appeared to be typical. Fig.2.3. shows his movements by night and day over a period of 96 hours during which he travelled a minimum of 43.7 km (27.1 miles) or an average of 10.9 km (6.8 miles) per day, his movements taking place mostly between 1700 and 1000 hours. In those four days he made no less than three circuits of Ndawe Hill and covered the greater part of his 30 km^2 home range. Similar 3-4 day studies on other occasions revealed much the same pattern. These findings are at variance with previous beliefs, such as that of Astley Maberley (1962) who wrote: "Males hunt over a wide area of their chosen range; seldom remaining in one portion of it for more than a few days, say a week, at a time, before moving on, and so, in the course of a month or so, patrolling the whole beat."

Radio-collared leopards showed few differences in their seasonal use of the home range. There was a slight tendency for most of them to increase the size of the home range in the wet season, but in the case of only one leopard, Tsavo adult male 5, was there a

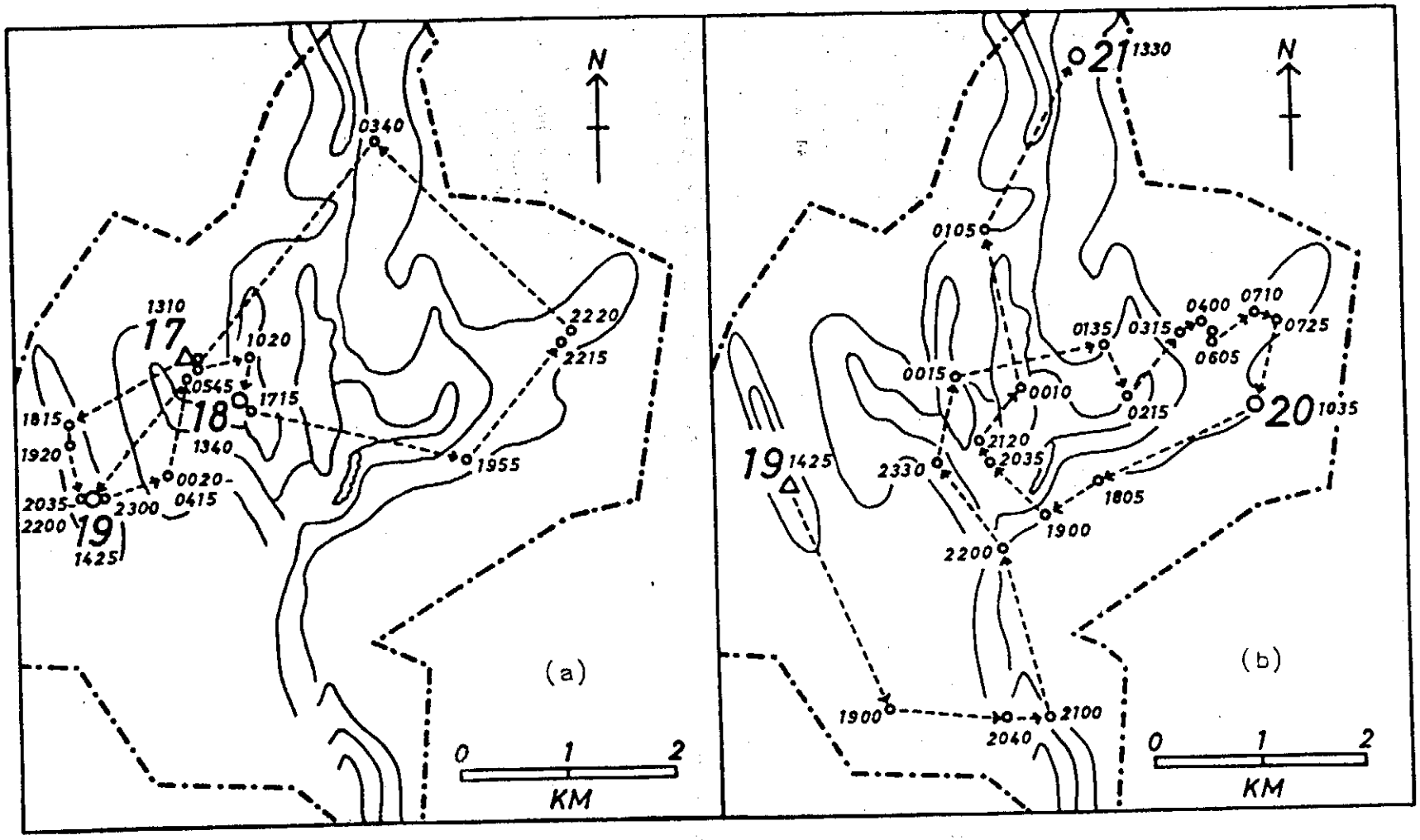

FIG.2.3. MOVEMENTS OF ADULT MALE LEOPARD 3 DURING THE PERIODS 17-19 JUNE 1973 (a) AND 19-21 JUNE 1973 (b). The boundary of the adjusted home range is outlined. A triangle marks the first resting place and large circles mark subsequent resting places. Small circles mark intermediate locations. Large numerals indicate dates and small numerals indicate times. (From Hamilton 1976).

statistically significant difference. But although he extended his range by about 40% in the wet seasons, there was no marked shift in location and he remained in much the same area.

Some Tsavo leopards also showed a tendency towards more even use of the home range in the wet season. The deciduous trees and shrubs on the plains were then in full leaf and their foliage provided innumerable shady resting places that probably encouraged this, for the leopards then had less need to seek shade and shelter among the rocks and evergreens on the hillsides and kopjes.

2.4.6. Activity periods

Radio-collared leopards moved mostly at night and rested during the hotter hours of the day (1000-1700 h) when in both Tsavo and Meru shade temperatures were usually between 29-33°C (84-92°F). But, as in the Serengeti (Bertram 1978), they sometimes moved at any time of day, and on two occasions I saw leopards hunting at 0930 and 1500 h on hot days. Usually, however, there was little movement between 1000 and 1700 h, a sharp increase between 1800 and 1900 h (dusk), more or less continuous movement throughout the night, although the animal might stay in the same place for several hours, and a gradual reduction between 0800 and 1000 h. Similarly although Tsavo leopards sometimes called at any time of day, they did so mostly during the night and around dusk and dawn. In Meru they were seldom heard.

2.4.7. Resting places

Some authorities (e.g. Bere 1962) have written of leopards' 'lairs', a lair normally being taken to mean a resting place used frequently and regularly by the same individual. But my radio-collared leopards usually rested in a different place each day except when they had large kills or, in the case of the Meru adult female, small cubs. They did, however, sometimes return to the same tree or rock in the course of time and seemed to have some favoured resting places, just as they preferred certain game trails and vehicle tracks as routes of travel.

The straight-line distance between resting sites on consecutive days, the 'daily distance', varied from leopard to leopard more or less in direct proportion to the size of the animal's home range. For example the mean daily distance of the subadult Tsavo male, with the smallest home range, was only 0.9 km (0.6 miles). That of the adult female was 2.0 km (1.2 miles), while those of five adult males varied from 2.3 to 4.2 km (1.4-2.6 miles) with a mean for all five males of 2.9 km (1.8 miles). The maximum daily distances recorded for each leopard within its home range varied in much the same way: from 1.9 km (1.2 miles) for the subadult male and 4.9 km (3.0 miles) for the adult female to 8.4 km (5.2 miles) for the adult male with the largest home range.

These figures suggest that adult male leopards tend to travel over larger areas than females or subadults. Although Meru provided no comparative data for males and females the same relationship probably applied there too. The mean daily distance for the subadult female before she moved eastwards was 1.2 km and for the adult female 1.3 km. The mean for the adult female is lower than expected

and probably reflects a reduced tendency to travel while she had her small cubs. For all leopards, however, the daily distance disguises the amount of travel actually undertaken during the night, as Section 2.4.5. shows.

Radio-collared leopards in both study areas used rocks, trees, and bushes as resting places. In Tsavo there were interesting and statistically significant seasonal differences in their use of rocks and trees. In the dry season, when the deciduous trees and shrubs had lost their leaves, leopards showed a significant preference for rocky resting places where caves, overhangs, and dense growths of evergreen trees and shrubs provided deep shade and concealment as well as good vantage points and safety from disturbance by elephants and other big game. The leopards were then also strategically located - in the right place and at the right time - for preying upon rock hyraxes when they emerged for their evening feeding period (Sale 1965) and I saw them take advantage of this. In the wet season leopards were more often seen in trees than amongst rocks, despite the difficulty of seeing them amidst the dense foliage. Their favourite choices in Tsavo were the deciduous Baobab, Adansonia digitata, and Melia volkensii, both of which were then in full leaf. In Meru leopards were most often seen in Acacia tortilis, the commonest large tree in the study area.

Bushes and thickets were frequently chosen as resting places in both Tsavo and Meru, but the leopards were then seldom visible and their presence was determined by a combination of radio-tracking on foot and investigation the following day, after the animal had moved on. In the wet season almost any bush in leaf sufficed but in the dry season there was a preference for evergreens such as Boscia coriacea and Maerua kirkii. Leopards resting under bushes usually curled up close to the base and were well concealed. Kills eaten on the ground were usually dragged into bushes too. In fact contrary to popular belief (e.g. Dorst & Dandelot 1970, Weigel 1975) less than one-third of the large kills I found in Tsavo and Meru were carried up into trees: probably because neither hyaenas nor jackals were common.

2.4.8. Feeding ecology

Analysis of the changes in day-to-day locations of Tsavo leopards showed that on only 13% of all consecutive days on which individual leopards were located were they found in the same place as on the preceding day. This in itself implied that they were making few large kills: a 'large' kill being any that detained them for more than a day and occasionally included animals as small as dikdik and duiker. Radio-tracking data given by Hamilton (1976) indicated that the average adult male Tsavo leopard made about 18 large kills a year (range 9-33) and that individuals sometimes went for periods of 2-3 weeks, if not more, without feeding on large prey. In Meru the kill rate appeared to be rather higher: of the order of 28 large kills a year for the adult female: a difference probably related to differences in the availability of prey.

The suggestion from movement data that Tsavo leopards must have been subsisting largely on small prey was confirmed by faecal analysis. This revealed that 39% of the 51 samples contained the remains of small rodents such as Tatera and Arvicanthis and insectivores such as Crocidura; 27% contained the hooves, teeth, and hair of small antelopes such as dikdik, grey duiker, and steinbok; and 27% contained the remains of ground birds such as the yellow-necked spurfowl (Pternistis leucoscepus). Others contained the remains of rock hyrax, African hare,

baboon, small snakes and lizards, and a variety of arthropods including tetigonid grasshoppers and the large turqoise centipede Scolopendra. In Meru so few leopard droppings were found (another indication of a sparse population) that faecal analysis was not attempted.

Whereas no less than 82% of the Tsavo faecal samples contained remnants of rodents, hares, hyraxes, small antelopes, and birds, only 12% contained identifiable remains of the larger antelopes. These animals, however, formed the majority of the thirty known leopard kills found during the study. Of the 23 antelope kills, eleven were impala, four were bushbuck, three were dikdik, two were lesser kudu, two were grey duiker, and one was a waterbuck. The other seven kills comprised two lion cubs, a young giraffe, a warthog, a vervet monkey, a rock hyrax and an African hare. The seven known kills made by Meru leopards included impala, bushbuck, lesser kudu, Grant's gazelle, waterbuck, and a baboon. None of the kills I examined appeared to be in poor condition.

It is clear that in the case of the Tsavo leopards examination of merely the kills that were discovered gives a misleading impression of the animals' diet. Most of the large kills were found when I investigated a leopard's temporary cessation of daily movement. Small kills such as birds, hares and rodents that did not require days to eat stood no chance of being detected in this way. It is undoubtedly because large kills are more likely to attract attention that most papers discussing predation by leopards tend to list the larger items at the expense of the smaller (e.g. Wright 1960, Mitchell et al. 1965, Kruuk & Turner 1967, Pienaar 1969). Nevertheless the diet of leopards does vary from place to place depending upon the prey available and probably also the size of the leopards, whose adult weight can range in Kenya alone from 30 kg (66lb) to 95 kg (209 lb). In the Serengeti, for example, the prey species most commonly caught by leopards are impalas and gazelles (Bertram 1978) but that is an exceptionally rich habitat with an abundance of large prey and the leopards there are also larger than those in Tsavo (Bertram, pers.comm.). I believe that the feeding ecology of Tsavo leopards is probably more typical, at least for the smallish leopards in the 30-50 kg size range that inhabit the Kenyan bushlands where large prey are less abundant. It is interesting that leopards in the Rhodes Matopos National Park also seem to feed extensively on rock hyrax, klipspringer, duiker, hares, rodents, and game birds (Grobler & Wilson 1972, Smith 1977).

It is also of interest that baboons and the various species of wild pig that are so often supposed to be the favourite prey of leopards (Wright 1960, Bere 1962, Smithers 1966, Dorst & Dandelot 1970, Weigel 1975) seldom featured in my Tsavo and Meru studies or in the kill records given by Wright (1960), Mitchell et al. (1965), Kruuk & Turner (1967), Pienaar (1969), Schaller (1972), and Bertram (1978). The leopard may be the baboon's chief natural enemy (Wright 1960, Smiles 1961, Astley Maberley 1962, Bere 1962) although this is debatable (Game Dept 1953-54, Guggisberg 1961) but it does not necessarily follow that the baboon is the leopard's chief prey, and few professional hunters in Kenya even consider using baboon for bait, for it is seldom successful. While some leopards do specialise in hunting them, as on Mount Suswa in Kenya (Simons 1966), this is probably for the very good reason that little other food is available, for baboons - and pig - are formidable prey whose capture is not without risk. Indeed Bertram's radio-collared leopards in the Serengeti and Joy

Adamson's semi-tame female in Shaba National Reserve, Kenya, usually avoided baboons whenever the two species met (Bertram 1978, Adamson 1980).

My own feeling, and that of many game wardens and professional hunters I have spoken to in Kenya, is that the belief that leopards feed largely on baboons and pig and thereby keep their numbers down (Bere 1962, Dorst & Dandelot 1970, Game Dept. 1929, 1930, 1932-34, 1935, 1937, 1950) has become part of the leopard's mythology. One Game Department report (1930) observes, for example: "The indiscriminate slaughter of leopards during 1929 and 1930 has upset numbers greatly, with the result that pig....have increased considerably." Such an increase in such a short period of time is biologically improbable, to say the least, and a better explanation may be found in the spread of human settlement into the natural habitat of the 'vermin' and the attraction exerted on them by cultivation; their numbers would probably still appear to be increasing even in the presence of a substantial leopard population. Indeed the Treetops Salient in the Aberdares has the densest population of warthog, bushpig, and giant forest hog I have ever seen in Kenya despite having also a dense population of unusually large leopards. In conclusion, while it is certainly true that leopards do take baboon and pig, particularly the young when they get the opportunity, and therefore obviously have some effect on their populations, I believe this effect has been exaggerated and is less than popular belief supposes.

There was little information on the food intake of wild African leopards before my Tsavo study apart from Turnbull-Kemp's (1967) estimates for the amounts of meat consumed by Rhodesian leopards in 24 hours: these varied from 8.1 to 17.6 kg (17.9-38.8 lb). In Tsavo, however, it was possible to measure the daily food intake of radio-collared leopards of known weight feeding on baits of known weight. The amounts of meat consumed ranged from 2.0 kg (4.4 lb) to 9.5 kg (20.9 lb) per leopard per night, with a mean of 6.3 kg (13.9 lb). Expressed as percentages of the body weights of individual leopards, the amounts eaten in one night represented 4-24% of body weight, with a mean of 16%. Thirteen (62%) of the meals represented 13-17% of body weight and four (19%) exceeded 20% of body weight. As the amount of bait remaining was never a limiting factor it can be assumed that the leopards took as much as they wanted. These findings show that the leopard, like the lion (Schaller 1972) and tiger (Schaller 1967), may eat as much as 20% of its body weight in 24 hours.

In addition it was possible to make some rough estimates of the daily food intake of Tsavo leopards of known weight feeding on their own kills. Though the kills could not be weighed, their approximate weights could be derived from various published sources (e.g. Ledger 1964, Sachs 1967) and radio-tracking data showed how long the leopards spent with each. Data from six impala, bushbuck and lesser kudu kills I examined suggested that the leopards consumed from 6.8 to 10.8 kg per day (15.0-23.8 lbs), with a mean of 8.1 kg/day (17.9 lb/day) over periods of 3-5 days. The five leopards weighed 29-42 kg (64-93 lb) with a mean weight of 37.4 kg (82.5 lb) and their estimated daily food intakes expressed as percentages of body weight ranged from 17 to 26%, with a mean of 23%. This substantial intake concurs with the thesis that carnivores are adapted to "a feast-or-famine regime" (Golley et. al. 1965). Contrary to the suggestion that leopards are wasteful feeders (Smiles 1961), those in Tsavo and Meru invariably made the

most of any large kill. They continued to feed after putrefaction was well advanced and were efficient and tidy feeders that took care to conceal their prey from scavengers and left little by the time they had finished.

In conclusion the leopard has a more catholic diet than any of the other large cats. My studies and a survey of the literature cited earlier show that the African leopard feeds upon over fifty species of wild mammals (excluding insectivores and rodents) in addition to domestic livestock and, occasionally, man himself. Birds ranging in size from starlings to ostrich, and including poultry, also feature in its diet, as well as crocodiles, snakes, lizards, amphibia, fish, snails, crabs, and insects; indeed some leopards have been known to specialise in fishing and crab-eating (Turnbull-Kemp 1967). Grass is sometimes eaten intentionally (personal observation) and wild fruits may occasionally be taken (Lyell, in Turnbull-Kemp 1967). Moreover, leopards often scavenge, contrary to the suggestion (Weigel 1975) that they only do so in an emergency. As scavengers they will feed on animals such as elephant (personal observation) that hardly constitute their normal prey. And my Tsavo subadult male which lived near Ngulia Lodge often used to forage in the rubbish dump after dusk, after spending the day less than 200 m from the staff quarters; on one occasion he was found late one night rummaging in waste bins in the kitchen which he had entered through a temporarily missing panel in the door! Indeed it can truthfully be said that the leopard will eat almost any animal, and this adaptability is perhaps the species' greatest strength apart from its secretive habits. Because the leopard has such a wide and varied diet it is less seriously affected than other large predators by the decline or disappearance of populations of any one, or even several, of its prey species. This 'buffer effect', together with the animal's secretive habits, largely explains the leopard's ability to exist in areas of dense human settlement. It is an important aspect therefore of the species' 'survival ecology'.

Another important aspect is the leopard's ability to survive for long periods (i.e. several months) without water, as they appear to do in Botswana (Smithers 1966) and parts of Kenya (this study). It is not true that they drink every day (Dorst & Dandelot 1970). My Tsavo observations suggest that where water is available they probably do drink every two or three days but do not need to do so. There was no water in one leopard's home range in the dry season and he was not known to visit the nearest spring. Like the Kalahari lion which may become completely independent of water under desert conditions (Eloff 1973b), the leopard's practice of resting during the heat of the day and moving mostly at night adapts it well to living in arid waterless environments.

2.4.9. Patterns of dispersion

Fig.2.2. showed that the home ranges of Tsavo leopards were not arranged haphazardly in space but with a degree of order that was maintained during the short time span of the study. The home ranges of the adult males were arranged in a mosaic upon which those of the subadult male (Leopard 6) and the adult female (Leopard 7) were superimposed separately. The most interesting feature of Fig.2.2. is not the generally small degree of overlap between the home ranges of the adult males but the way in which the boundaries of adjacent home

ranges correspond with each other. Leopards 2 and 8, the two adult males that shared the same area, constitute a special case that will be examined later. But even their home ranges illustrate the phenomenon of correspondence, for both indented west of Kavu hill in the same place. This indentation ran more or less parallel to Kavu and may have been partly influenced by topography. But what is interesting is that the eastern boundary of Leopard 9's home range fitted into it without extending further eastwards. There also appeared to be reasonably distinct boundaries between the home ranges of leopards 3 and 9, 3 and 2, and 3 and 11. Where Leopard 3's home range did overlap those of the other adult males, the overlap may be exaggerated because he provided more radio-locations over a longer period than any other leopard and all his movements, including those on the periphery of his home range, are better represented.

The spatial arrangement of home ranges and the dispersion of individuals can be expressed quantitatively by calculating for each leopard the 'geometric centre' (Mech, Tester & Warner 1966) or 'centre of activity' (Hayne 1949) of all its locations within the home range and by comparing the distances between the geometric centres of different leopards. This showed that for six neighbouring adult males the average distance from the geometric centre of the locations of each of them to that of the nearest known adult male was 3.1 km or 1.9 miles (range 0.8-4.6 km). The distance between the geometric centres of the adult female Leopard 7 and the nearest adult male (1.0 km or 0.6 miles) was substantially less.

Another measure of dispersion is 'inter-individual distance' (Hamilton 1976): the linear distance between any two leopards at the same time. The Tsavo data showed that an adult male was normally separated from his nearest known adult male neighbour by an average of 3.8 km (2.4 miles). Even the adult males 2 and 8 were on average 2.8 km (1.7 miles) apart although they shared over 70% of their home ranges and the geometric centres of their locations were only 0.8 km (0.5 miles) apart; in other words they appeared to be actively avoiding each other. Maps of the intensity of use of their home ranges showed that they did concentrate their activities in different areas, and the separation of the two animals in time and space illustrates Leyhausen's point (1965) that the common use of an area does not necessarily mean simultaneous use. It is also of interest that Leopard 7, the only collared adult female, was normally separated from adult male 11 by 2.2 km (1.4 miles) and from subadult male 6 by 1.7 km (1.1 miles) although her home range overlapped extensively with theirs. However, concentration of the activities of leopards 7 and 6 in much the same area suggests a considerable mutual tolerance.

2.4.10. Patterns of association

My observations in Tsavo and Meru confirmed the findings of Bertram (1978) in the Serengeti that leopards are basically solitary animals and are almost always alone. In Tsavo 87% of my 150 sightings of leopard were of leopards seen alone, and on 88% of the occasions when my baits were fed upon by leopards only one animal was present. In Meru too I only saw my adult female alone except when accompanied by her cub. But for several reasons radio-tracking did not reveal the true frequency of association between individual leopards: not all the leopards in the study areas were radio-collared; not all the

collared leopards transmitted at the same time; and the frequency of radio-tracking was not sufficiently continuous for the close monitoring required to detect all, or even most, associations between collared leopards. Encounters between them, particularly between males, were often brief and stood little chance of being detected. Despite this the technique provided some interesting information on the relationships between individuals of both sexes.

The relationship between adult males appeared to be one of mutual intolerance, even hostility. Hamilton (1976) gives evidence of six suspected conflicts between Leopard 2 and leopards 3 and 8. In three of these encounters, which all took place in the boundary or overlap areas between neighbouring home ranges, radio-collars were either broken or came off intact. There was also evidence that moderately severe injuries were sometimes sustained by the combatants: in at least two encounters leopards 3 and 8 were bitten on the head and clawed on the head, neck and forequarters, and two hours after another encounter Leopard 2 was seen limping badly with a cut or split forepaw. The infliction of deep canine toothmarks on the head and the breakage of acrylic collars indicate bites of considerable force. Although the wounds eventually healed, sometimes after a period of suppuration (Leopard 8), it is not surprising that such bites sometimes result in death. Woodley, for example, reports a fatal encounter between two males that met on a forest game trail; the younger animal was killed by a bite that crushed the skull (Mountain National Parks 1966). Other incidents have been recorded by the Game Department (1952), Royal National Parks (1954, 1958), Anon. (1960), and Elliott (pers.comm.). The prevalence of fighting in Tsavo was indicated by the scars of past encounters borne by the four oldest leopards I caught; only the female and some of the younger males were unmarked. I believe, therefore, that bloody fighting amongst male leopards is more common than has hitherto been believed (Corbett 1956, Turnbull-Kemp 1967, Ewer 1973). It may even be a significant cause of mortality.

There appeared to be greater tolerance between adult males and subadult males. The home range of subadult Leopard 6, for example, fell entirely within that of the adult male Leopard 11; and it was not until Leopard 6 was over two years old that he left the area to establish himself elsewhere. Bertram's (1978) study of the long term records of individual leopards at Seronera suggested that young males, though apparently not their sisters, tend to leave their birthplaces although "there is no information on where they are likely to go or why they leave." I believe that, as in lions (Schaller 1972, Bertram 1978), tigers (Schaller 1967), and mountain lions (Hornocker 1969, Seidensticker et al. 1973), some male leopards may become nomadic. Schaller believed this was so in India (Schaller 1967) and the Serengeti (Schaller 1972) and there is other evidence from Smith (1977) in Zimbabwe and professional hunters operating in Botswana (Babault, Lawrence - pers.comm.). However, I believe that Leopard 6's departure was probably provoked by increasing intolerance of Leopard 11 towards him as he became adult. Bertram (1978) also suspected that his 2½-3-year old collared male was driven out of his original home area by a fully adult male who was regularly seen thereafter.

I recorded only one apparently tolerant association between two adult males when Leopards 3 and 8, who were of about the same size and age, spent a day resting together in an area where their home ranges overlapped slightly. Although I did not see them, their signals came from the same place and I could find no evidence of a hostile encounter. These two males were never known to fight each

other although each of them violently fought the younger Leopard 2. This tolerance may have been an example of what Fisher (1954, in Wilson 1975) called the 'dear-enemy' or 'rival-friend' phenomenon. The importance of the association between leopards 3 and 8 is that it shows that the responses of one male leopard to another are not simply a matter of sex, size, age, and the situation in which they meet; their past history and 'personal' relationships may also be important. Nevertheless there is little doubt that associations between adult male leopards are highly unusual. Neither Schaller (1972) nor Bertram (1978) ever saw two adult males together in the Serengeti, and Eisenberg & Lockhart (1972) report only one instance, which they did not witness personally, of two males seen together in Wilpattu, Sri Lanka, in the company of a female. Unlike the lion (Schaller 1972), tiger (Schaller 1967), and cheetah (McLaughlin 1970), avoidance between adult males seems to be the rule in both the mountain lion (Seidensticker et al. 1973) and the leopard.

In these two species the relationship between adult males and females also appears to be broadly similar. In both, the adults of either sex are essentially solitary and join others of the opposite sex for only brief periods. In both the mating system appears to be promiscuous, with a weak pair bond. In contrast to the belief that leopards have only one mate for which "they show strong affection" (Hunter 1957), Leopard 7, the Tsavo adult female, was known to associate with at least three different adult males (and a subadult male) during the course of a year. But none of the nine detected associations between her and the adult males lasted for more than twelve days at the most (probably much less), while at least three lasted for less than 48 hours. Similarly two of my collared males were each seen with two different females at different times. The belief that adult male and female leopards live in pairs sharing the same home range (Hunter 1957, Astley Maberley 1962, Muckenhirn & Eisenberg 1973) is now no longer tenable.

Relationships between adult female leopards were not revealed by either the Tsavo or Meru studies. However, from studies of the lynx (Berrie 1973), bobcat (Provost, Nelson & Marshall 1973, Bailey 1974), and mountain lion (Seidensticker et al. 1973) it seems that mutual intolerance between females is the rule in solitary felids. In the Serengeti where, as in the mountain lion, the home ranges of female leopards overlapped, Schaller (1972) found that the females themselves showed "a strong mutual avoidance" although there was no evidence that they defended their home areas.

2.4.11. Social organisation

Finally it remains to consider briefly how the mosaic of leopard home ranges - which was surely not coincidental - may have been created and maintained. In Tsavo, topography did govern some home ranges to the extent that boundaries tended to be at passes between hills or at water points such as springs. But it could not have shaped them to form the observed mosaic. The explanation must therefore be sought in the leopards' behaviour.

The extraordinary correspondence between the boundaries of the home ranges of neighbouring adult males suggests that scent marking probably played an important role in delineating them. Although home ranges were frequently and thoroughly covered by their occupants, they

were too large for surveillance to be maintained by physical presence alone. There was clearly some other factor discouraging neighbouring males from intruding too far into each others' home ranges. The sharing of Kavu hill by leopards 2 and 8 does not invalidate this, for the two animals were separated in time and space. Indeed the striking similarities in the size, location, and shape of their home ranges suggests that the movements of both leopards were subject to the same strong influences, namely the presence of neighbouring adult males.

Any leopard leaves evidence of its presence in an area in the form of urine, faeces, and tracks, and these may serve as signals to other leopards travelling along the same routes later. But they are also known to urine-mark by spraying in the same way as most of the other large cats, as described by Schaller (1972), Eisenberg & Lockhart (1972), Bertram (1978) and Adamson (1980), and this was also seen in Tsavo. In addition they also communicate by calling, which they do frequently in areas where they are undisturbed such as Tsavo during this study. Whether other leopards are repelled or attracted by these various signals depends upon their sex, reproductive condition, and residential status in relation to the marker. Reception of signals from one adult male does not necessarily result in the withdrawal of another; the forays which male leopards made into the home ranges of others show that such areas were not always avoided. They did appear, however, to change their behaviour outside their own home ranges and tended to withdraw sharply after encountering a resident male. Leopard 2's linear movements on foray were uncharacteristically long and he withdrew hastily from Leopard 3's home range after two suspected encounters there; by contrast Leopard 3 lost his collar and was bitten on the head when he intruded into Leopard 2's home range. Whether these changes in behaviour outside the home range were in response to the alien scent marks of the occupant, or to unfamiliar terrain, or to the absence of the intruder's own scent marks, is not known. All three were probably important. Whatever the truth these incidents suggest that intruding male leopards were at a disadvantage in encounters with resident males, a finding that agrees with observations in birds and small carnivores (Lockie 1966).

In conclusion it is evident that fights between adult male leopards were not the normal means of preserving the social order. The separation of individuals in time and space was achieved by what Hornocker (1969) called a 'mutual-avoidance mechanism'. This behaviour is maintained by the visual, chemical, and vocal methods of communication mentioned earlier, and fights probably occur only when these signals are ignored or otherwise fail to prevent encounters.

2.5. DISCUSSION

In conclusion my radio-tracking studies have, I believe, thrown new light on many aspects of the leopard's ecology and way of life. They have demonstrated the existence of stable, recognisable home ranges of 10-60 km^2 which their occupants cover frequently, thoroughly, and more or less evenly, although they do occasionally leave on forays from time to time. They revealed a mosaic arrangement of polygonal male home ranges which overlap relatively little, while showing that female home ranges do not appear to fit in with the male mosaic but are probably superimposed in a separate overlapping mosaic

of female ranges. They produced evidence that resident adult males do not tolerate intrusions by other adult males and occasionally fight fiercely. They confirmed that the leopard is basically solitary but showed that this applies to both sexes, except when females have dependent young. They contradicted the belief that male and female leopards form devoted couples which share the same home range and showed instead that both sexes are promiscuous and that associations between them are not only brief but infrequent. They revealed that leopards feed on small prey to a much greater extent than has hitherto been believed and in Tsavo and Meru seldom eat baboons or take their kills into trees. Finally they produced estimates of the density of a known leopard population living in excellent habitat in a protected area.

Three points are of particular relevance to any consideration of the status of the leopard and conservation and management of the species. Briefly these are the leopard's habits, feeding ecology, and social organisation. With its secretive and largely nocturnal way of life the leopard fully lives up to its reputation as the most elusive and wary of all the larger African carnivores, and this in itself is a great asset in the species' struggle for survival in Africa although, paradoxically, its boldness can sometimes lead it into trouble with man. Similarly its wide and varied diet gives it much greater powers of adaptation to changing conditions than most - if not all - other African carnivores, although on the debit side its tendency to scavenge renders it highly vulnerable to sport hunting, poisoning, and trapping. Thirdly its social system appears to be one that is not favourable to translocation, for resident leopards established in their home ranges do not welcome the intrusion of strangers of the same sex.

Finally it is the social system that primarily influences the maximum densities that leopard populations can attain in areas where food supply is not a limiting factor. The density estimates for the Tsavo census area, the tendency of polygonal home ranges to form a mosaic, the uneasy sharing of the same area by two mutually intolerant adult males, and the incidence of fighting, all suggest that the density, of male leopards at least, in the study area was high. In view of this, and the fact that these figures were obtained from a wild population living in ideal habitat in a protected area where there was little disturbance, I find it difficult to believe that leopard populations can attain densities as high as 1/0.6 km^2 (1/0.2 sq.mi.) or 1/1 km^2 (1/0.4 sq.mi.), as Eaton (1979b) and Myers (1976b) have suggested.

CHAPTER 3

TRANSLOCATION

3.1. INTRODUCTION

Leopards have long been one of the major causes of conflict between man and wildlife in Kenya. By helping themselves to domestic animals and poultry they have over the years made themselves unpopular with smallholders, ranchers, and nomadic pastoralists. They used to be so widely distributed and so numerous that until 1933 they were legally regarded as vermin; no permits were required to kill them and they could be trapped, poisoned, or shot in unlimited numbers. In 1933 they were declared game animals (Chapter 6) and in 1950 were made the subject of a special licence but this did not apply to private landowners who retained the right to kill leopards in defence of their livestock. In 1950 about 250-300 were killed in this way: probably because, as the Game Department noted, "it pays to have a sheep or goat worth shs.20/- taken for if you catch the predator you can get £8-£15 for his skin". Not surprisingly the leopard was described as the Department's "biggest headache" (Game Dept. 1950). In 1953-54 it was still "a worry" and applications were being received daily from owners of private land to keep the skins of animals shot in defence of property. All applications were carefully scrutinized but generally the applicant was permitted to keep the skin with a permit endorsed "Sale or disposal not permitted" (Game Dept. 1953-54).

In 1956, however, the Director of National Parks expressed concern at the reduction of the leopard population in Kenya as a whole and suggested that translocating, or moving, troublesome leopards from the scenes of their crimes to remote areas would be the best way of solving the problem (Royal National Parks 1956). In 1957 the first stock-raiding leopards trapped around Nairobi and in other settled areas nearby were taken to Tsavo National Park and released in a joint operation between National Parks and the hunting firm of Ker & Downey. Several leopards were transported to Tsavo in Ker & Downey vehicles at that firm's expense, in just one example of the many contributions that have been made towards wildlife conservation in Kenya by the country's professional hunters. In the next two years another six leopards trapped around Nairobi and in the Nanyuki area were released in national parks: four in Tsavo and two in Nairobi. In 1960 the Game Department formally adopted translocation as a policy and there was a marked increase in the number of stock-raiding leopards trapped for translocation: between them the National Parks, the Game Department, and the Warden of the newly created Meru Game Reserve caught over thirty leopards which were distributed between Tsavo, Meru, and the Nairobi National Park.

In the next three years no less than 77 leopards - but probably more - were caught and translocated, the majority going to Tsavo. By this time a smooth and efficient procedure had developed, co-ordinated by F.W. Woodley, Warden of Mountain National Parks at Mweiga, but involving co-operation between farmers, the Game Department, National Parks, and the East African Railways and Harbours. Stock-raiding leopards were caught by either the farmers or the Game Department or National Parks, transferred into specially designed

wooden travelling boxes, and railed from Kiganjo to Voi on empty bogies returning to the port of Mombasa. The Railways did not impose freight charges, and all that National Parks had to pay for were tickets for the leopard and the armed Ranger who accompanied it to Voi. There they were met by Tsavo National Park staff and the leopard was released in Tsavo East either at Melka Faya on the Galana River or at Aruba.

This arrangement continued to function smoothly, with a turnover of about twenty leopards per annum, until 1968 when the Railways withdrew their co-operation and decided to impose freight charges that would have made the operation prohibitively expensive. Translocation to Tsavo then ceased, and leopards trapped in late 1968 and early 1969 were released in the Mountain National Parks, not far from where they were caught. From late 1969 onwards the newly gazetted Meru National Park became the chief receptacle for translocated leopards and took 111 in the next ten years. Once again an efficient procedure developed, with Mweiga notifying Meru Park by radio of any leopards awaiting collection and Meru Park collecting them when it next had a vehicle taking the rough 200 km (124 mile) road to Nanyuki. Leopards held in their boxes at Mweiga, where it was cool and they were fed and watered, usually had to wait a few days for collection but seldom much more than a week and were none the worse when they arrived in Meru Park. There they were released at Rainkombe in the centre of the Park without further ceremony. From August 1977 until December 1979 when translocation to Meru ceased, incoming leopards were fitted with radio-collars for determining their movements after release. This formed the basis of the present study.

The initial request by Kenya National Parks for such a study was made in 1970, by which time the organisation had released over 200 leopards since 1957 without really knowing what had happened to them. The need for an intensive investigation was high-lighted by the first attempt in 1970 to follow radio-collared translocated leopards after release. This was initiated and carried out by the Warden of Tsavo West, E.C. Goss, in collaboration with Dr. L.D. Mech of the U.S. Fish and Wildlife Service and involved aerial radio-tracking of two stock-raiding leopards released on the Tsavo River. The results of this are described in detail by Hamilton (1976) and are summarised briefly in this chapter.

The study of resident leopards in Tsavo West followed, revealing a high density of leopards in the Tsavo River-Ngulia area and suggesting that further releases there were unlikely to be any more successful than those of 1970. Meru National Park was therefore chosen as the best place for a more intensive study of translocated leopards. Its own leopard population had been heavily depleted by persistent poaching in the 1950s and 1960s, first by Wakamba and Tharaka (Adamson, pers.comm.) and later by Somalis (Jenkins, pers.comm.) so it was unlikely that a high density of long-established resident leopards would interfere with the released animals. In addition the efficient procedure mentioned earlier was operating smoothly, ensuring a more or less steady supply of stock-raiding leopards from Meru and Laikipia districts around Mount Kenya. Moreover, unlike the Nairobi, Lake Nakuru, Aberdares, and Mount Kenya national parks, Meru is not in the heart of dense human settlement and was considered to be sufficiently remote to be suitable for the release of potentially mischievous marauding leopards.

The purpose of this chapter is to examine the results of the present study, to review all other relevant information on the fate of translocated leopards after release, and to assess the policy and practice of translocation.

3.2. METHODS

3.2.1. Capture and translocation

Stock-raiding leopards trapped in central Kenya were collected by Kenya National Parks and transferred into large, heavy wooden travelling boxes for transportation. These boxes, measuring 2.1m X 0.9m X 0.9m (7' X 3' X 3') were lined on the inside by galvanised sheet metal which prevented the occupant from using its teeth and claws and damaging either itself or the box. Light and air came through a small weldmesh grille in the roof. As this provided the leopard's only window on the outside world, the animal was able to see little of what was going on and behaved quietly as a result. A removable metal drinking tray provided water, and meat could either be placed in the box before the leopard was transferred into it or it could be dropped through the 2.5 cm X 2.5 cm (2" X 2") mesh of the grille or pushed through the gap for the water dish. Provided that they were not teased through the grille, confined leopards sat or lay quietly and usually gave no trouble.

Translocated leopards were released at Rainkombe by raising the drop door of the travelling box by a pulley operated from the safety of a vehicle. During the present study two variations of the release procedure were practised. In the first the leopard was immobilised, fitted with a radio-collar, and allowed to recover - in effect released - at the usual site of release. In the second the leopard was immobilised and radio-collared in the same way but allowed to recover in a holding pen nearby, where it was kept for about ten days before release. The first procedure simulated, apart from immobilisation, the usual method of instant release. The second was designed to establish whether or not holding the leopard for 1-2 weeks before release would help it to recover from the trauma of trapping and transportation and make it more likely to settle down in the Park after release. The practice of holding translocated animals before release has worked well with some herbivores such as the black rhinoceros (Hamilton & King 1969) but it was not known if it would work with large cats.

3.2.2. Immobilisation

All the leopards fitted with radio-collars were immobilised in the travelling boxes. Each box had two circular holes of 2.5 cm (1") diameter drilled into the end wall, about 15 cm (6") above the floor of the box and 30 cm (12") apart. They were so placed that when the leopard sat at the far (darker) end of the box, as it almost invariably did, with the hindquarters against one or other of the holes, it was normally an easy matter to inject it by hand through the openings. The occasional unco-operative leopard could always be induced to sit against the holes sooner or later, either by tipping the box or by teasing through the grille: a form of disturbance that usually caused the animal to retreat to the far end after making a few lunges.

All the imprisoned leopards were injected intramuscularly by hand using stout 18 or 19 gauge needles and the immobilising drug CI-744. They were usually on their feet within 2-3 hours of injection. Of the 15 radio-collared in the present study ten were allowed to recover in the open, under the shade of a tree, and five were placed in the pen. Animals recovering in the open were watched discreetly until they were able to walk in a co-ordinated manner. The necessity of guarding them until they had recovered was strikingly shown when one of the leopards was attacked by a troop of baboons as it lay still drowsy under a thorn tree; only my intervention saved it from death or injury.

3.2.3. Captive leopards

The holding pen at Rainkombe was under a large Acacia tortilis tree about 1 km from the usual release site and situated well away from any main road. Measuring 10.0m X 7.0m X 2.1m (33' X 23' X 7') it was similar in size and initial construction to the leopard pens in the Nairobi Animal Orphanage and consisted of 12½ gauge chain link fencing buried 30-45 cm (12-18") deep and supported by stout cedar posts that provided a framework for the chain link roof. A wooden kennel offered a den into which the leopard could retire, and papyrus matting on the outside of the wire formed a visual barrier that obscured human movements from the inmate.

It seemed reasonable to suppose that this type of pen would prove adequate for holding translocated leopards in Meru. But events proved otherwise. The first leopard held there, Leopard 106, an adult female, dug her way out under the wire on her second night during heavy rain which softened the normally rock-hard ground. After this escape the depth of the chain link was extended by another 30 cm all round, and rocks and stones were packed against the inside of the wire to discourage digging. But even this did not prove sufficient to make the pen leopard-proof. The next occupant, Leopard 108, an adult female with a small cub (107), bit through the chain link on her first night and escaped with her cub through a hole no more than 15 cm (6") square. To add insult to injury she shed her collar in the process.

After this the pen was massively reinforced all the way round the inside by a 1.8m (6') high layer of 5.7 cm (2.25") mesh netting wire supplemented by a 0.9m (3') high layer of 1.9 cm (¾") chicken wire. Further reinforcement at the lower level was provided by five strands of 22 gauge fencing wire separated by 15-23 cm (6-9"). Loose lava rocks were also packed on the ground on both sides of the perimeter fence to discourage further digging. Thereafter the pen appeared to be leopard-proof.

The pen itself was divided longitudinally into two equal compartments by a chain link partition. This included a drop door that could be raised or lowered by a pulley operated from outside the pen, so that the compartments could be connected or separated as desired. It was originally intended that only one leopard at a time would be kept in the pen, and the communicating door was designed to allow safe human access to whichever part of the pen was not occupied by the leopard. This door was normally kept open except when access was required for throwing in food, replenishing water, and cleaning. However, captive leopards proved so hostile to any human presence

that cleaning of the pen was not attempted and water troughs were replenished by using a funnel and hosepipe from the outside. When it did become necessary to hold two leopards simultaneously (adult female 110 and adult male 111) one leopard was held in each compartment and the communicating door was kept closed. Feeding them obviously demanded great caution but was accomplished without mishap. Captive leopards were fed a sheep every two or three days.

Access to the outside was provided by two stable-type doors, one in each compartment, divided into halves that could be opened separately. When the time for release came, the leopard could be let out by attaching a rope to one of the lower doors and pulling it open from the safety of a vehicle.

3.2.4. Radio-tracking

Released leopards were located from the air using a Piper Supercub or Cessna 185 aircraft, as described earlier. Aircraft availability permitting, the tracking strategy was to attempt to locate released leopards every day for the first two weeks after release, when their movements were greatest and entirely unpredictable. It was then usually apparent whether or not the leopard was likely to stay in the Park, and the frequency of tracking was thereafter gradually reduced to once or twice a week and later once or twice a month if the animal was still within radio-tracking range. The positions of located leopards were marked on aerial photographs and later transferred to 1/100,000 or 1/250,000 maps.

Radio-tracking by vehicle was totally impracticable because of the large overnight distances sometimes travelled by released leopards and the unpredictability of their movements, as well as the lack of roads outside the Park. Indeed difficulties in obtaining an aircraft at the beginning of the project severely hampered attempts to keep in touch with the first three collared leopards and showed that without an aircraft permanently available on standby no successful follow-up was possible.

3.3. RESULTS

3.3.1. Radio-tracking success

Between August 1977 and December 1979 seventeen stock-raiding leopards were sent to Meru Park for release, bringing the total number released there since 1969 to 111. All but two were trapped in either Meru or Laikipia districts, within a radius of 180 km (112 miles) of the centre of Meru Park. Of these seventeen, ten were males and seven were females, all of them adult except for a 6-month old cub. Fifteen of the animals were fitted with radio-collars. The only exceptions were an adult male that arrived while I was ill in Nairobi and the small cub which would have rapidly outgrown any collar fitted. Of the fifteen collars, two failed within 24 hours and three were successfully removed by their owners. Because the leopard has such a thick neck in relation to the size of its head, fitting collars tight enough but not too tight was always difficult and I sometimes erred on the side of caution. However, loss or malfunction of these five collars meant that only ten leopards

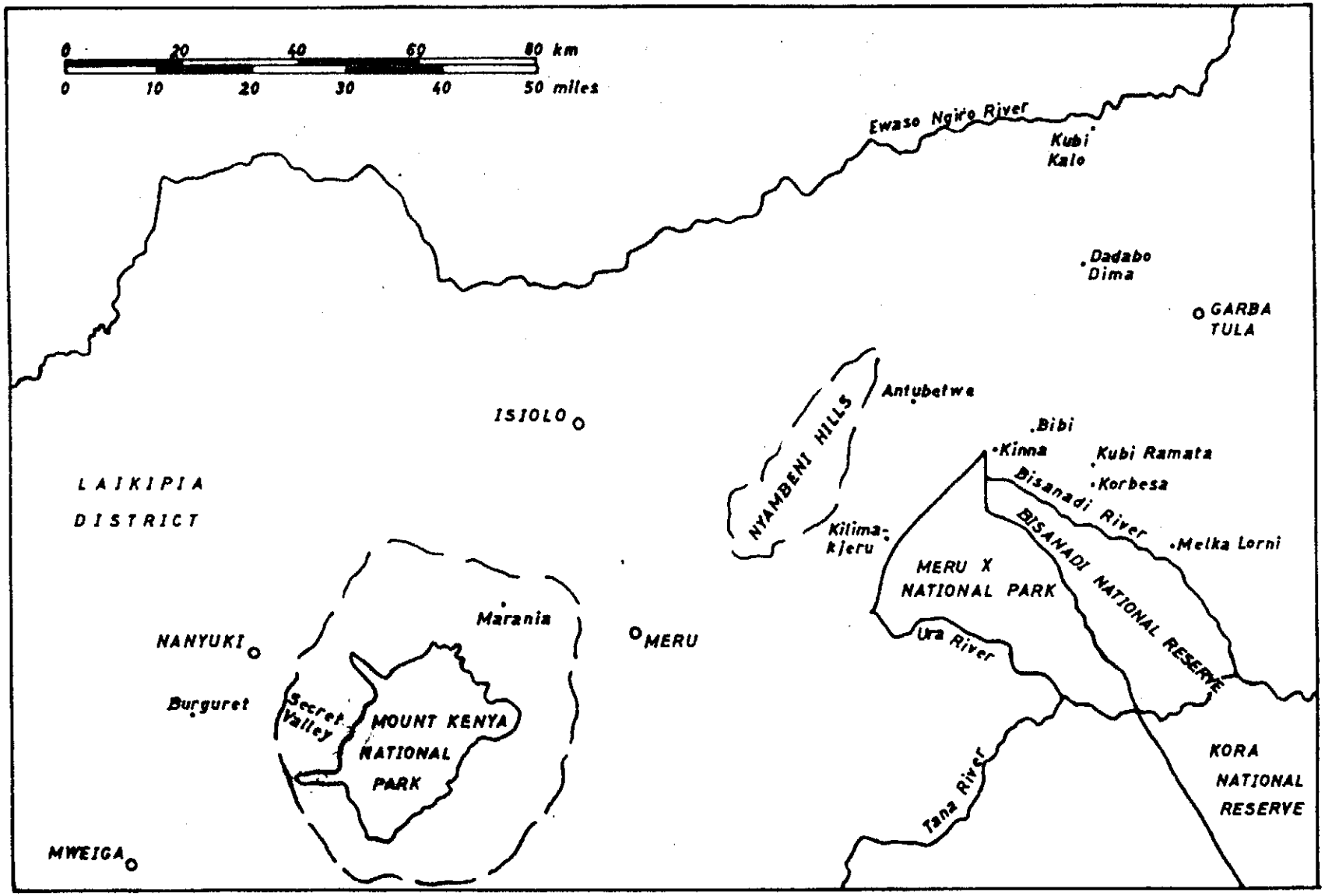

FIG.3.1. MERU NATIONAL PARK AND SURROUNDING AREA. X marks site of release at Rainkombe.

provided any information. Six of these were released at Rainkombe airstrip without any detention and four were released - or released themselves - from the holding pen.

These leopards were located 197 times after release. There was usually no difficulty in detecting their signals from the aircraft although none of the many radio-collars used measured up to more than 50% of their advertised performance. The greatest range I recorded was 33 km (20.5 miles) when the leopard concerned was on a hillside 1500' above the plains and the aircraft at 1800'. A range of 24 km (15 mi.) from a flying height of 2000' above ground level was considered good, while at 1000' I did not normally expect to pick up a signal much further than 10 km (6 miles) from the aircraft. The failure of the equipment to meet its advertised claims was disappointing, and its unreliability affected the success of the study.

3.3.2. Movements of translocated leopards

The movements of the ten leopards that provided any information are briefly described below as a preliminary to more general consideration. As the movements and eventual fate of the released animals varied so widely, I believe that the presentation of individual case histories is both interesting and worthwhile.

Leopard 95

A 62 kg (137 lb) adult male from Lamuria in Laikipia, Leopard 95 was released at Rainkombe airstrip on 28 Aug 1977. He was located in the centre of the Park for the first few days but his signal was then lost, partly because it was weak and partly because I did not then have the daily use of an aircraft for tracking. A thorough aerial search of the entire Park a week after the release failed to find him and it is reasonable to assume that he had by then already left; subsequent experience with other translocated leopards showed that they usually left within three or four days.

His translocation cannot therefore be considered a proven success.

Leopard 97

An enormous 73 kg (161 lb) adult male whose tail had been cut off in his youth, Leopard 97 had an interesting history of previous unsuccessful translocations. First caught stock-raiding at Naivasha, he was taken to Lake Nakuru National Park some 50 km (31 miles) distant, but he returned to the same farm and was retrapped after killing more livestock. This time he was taken out of the Rift Valley to beyond Narok. However, he returned to Naivasha and in December 1976 was caught on the same farm for the third time. He was then taken to Secret Valley, 110 km (68 miles) distant on the western slopes of Mount Kenya and released in the forest. Exactly one year later he was trapped killing livestock on Burguret Estate, near Nanyuki, and sent to Meru National Park, 130 km (81 miles) distant to the east of Mount Kenya.

He was released at Rainkombe airstrip on 15 Dec 1977 and spent the first few days within 2 km (1.2 miles) of the site of release. But on the 19th radio contact was lost and not regained until I obtained the daily use of a hired aircraft. On 29th December, two

weeks after release, he was located at the southern end of the Nyambeni Hills, some 16 km (10 miles) west of the Park and 35 km (22 miles) from the site of release (Fig.3.1.). Two days later he was 3 km to the south and on the following day 8 km (5 miles) to the north-east, still in the densely settled hills and less than 1 km (0.6 miles) from a village market. On 3 Jan 1978 he could not be found and had probably moved further west beyond the Nyambeni Hills and the range of my search. Contact was not regained as I then had to return the hired aircraft to Nairobi.

Six weeks later Leopard 97 was trapped on Marania Estate, Timau, after killing two sheep. Marania is on the northern slopes of Mount Kenya, 50 km (31 miles) due west of the southern Nyambenis and 80 km (50 miles) from the site of release. Burguret Estate from which he came in December 1977 is 55 km (34 miles) south-west of Marania, with Naivasha another 105 km (65 miles) in the same direction. Had he not been intercepted he might well have returned to one or the other.

Leopard 97's translocation was a double failure because in addition to leaving the Park he reverted to stock-raiding. After his capture on Marania he was brought back to Meru Park and released in uninhabited bushland on the south bank of the Tana. Unfortunately his collar had caused abrasion under the throat - the first time I had seen this on any of a number of recaptured leopards - and had to be removed. We do not therefore know his fate after this release.

Leopard 98

Leopard 98, a 64 kg (141 lb) adult male from Tharua farm in Laikipia District was released at Rainkombe airstrip on 22 Dec 1977. He spent the first two days nearby, only 1.4 km (0.9 miles) from the site of release, before beginning a series of movements that took him out of the Park on the third night and into the Bisanadi National Reserve via the Mutundu River and Leopard Rock. From 26 Dec 1977 to 5 Jan 1978 he wandered up and down the Murera River between Leopard Rock and Golo, sometimes venturing a few kilometres into the Park and the National Reserve before returning to the centre of the Park on 6 Jan 78, fifteen days after release.

Data gathered during the first fortnight after release, during which he was located every day, showed that his mean straight-line movement from day to day was 3.6 km (2.2 miles) but that he sometimes moved as much as 11 km (6.8 miles) overnight. The maximum distance he was located from the site of release was 13.5 km (8.4 miles) and in two weeks he covered an area of not less than 122 km^2 (47 sq.mi.).

Leopard 98 was not located again, because I had no aircraft, until 11 Feb 1978 when he was found 400m south of the Ura River which forms the Park's southern boundary. He was next located on April 5th in the Bisanadi National Reserve, 27 km (17 miles) to the north-east and 15.5 km (9.6 miles) from the site of release. Thereafter he was located 1-4 times a month for every month, with only one exception, until his collar finally expired in April 1979 after 15 months of transmission. After his return to the Bisanadi in or by April 1978 he was consistently located for the next five months in a 20 km^2 (7.7 sq.mi.) area of the Bisanadi Reserve. This pattern was interrupted only for about two weeks in May 1978 when he moved some 28 km (17 miles) to the north-west to the Antubetwe area of the eastern Nyambenis. It may be significant that another translocated male, Leopard 101, was at the same point on the Bisanadi River on May 9th. It is not known if there was any hostile

encounter but both leopards left the area within a week, Leopard 98 moving north-west towards the Nyambenis and Leopard 101 moving down the Bisanadi River in the opposite direction. By early June Leopard 98 had returned to the Bisanadi and he spent the next eight months in an area of about 90 km^2 (35 sq.mi.) straddling the Park and the National Reserve near Golo. By mid-February he had moved back into the centre of the Park near Rainkombe where he continued to be located, weak and intermittent signals permitting, until his radio-collar expired in April.

His translocation can be considered a success because nearly 16 months after release he was living in the centre of the Park and feeding entirely upon wild prey. He had in the meantime, however, travelled widely, covering an area of not less than 600 km^2 (232 sq.mi.) and almost certainly very much more. His movements showed that once a translocated leopard left the Park it did not necessarily do so for all time, but they also suggest he had difficulty in settling down. Whether he had finally established a permanent home range by the time his collar failed will never be known but it is reasonable to assume that he is probably still in the Park.

Leopard 99

Leopard 99, a 43 kg (95 lb) pregnant female, was caught in the same trap at Tharua as Leopard 98. But although the two leopards were released together at Rainkombe airstrip on 22 Dec 1977 they stayed together for only part of the afternoon before separating. After release Leopard 99 first went to the Kiolu area in the centre of the Park where she spent two days before moving a linear distance of 14 km (8.7 miles) in one night to the eastern boundary near Golo (Fig. 3.2.). The next day she was back at the same place on the Kiolu River where she remained for another day before beginning a series of long movements in which she travelled straight-line distances of 11.4, 11.7, and 12.8 km (7.1, 7.3, & 7.9 miles) in 72 hours. These movements took her out of the Park by the 29th, the seventh day after release, and through the Bisanadi National Reserve to the Korbesa area near Kubi Ramata hill. She spent five days there in an area being used by both livestock and wildlife before returning to the Park on 4 Jan 1978 in an overnight linear movement of 20.7 km (12.9 miles). She was still in the Park on 6th January when I had to return the hired aircraft to Nairobi.

Data gathered during the first fortnight after release, during which she was located every day, showed that her mean straight-line movement from day to day was 7.9 km (4.9 miles) but that she sometimes moved as much as 20.7 km (12.9 miles). The maximum distance she was located from the site of release was 25.5 km (15.8 miles) and in two weeks she covered an area of over 214 km^2 (83 sq.mi.).

She was not located again, because I had no aircraft, until 18 Jan 78, almost one month after release. She was then near Bibi, 10 km north of the National Reserve. Thereafter she was consistently located every few weeks until the end of August 1978 in an area of 48 km^2 (18.5 sq.mi.) around Kubi Ramata, a small rocky outcrop in otherwise flat Acacia bushland where she may have given birth to cubs. In early September she moved about 27 km (17 miles) to the north-west and took up residence in an area of about 18 km^2 (7 sq.mi.), devoid of livestock, on the lower lava flows of the north-eastern Nyambenis, where she remained until the end of the study in December

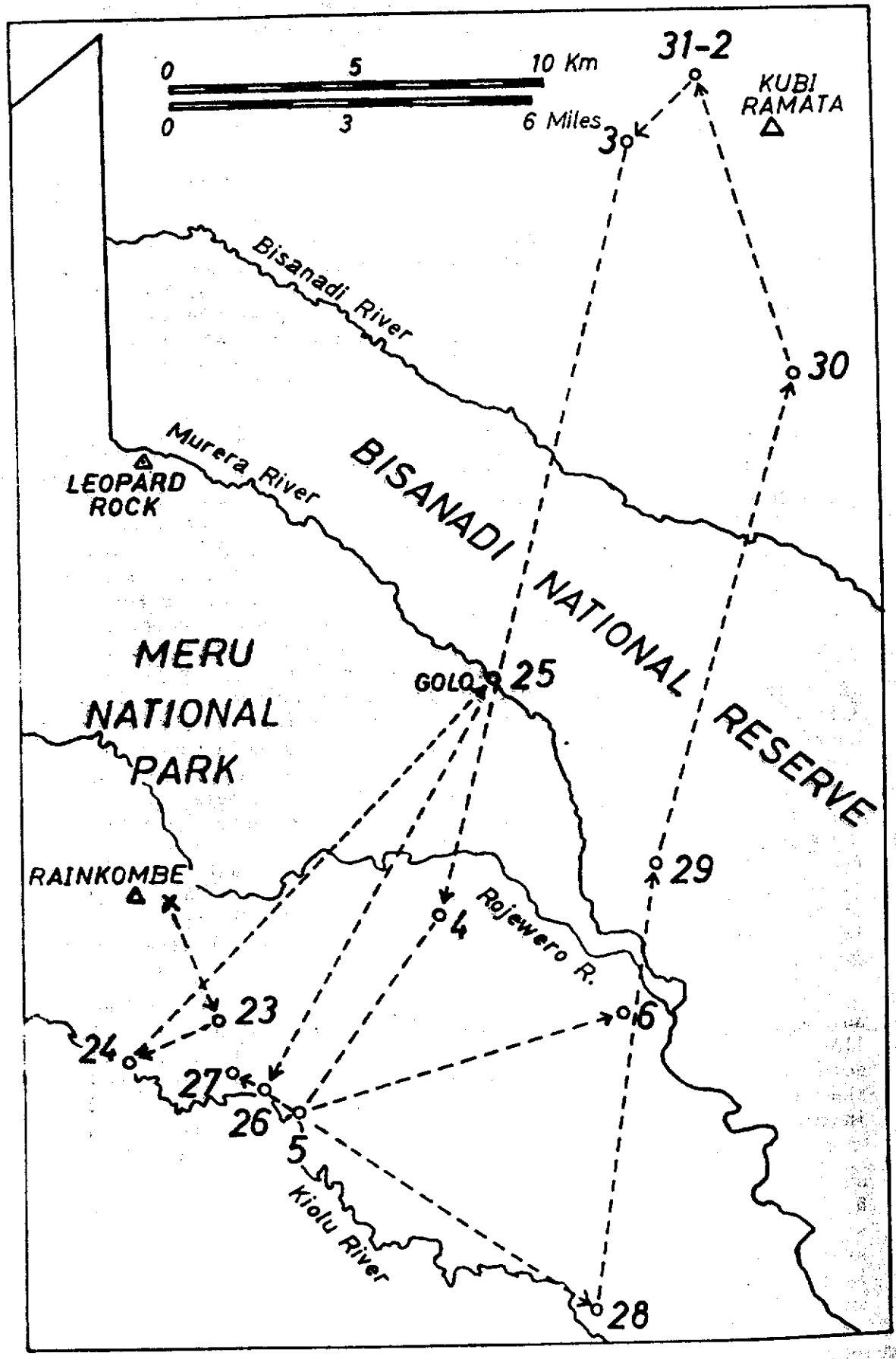

FIG.3.2. MOVEMENTS OF LEOPARD 99 IN FIRST FORTNIGHT AFTER RELEASE ON 22 DEC 1977. Numbers denote dates in Dec 77 & Jan 78.

1979. She was then well outside the Park and about 40 km (25 miles) from the site of release. Her translocation was not therefore a success.

Leopard 101

Leopard 101, a 46 kg (101 lb) adult male from Nanyuki, was released at Rainkombe airstrip on 25 Mar 78. He moved relatively little for the first four days, remaining within 3 km (1.9 miles) of the site of release. He then moved to the Murera River, which forms the Park's eastern boundary, and remained in the Golo area until 12th April. His mean straight-line movement from day to day during the first fortnight was only 2.2 km (1.4 miles), with a maximum of 6.5 km (4.0 miles). He remained within 12 km of the site of release and covered an area of not less than 42 km^2 (16 sq.mi.).

On 12th April, the 18th day after release, he was surprised at close quarters (seven paces!) by my assistant and I while we were radio-tracking him on foot. He was in excellent condition and had obviously been feeding since release although there was no livestock in the vicinity. However, the incident must have upset him because he fled from the area and was back at Rainkombe 8 km (5 miles) distant the next day. After a few days there he returned to Golo and entered the National Reserve, where he remained for the next five weeks. One day he was located at the same point as Leopard 98, as was mentioned earlier. But by July 10th, three and a half months after release and the last occasion on which his signal was ever heard, he was outside the National Reserve about 3 km (1.9 miles) east of the Bisanadi River near Melka Lorni, in an area much frequented by livestock. By that time he had covered over 238 km^2 (92 sq.mi.) since release and was more than 27 km (17 miles) from Rainkombe. Although his ultimate fate is unknown, his translocation cannot be considered a success because he left the Park and National Reserve and, three and a half months after release, did not appear to have settled down anywhere.

Leopard 103

Leopard 103, a 51 kg (112 lb) adult male from near Nanyuki, was released at Rainkombe airstrip on 6 July 78. Within four days he had moved southwards out of the Park to the Tana River which he then crossed. He was last located on the seventh day after release, apparently moving fast towards Kora National Reserve to the south-east. He was then nearly 35 km (22 miles) from the site of release and had covered more than 181 km^2 (70 sq.mi.) in a week, his straight-line distances averaging 5.9 km (3.7 miles) with a maximum of 10 km (6.2 miles). Unfortunately the aircraft then had to return to Nairobi for a mandatory maintenance check, and I could not find the leopard's signal on my return a few days later despite an extensive search. I believe he had moved further south, well beyond reasonable radio-tracking range. His translocation was not, therefore, a success as he left the Park within four days of release and never returned.

Leopard 106

Leopard 106, a 44 kg (97 lb) adult female, was immobilised on 7 May 79 in the Rainkombe holding pen but escaped during her second night of captivity as described earlier. She spent the next day on the Rojewero River only 1.5 km (0.9 miles) distant, but three days later was outside the Park, 2.5 km north of Kinna township and 26 km

(16 miles) from the pen. She remained near Kinna until the 22nd and had probably made a large kill which, however, we were unable to find. During these fourteen days her daily movements averaged only 2.0 km (1.2 miles) and she covered a very limited area, although it was almost certainly more than the 20 km^2 (7.7 sq.mi.) the data indicated because, for various reasons, she was not located every day.

She then headed north again and by the 25th, the 17th day after release, had crossed the Isiolo-Garba Tula road and was 53 km (33 miles) from the pen. She remained in this area for about a month and was located several times on the Dadabo Dima kopjes. Because of the distance from the Park only one attempt was made to locate her in June and she was then found 17 km (10.6 miles) further north, near Kubi Kalo hill 7 km (4.3 miles) south of the Ewaso Ngiro River. She was then nearly 80 km (50 miles) north of the pen from which she had escaped two months earlier. Thereafter until the end of the study she continued to be located in an area of about 37 km^2 (14 sq.mi.) along the Ewaso Ngiro, 85 km (53 miles) from Rainkombe. She appeared to have settled down there but her translocation cannot be considered a success because she had moved so far from the site of release and was living in a livestock inhabited area well outside the Park.

Leopard 109

Leopard 109, a 53 kg (117 lb) adult male from Marania, was immobilised in the Rainkombe holding pen on 22 Sept 79. He was held there for eleven days, during which he rested quietly in the daytime but made determined attempts to escape every night. By the time of his release he had attacked the wire along 60% of the perimeter and had dug along 40%. He managed to dig remarkably effectively to a depth of up to 30 cm (12") and removed rocks weighing several kilos, but was prevented from escaping by my earlier downward extension of the wire. He remained intractable to the end and showed no signs of settling down.

He left the Park within 48 hours of his release on 8th October but instead of continuing westwards towards Marania took up residence in a patch of dense riverine forest on the upper Kindani River near Kilimakieru hill, about 2 km (1.2 miles) outside the western boundary and 21 km (13 miles) from the point of release. Thereafter until the end of the study he was consistently located in an area of 55 km^2 (21 sq.mi.) in this locality. He occasionally entered the Park in the Kindani and Punguru areas but was usually found in the dense riverine forest outside, in an area of about 8 km^2 (5 sq.mi.) and was there when the study ended in January 1980.

Of all the male translocated leopards tracked, Leopard 109 moved the least after release. In the first fortnight he covered about 40 km^2 (15 sq.mi.) - although this is probably an underestimate - and his daily straight-line distances averaged 3.6 km (2.2 miles) with a maximum of 10.3 km (6.4 miles). Had he settled down just 5 km to the east his translocation could have been considered a success. Instead he was living in a forest surrounded by human settlement, although as we received no reports of a leopard killing livestock in that area he may have kept out of trouble. His translocation can be regarded as a partial success in view of this and because he was living on the Park boundary and continued to reenter the Park from time to time.

Leopards 110 and 111

In December 1979 two leopards, both allegedly stock-raiders, were sent to Meru Park from the Nairobi Animal Orphanage: a 33 kg (73 lb) adult female trapped in Machakos District in October 1979 (Leopard 110) and a 40 kg (88 lb) adult male trapped in Siaya District District in July (Leopard 111). Unfortunately the male arrived in very poor condition, totally unfit for release. He was thin, with open sores on his pads, and his hindquarters had more or less atrophied through lack of exercise in confinement; it transpired that he had been kept in a trap since capture and had therefore had no opportunity to exercise. He also appeared to have been semi-starved and was so ravenously hungry that he started to feed even before the effects of the immobilising drug had worn off.

Both leopards were kept in my holding pen for twelve days, one leopard in each compartment, during which time they each consumed four sheep and a goat. They settled down better than their predecessors and made less frantic attempts to escape, perhaps because they were not alone and had already been in captivity in Nairobi. The male, who badly needed to build up his strength, made little effort to dig, but the female made concerted attempts and removed most of the rocks that had been placed along the inside perimeter of the wire. She also inflicted extensive damage on the wooden kennel, tearing the sheet metal off the roof and chewing much of the wood. The leopards did not become tractable and reacted with violent hostility to any human presence, often charging the wire with considerable force. By the time of release on December 19th the male was looking in much better condition. Both leopards were released together but they separated immediately.

Leopard 110, the female, left the Park within four days, moving via Leopard Rock and the Bisanadi Reserve to near Kubi Ramata, the small hill favoured by Leopard 99 after her release. Leopard 110 stayed there for only six days before returning to near Rainkombe. During this first fortnight she covered at least 278 km^2 (107 sq.mi.) and her daily straight-line distances averaged 5.6 km (3.5 miles), with a maximum of 17.8 km (11.1 miles). Holding her in the pen did not seem to have dampened her ardour.

She remained within the Park for the first two weeks of January 1980 but travelled extensively before re-entering the Bisanadi Reserve. She was last located there on January 17th, just before the tracking aircraft was withdrawn. By that time she had covered over 480 km^2 (185 sq.mi.) since release. An attempt to find her again in February failed and I believe she was no longer anywhere in the area. Her translocation cannot therefore be considered a success.

Leopard 111, the Siaya male, moved gradually westwards across the Park in the first nine days after release. By the tenth day he was across the western boundary and he soon started to prey on goats in the settled area 1 km outside the Park. Some time in the first week of January 1980 he was poisoned and skinned. With Rangers from the Anti-Poaching Unit I searched the area on foot with hand-held tracking equipment and after considerable difficulty succeeded in finding the collar, which had been cut off the leopard and buried in a ravine near some huts. There was no sign of the leopard until the Anti-Poaching Unit made two arrests and were later shown where the

animal's bones had been buried. The skin had already been sold to a dealer with a local political connection. The two men charged with illegally killing the leopard were acquitted by the Resident Magistrate's Court in Meru despite the evidence of the radio-collar, the leopard's remains, the poison, and their own admission that they had killed the animal.

The translocation of Leopard 111 was not a success as he left the Park and reverted to stock-raiding. This was not, however, the most disturbing feature of his translocation. It later transpired that this leopard was trapped in Boro division of Siaya District in July 1979 after killing a child (Ngonze, pers.comm.). When he arrived at Meru Park with Leopard 110 and an Assistant Warden from the Orphanage both the Park Warden and myself were given emphatic assurances that this leopard was an ordinary stock-raider with no history of taking human life, for I had already seen Press reports of the activities of man-killing leopards in Siaya. Had we known that Leopard 111 was a known killer, we would have either returned him to Nairobi or shot him there and then; we would not have released him. In view of all this it is perhaps fortunate that he died before killing anyone else.

3.3.3. Other translocations in Kenya

Apart from the Meru study there is little information on the fate of translocated leopards - or other carnivores - after release in Kenya. Given the nature of these animals this is not surprising. However, there are a number of reports from Game Department and National Parks sources that throw some light on the success of translocations carried out in other parts of the country. The purpose of this section is to review this information briefly.

There are several references to the apparent success of leopard translocations in Tsavo, Samburu, and Meru. In 1958, for example, the Director of National Parks reported that "indications show....that the leopards which have now been released in the Tsavo Royal National Park have accepted their new surroundings and have so far not tried to return to their old haunts, nor have they stolen any chickens from adjoining areas" (Royal National Parks 1958). This assessment is not based on any detailed follow-up, but P.R. Jenkins, who was Assistant Warden in Tsavo for twenty years and released many of the translocated leopards, confirms (pers.comm.) that some of these animals certainly settled down after release; because of their generally greater size and darker skin they could readily be distinguished from the smaller, paler Tsavo leopards. I have myself seen one of these highland leopards on the Galana River, although none of the twelve leopards I caught at Ngulia was obviously of highland origin. Other reports of sightings after release come from Samburu/Isiolo Game Reserve where translocated leopards were being "seen regularly" after release (Game Dept. 1965) and Meru National Park where the Warden noted in 1971 that two ear-tagged leopards had been seen since release (Meru National Park Quarterly Reports 1971).

Against these rather nebulous successes, however, there is more plentiful evidence of failure: perhaps partly because failures are more likely to attract attention. The first report of interest, although it concerns a cattle-killing lioness rather than a leopard, relates to an animal trapped at Simba and released in Tsavo West National Park, 100 km (62 miles) to the south-east. Three weeks later she

was shot at Kibwezi, killing cattle again, having moved 50 km (30 miles) back towards Simba (Royal National Parks 1959-60). The next report concerns a leopard caught killing sheep at Gilgil in 1963 and released with an eartag in Nairobi National Park. Fourteen months later it was recaptured at Dundori, 35 km (22 miles) from Gilgil and 140 km (87 miles) from the site of release; in other words it had returned to the area where it was caught and had resumed stock-raiding (Game Dept. 1964). Another leopard caught killing sheep at Gilgil in April 1963 was also released with an eartag in Nairobi National Park. Sixteen months later it was recaptured on a farm at Ruiru, about 30 km (19 miles) north-east of the Park (Game Dept. 1965b). Yet another leopard trapped by the Game Department and released in Nairobi Park ended up in the lavatory of a biscuit factory in the Industrial Area of Nairobi (Kenya National Parks 1966/67).

The next recorded information comes from the pioneer radio-tracking experiment, mentioned earlier, in Tsavo West. Full details are given in Hamilton (1976) and only briefly summarised below. One leopard, a male from Nandi Hills in western Kenya and released on the Tsavo River on 31 Aug 1970, left the Park within three weeks after travelling through the Ngulia area without settling down (Fig.3.3.). By the end of five weeks he had reached Kamenioni in the Chyulu Hills, 75 km (47 miles) north-west of the site of release, 30 km (19 miles) outside the Park, and 80 km (50 miles) nearer to Nandi Hills which lay some 415 km (258 miles) further in the same direction. During the next eleven weeks he was located twelve times within 8 km (5 miles) of Kamenioni, a water point where in January 1971 I found a wooden leopard trap constructed of local materials. From 8th-13th January the leopard's signal was located daily from the air, near a group of huts belonging to Wakamba squatters in the foothills. An investigation with Rangers on foot on the 14th failed to pick up any signal, although we did discover that a leopard had been attacking the squatters' goats. I believe this was the translocated leopard that Mr. Goss had been tracking and that, having killed the leopard, the squatters destroyed the radio-collar when they realised that it was attracting the National Parks aircraft. It is clear that this translocation was not a success.

The other leopard, a male from Timau, was also released on the Tsavo River, near Mzima Springs. He spent the first five weeks in the Kilaguni area about 10 km (6 miles) north of the site of release before moving 30 km (19 miles) to the south-east, travelling fairly rapidly through the Ngulia Range to the Tsavo River, where he remained until his signal was lost in the eighth week. It is possible, though unlikely, that water seeped into his sealed acrylic collar from his frequent crossings of the river, resulting in failure. But it is more likely that he moved southwards outside the Park, beyond radio-tracking coverage. Although the result of his translocation is therefore somewhat inconclusive, it is clear that he did not settle down in the vicinity of his release. Had his release taken place in a smaller park, such as Meru, a movement of 30 km from the site of release would have taken him well beyond the boundaries.

Details of the Meru study have already been given but a few additional observations are relevant. The first translocations of leopard there were carried out in 1960 by E.C. Goss, Warden of what was then the Meru African District Council Game Reserve (Game Dept. 1960). Ten leopards and three cheetahs, all stock-raiders, were

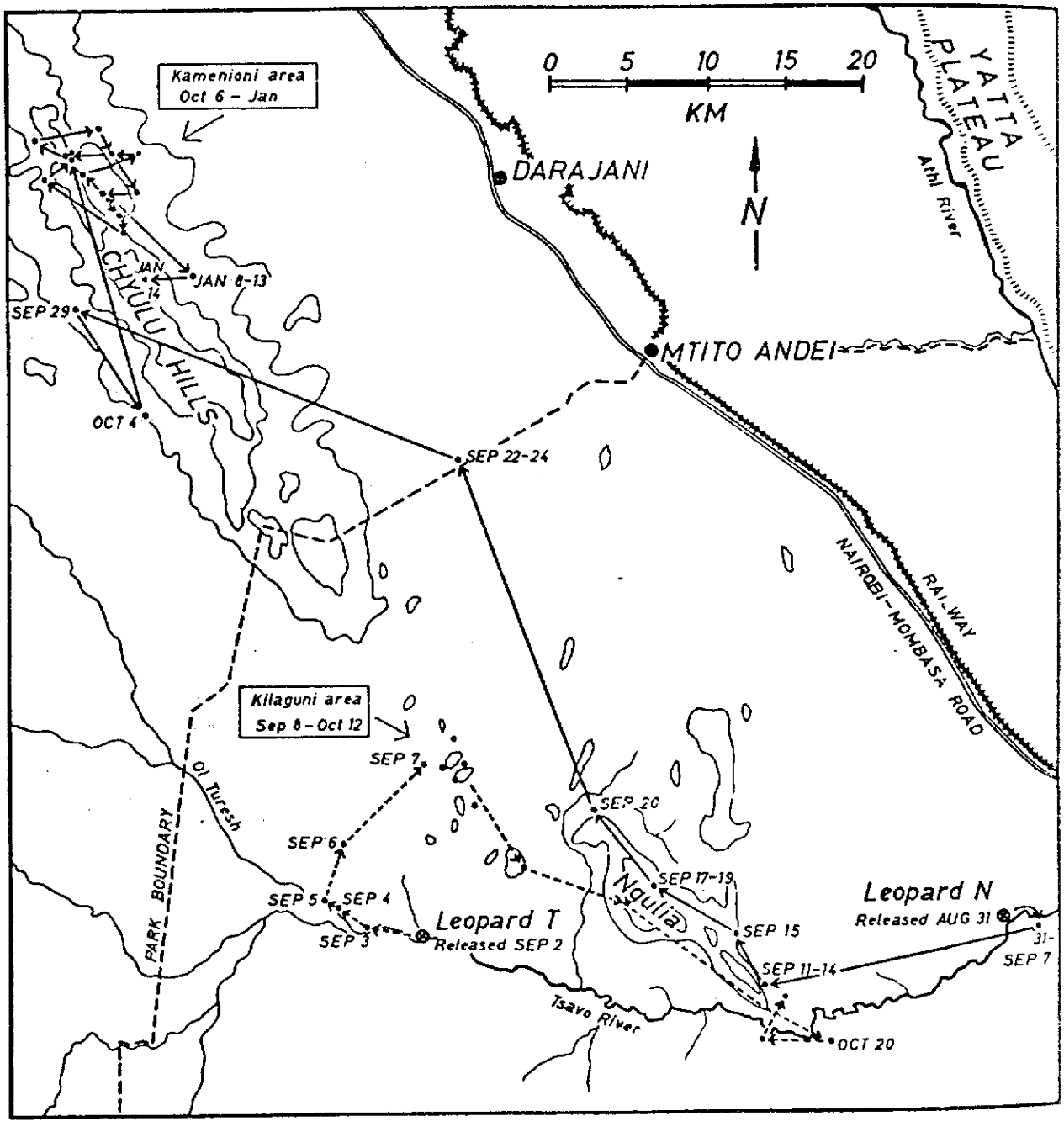

FIG.3.3. MOVEMENTS OF TWO TRANSLOCATED LEOPARDS RELEASED IN TSAVO WEST NATIONAL PARK IN 1970. Leopard N from Nandi Hills and Leopard T from Timau.

released and, although there was no specific follow-up, the Warden is sure that some of the leopards entered the Nyambenis and reverted to stock-raiding (Goss, pers.comm.). It is interesting also that even after 111 leopards had been released between 1969 and 1979, sightings of leopards in Meru Park continue to be rare; indeed I saw leopards (apart from collared animals) on only three occasions in three years there, compared with twenty chance encounters in 2½ years in Tsavo. This proves nothing but it does suggest that many, if not most, of the translocated leopards released in Meru did not remain there.

Finally at least three translocations of leopards have ended with the animals being shot in defence of human life. The first incident took place in the Nyambenis in the 1960s when the Warden of the Meru Game Reserve shot a translocated leopard that had mauled several people who were harassing it (Goss, pers.comm.). The second took place in Meru National Park in the early 1970s and involved a stock-raiding leopard from Eburu which had broken all its canines in the trap and was sent to Meru after spending six months in the Orphanage. This leopard entered a tent occupied by Field Force Rangers camped on the Rojewero River and awakened one of the Rangers who promptly shot it dead. The animal may not have had evil intent but the Ranger's reaction was understandable, and that particular translocation ended in failure. The third incident, and one worth describing in some detail because of its circumstances, took place in Tsavo West in March 1980. I happened to be passing through a few days later and was able to see where it happened and to talk to most of the people involved.

On 11th March three stock-raiding leopards which had been held at the Orphanage arrived in Tsavo West with six men on the back of a Wildlife Department lorry. They were not in wooden travelling boxes but in open wire mesh traps without food or water and loosely and inadequately covered by torn and tattered tarpaulins. Not surprisingly they were in a state of agitation by the time they arrived. Although the Warden of Tsavo West had given instructions to feed and water them overnight before releasing them the next day, the lorry had to return to Nairobi the same day with the Assistant Warden from the Orphanage, so the leopards were released by the Assistant Warden Tsavo West near Ngulia Safari Camp in the evening.

That night two of the bandas or cottages, which are built of stone with a palm-thatch roof, were occupied by visitors, one of whom in Banda No. 2 was unable to sleep because of a leopard prowling round the banda during the night. Early the following morning at about 6.00 a.m. the occupants of Banda No. 1 saw a leopard on their verandah and watched it prowl around their banda, often appearing to look in through the windows. After a little while they heard a scrabbling noise as the leopard entered under the roof at the rear of the banda and looked up to see it on top of the wall, inside the cottage. The couple left with their baby through the main door, leaving the leopard in the banda from which it could not immediately follow owing to the wire mesh covering the verandah, and they safely gained access to the next door Banda No. 2 where the couple there let them in. The camp staff responded to their calls for help and the leopard disappeared. The visitors all abandoned the Safari Camp in a state of shock and the night's events were reported to Park Headquarters. Field Force Rangers patrolled the vicinity during the day and departed that evening; they thought they had glimpsed two leopards but were not sure and did not shoot.

That evening three of the Camp attendants were seated on the verandah of one of the staff quarters at dusk when the leopard sprang from 3m (10') away, its claws raking the earth as it did so, cleared the verandah wall, seized one of the men by the head, and took him in one flowing movement back over the wall. As the man was dragged across the ground one of the attendants seized a length of iron pipe and beat the leopard which released its quarry and withdrew. Assisted by his companion the attendant was able to rescue the injured man, and the Camp Caretaker and his visiting brother came to their assistance. In the face of constant attempts by the leopard to retrieve its victim, the four men carried their injured colleague to the safety of Staff Quarters Room No. 5 where they all spent the rest of the night together and were terrorised by the leopard, which also entered the vacated rooms and chewed up clothing, pillows, mattresses, blankets, and two large plastic basins.

Field Force Rangers returned early the following morning and the injured man was brought to Headquarters and flown by the Warden to Voi Hospital. In the meantime two armed Rangers were sent to Ngulia to protect the remaining attendants until the afternoon when the Warden planned to return with a goat and shoot the leopard. However, the leopard came into the Camp at 2.30 p.m. in the heat of the afternoon and, apparently following the blood trail of its victim, entered the verandahs of two of the staff rooms. The Rangers saw it and shot it dead on the verandah of the room belonging to the injured man.

On close examination there was nothing obviously wrong with the animal, an adult male, except that its stomach was totally empty and in a contracted state, indicating that the leopard had not recently fed (Woodley, pers.comm.). This animal was allegedly caught killing chickens in Homa Bay District of western Kenya in July 1976, when it was about eighteen months old (Ngonze, pers.comm.). Known as "Kimanthi", it was held in the Orphanage for three years and eight months before release, and I suspect that this long period of captivity did much to remove its fear of man although it remained fierce in the Orphanage. Other exacerbating factors were its unsatisfactory and provocative travelling conditions from Nairobi to Tsavo, its agitated state and hunger at release, and the choice of a site of release only 200 m from a Safari Camp occupied by people. Whatever the causes of the incidents, the leopard's bold behaviour and the extraordinary singlemindedness with which it pursued its human prey are sufficiently unusual to be suggestive of a man-eater with previous experience.

In conclusion these incidents show that the translocation of leopards is a procedure not without risk. It should not be undertaken lightly.

3.4. DISCUSSION

3.4.1. Translocation: criteria for success

Although the translocation of predators has been practised in many countries, not only in Africa, as a wildlife conservation and management policy, there is relatively little published information on the fate of translocated carnivores after release. What literature there is mostly concerns wolves (Mech 1966, Mech 1970, Henshaw &

Stephenson 1974, Weise et al. 1975), black bears (Harger 1970), and the red fox (Phillips & Mech 1970) in North America, apart from a few reports from South Africa on lions (Eloff 1973a), cheetah and leopards (Ebedes 1970) and the black-backed jackal (Bothma 1971). Almost without exception these describe failure after failure, with few accounts of success. In general most of the translocated animals moved large distances from the site of release, frequently homing on their point of origin, and often reverted to stock-raiding or otherwise met with death at the hands of man. The results of the Tsavo and Meru translocation studies and the other information on translocation in Kenya reviewed in the preceding section do little to change the conclusion that the translocation of carnivores is seldom successful. Recent information from the Republic of South Africa, which has considerable experience of translocation, serves only to confirm this (Stewart, pers. comm.).

What are the reasons for translocation and what are the criteria for success? Its objectives in Kenya have been to control the incidence of stock-raiding by moving trapped carnivores elsewhere instead of shooting them - a management policy - and to assist the conservation of their species by helping to restock populations that have been depleted - a conservation policy. For translocation to be successful it must fulfil both these objectives. To be specific: not only must the translocated animals remain within the national parks or sanctuaries where they are released; they must also keep out of further mischief. The conservation objective is not fulfilled if the translocated animals wander far from their reception areas and fail to integrate with the populations they are supposed to be strengthening. The management objective is not fulfilled if the released animals re-enter settled or pastoral areas and revert to stock-raiding or worse. This is so whether the translocated animal returns to its place of origin, as several leopards have done, in which case nothing has been achieved at the cost of considerable expense; or whether the translocated animal merely takes to stock-raiding in the neighbourhood of its release, in which case all that has been achieved has been the transfer of a problem from one part of the country to another, again at considerable expense. The criteria of success are demanding. Nevertheless they must form the basis of any review of the policy and practice of translocation, and it is within this context that the Meru results are examined below.

3.4.2. The Meru study

The movements of translocated animals after release can be divided into four phases based on the study of translocated wolves by Weise et al. (1975): a post-release phase, an exploratory movement phase, an optional directional movement phase, and a settled phase. This sequence, which differs slightly from that of Weise et al., is not necessarily followed rigidly, and phases can be omitted, but it provides a useful framework for examining the movements of translocated leopards.

The post-release phase, which immediately followed release and was relatively brief, was shown by virtually all the Meru translocated leopards. With only two known exceptions they all spent the first 1-4 days after release (mean = 2.6 days) within 5 km, or often within 2 km, of the site of release, and usually favoured either the Rojewero or Kiolu rivers. Although the after-effects of Cl-744

immobilisation cannot be ruled out, I do not believe that this relatively inactive phase was drug-induced as it occurred not only in 'airstrip leopards' but also in at least two of the penned leopards which had ample time to recover before release. Moreover, free-living resident leopards immobilised with CI-744 in Tsavo showed no noticeable depression of movement in the first night following immobilisation (Hamilton 1976). Like Weise et al. (1975) I believe that this phase was characterised by "confusion and indecision", but it never lasted for more than four days, by which time hunger may have begun to spur the animals into activity.

The second or exploratory phase, which usually followed, was characterised by long and unpredictable movements, considerable zig-zagging, and the revisiting of places visited earlier: features particularly well illustrated by the movements of Leopard 99 in the first fortnight after release. Overnight linear distances of over 10 km (6.2 miles) were not unusual, with up to 20.7 km (12.9 miles) being recorded. This distance was sufficient to take a leopard well beyond the boundaries of a park the size of Meru in a single night. Indeed most of the released leopards left the Park during the first few days of this phase. Movements during the exploratory phase also demonstrated the ability of newly released leopards to navigate in entirely unfamiliar country where the terrain was flat, the vegetation dense, and landmarks east of Rainkombe were few and far between. Leopard 99, for example, seemed to have no difficulty in returning on 5 Jan 1978 to the same spot on the Kiolu River that she had visited, for the first time in her life, on 26 Dec 1977, although she had in the meantime travelled some 30 km (19 miles) to Kubi Ramata, well outside the Park. and to which she later returned.

The third or directional movement phase was characterised by a series of generally long movements consistently made in the same direction. It did not always occur but was shown, for example, by the Nandi Hills leopard released in Tsavo and by Leopards 97, 103, and 106 released in Meru. Sometimes (e.g. Nandi Hills and 97) the direction of travel was that which could ultimately take the leopard back to its place of capture. But with others directional movements took the leopards in different directions. Leopard 103, for example, moved south across the Tana and continued southeastwards, whereas Leopard 106 headed more or less due north until she reached the Ewaso Ngiro River: both leopards would have had to go west to return to Laikipia.

Directional movements did not therefore necessarily result in homing on the point of origin. There is plenty of evidence, however, that homing tendencies exist in carnivores. There are reports, for example, of an adult female red fox returning to her home site twelve days after being displaced 56 km (35 miles) (Phillips & Mech 1970) and of a laboratory-reared wolf that returned to her pen within four months of being displaced 282 km (175 miles) (Henshaw & Stephenson 1974). Harger (1970) found that of 107 black bears displaced from 16 to 270 km (mean 101 km) (10-168 miles, mean 63 miles), 37 returned home and 11 others moved long distances towards home. Among the large cats there are reports of translocated lions homing 193 km (120 miles) in six days (Eloff 1973a), and Ebedes (1970), commenting that "members of the cat family have strong homing instincts", reported that two leopards and two cheetah released in Etosha Park were killed on nearby farms within six weeks of being released. Also in South West Africa, Port claims (Teer & Swank 1977) that of eleven marked leopards that he

released in Etosha, six returned home over a distance of some 800 km (c.500 miles) after periods of 5-28 months. The Gilgil leopard mentioned earlier and the history of Leopard 97 show that leopards in Kenya have a homing ability too. Perhaps the only cause for surprise is that those released in Meru did not demonstrate it more often. Indeed there seemed to be no recognisable pattern of dispersal, for they scattered in all directions.

One feature, however, which they nearly all demonstrated during the exploratory and directional movement phases was greater movement than natives living in the same areas, and this corresponds with observations on translocated black bears (Harger 1970), wolves (Weise et al. 1975), and lions (Eloff 1973a). The mean daily distances covered by translocated leopards during the first fortnight after release ranged from 2.0-7.9 km (1.2-4.9 miles) with an average of 4.2 km (2.6 miles), compared with adult resident Tsavo and Meru leopards whose mean daily distances did not exceed 4.2 km and averaged only 2.5 km (1.6 miles). Although these differences were not statistically significant at the 5% level of significance ($P = .076$, Mann-Whitney one-tailed test), the differences between the maximum daily distances of translocated and resident leopards were significant ($P = .004$): those of translocated leopards ranging from 6.5 to 20.7 km (4-12.9 miles) compared with a range of 3.4 to 8.4 km (2.1-5.2 miles) for resident leopards within their own home areas. One might expect directional movements by non-residents to be longer than the movements normally made by residents within a limited home range and which, as the Tsavo study showed, involve much zigzagging. But unfamiliarity with a strange area and the foreign scent marks of any resident leopards may also be unsettling influences that tend to increase the movements of translocated leopards, transients, and residents on foray. Whatever the reasons, the relatively long linear movements of translocated leopards resulted in the released animals covering much larger areas. Several of the leopards released in Meru covered areas of between 100 and 300 km^2 (39-116 sq.mi.) in the first fortnight after release, while over longer periods some of them roamed over more than 600 km^2 (232 sq.mi.). By comparison the home ranges of resident Tsavo leopards seldom exceeded 30 km^2 (11.6 sq.mi.).

The fourth or settled phase was characterised by reduced movements confined to a limited area suggestive of a leopard's normal home range. It was demonstrated by the Nandi Hills leopard in the Chyulu Hills and by Leopards 98, 99, 106, and 109 released in Meru. The fate of other leopards such as 103 and 110 which went out of radio-tracking contact remains unknown, but they may well have settled down far from the site of release. However, of the four leopards known to have settled in the Meru/Garba Tula area after release, only two (males 98 and 109) settled down inside or immediately adjoining the Park, while the other two, both females, settled much further afield: Leopard 106 on the Ewaso Ngiro River over 80 km (50 miles) north of Rainkombe, and Leopard 99 first at Kubi Ramata, 25 km (15.5 miles) to the north-east, and later on the northern Nyambeni lava flows 20 km (12.4 miles) north-west of Kinna Hill and the northernmost tip of the Park. The difference between the sexes is interesting but the sample too small to be of any significance. Nevertheless the inference is that females are less likely to settle down at or near the site of release.

To sum up, five of the ten radio-collared leopards left the Park within three days of release and the others all left within two

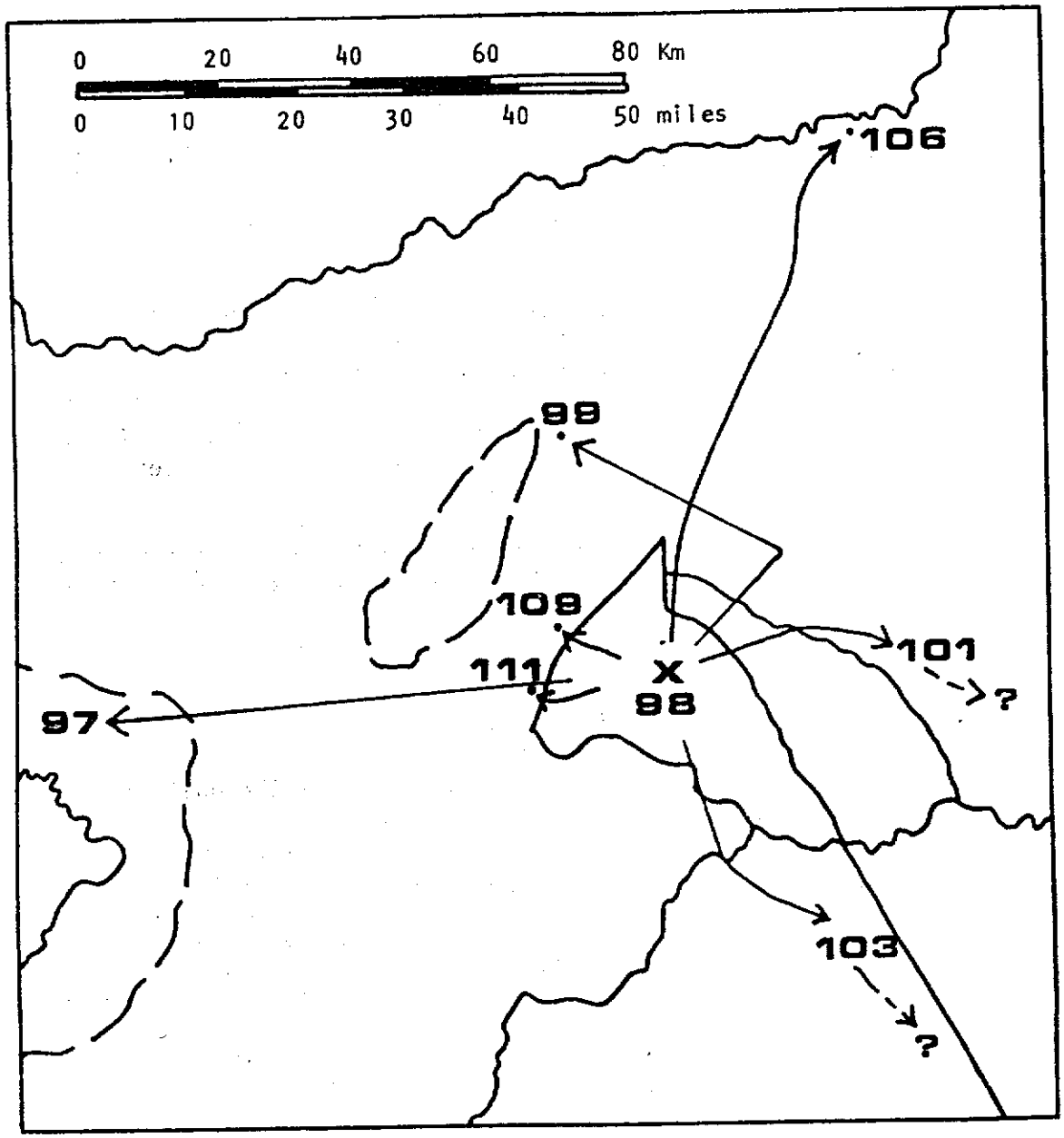

FIG.3.4. SCHEMATIC DIAGRAM OF THE DISPERSAL OF TRANSLOCATED LEOPARDS RELEASED IN MERU NATIONAL PARK. X marks site of release. Numbers identify leopards. Leopards 95 and 110 omitted because of lack of information on final destination.

weeks. Although some did return later, this was usually temporary, and only two, Leopards 98 and 109, settled down in the Park or on the boundary. Of the others at least two (97 and 111) reverted to stock-raiding, and Leopard 111 was killed as a result. Only one leopard (97) was known to have returned to the same general area where he was caught. The others dispersed in all directions. One leopard (106) settled on the Ewaso and another (99) on the northern Nyambeni lava flows, but the remaining four apparently all left the 10,000 km^2 (3,860 sq.mi.) zone of radio-tracking coverage.

In conclusion the translocation of these leopards to Meru was largely a failure on two counts. It failed to fulfil the conservation objective of the exercise as only one leopard - a male at that - settled properly in the Park, while another, also a male, settled too precariously for comfort in an area partly within the Park but also partly within a high risk area of human settlement, not far from where Leopard 111 was poisoned; I do not therefore rate his long term chances of survival very great. While it can be argued that the translocations did result in at least two of the released leopards establishing themselves in Isiolo District and that this is better than nothing, it must be borne in mind that this part of northern Kenya is pastoral country inhabited throughout by nomadic herdsmen, mostly Somalis, with large flocks of sheep and goats and a proven ability to eliminate leopards. Given that all the leopards in question had a history of stock-raiding, the chances of conflict occurring sooner or later must have been considerable; and indeed Leopards 99 and 106 may have been taking livestock without my knowledge. Certainly the known reversion of Leopards 97 and 111 to stock-raiding represented a failure of the management objective of translocation. The only possible conclusion therefore is that the exercise was largely a failure.

3.4.3. Reasons for failure

What then are the reasons for failure?

Some answers can be sought in the social organisation of the leopard. The Tsavo study showed, for example, that the home ranges of resident adult males formed a tight mosaic with little overlap, and that detected intrusions by other males were seldom tolerated by the occupants, which sometimes fought fiercely. Furthermore, evidence from a wide variety of other carnivores, including the wolf (Mech 1970), spotted hyaena (Kruuk 1972), domestic cat (Leyhausen 1965), lion (Schaller 1972), and polecat (Poole 1973), suggests that unfamiliar members of the same species generally elicit more serious fighting than familiar or known opponents. As translocated male leopards are strangers to any males resident in the release area, they probably meet with greater hostility than if they were natives; yet, as the Tsavo study showed, even neighbouring residents fight each other fiercely enough to inflict considerable wounds. The conservation objective of translocation is not served if introduced animals are killed by residents or if residents are killed or displaced by introduced animals. It is not known how often either of these events occur, but gross disparity between the sizes of the combatants may favour the translocated leopards which in Kenya are usually highland animals that may weigh from 60 to 95 kg (132-209 lb): in other words 43-126% more than the average Tsavo male. Nevertheless the advantages enjoyed by resident males on their home ground may still hold, even in

encounters with 70 kg giants. But even in the absence of physical conflict translocated males are likely to disperse because of their tendency to avoid ground already occupied by resident males. The failure of the two radio-collared males released in Tsavo to settle in the Ngulia area and their hurried travels through it strongly suggest the operation of avoidance behaviour: behaviour that is unlikely to render translocation successful in any release area already occupied by a dense population of resident males.

So far as females are concerned, strange translocated females are more likely to be accepted by resident males. However, in view of the intolerance that female felids normally show towards each other, and particularly towards strangers, it is improbable that a translocated female leopard can readily settle in the release area unless there is room for her. An important finding of the mountain lion studies is relevant here. Seidensticker et al. (1973) observed that males and females respond differently to the death of a resident mountain lion: it appeared that the death of a resident male did not leave an opening for a female, and vice versa. If this also applies to the leopard, as it probably does because of the close similarity of the social organisation of the two species, it implies that the settlement of translocated leopards in the release area will only succeed if there are vacancies there for leopards of the required sex or sexes. Unfortunately it is very difficult to establish if such vacancies exist. But we can reasonably assume that in any release area already occupied by a substantial population of residents, the social system of the leopard and, in particular, the operation of avoidance behaviour are likely to conspire against the success of translocation.

What, then, happens in a sparse population depleted almost to the point of extermination: a population in which high density cannot be a limiting factor? Once again findings of the mountain lion studies are relevant. Seidensticker et al. (1973) found that although, because of its pattern of dispersal, the mountain lion is an effective colonising species, this seemed to be so only in areas that already had at least a few residents and were adjacent to a thriving population that provided a source of transients. Where the species had been virtually eradicated colonisation was slow, even in protected areas providing suitable habitats. Considering the mountain lion's land tenure and mating systems, which seem close to those of the leopard, Seidensticker et al. (1973) postulated that the prior presence of other lions, particularly members of the opposite sex, is necessary to initiate attachment to a site by wandering transients. This implies that the translocation of leopards to regions where the species has been eliminated is unlikely to meet with success. In other words, it seems likely that the absence or scarcity of resident leopards may affect the success of translocation as much as the presence of an adequate resident population. It should not be assumed, therefore, that translocation will readily restore leopard populations that have been exterminated.

We have now considered the possible effects of the leopard's social system on the success of translocation in two different situations: an area, such as Ngulia, with a dense resident population, and an area, such as Kora National Reserve for example, with a very sparse, almost exterminated, resident population. But Meru National Park comes into neither category. It did once have a substantial

leopard population (Adamson, Babault, Mathews, Seth-Smith, Sutton - pers.comm.) but this was heavily depleted by the poaching of the late 1960s (Chapter 4). Nevertheless a small remnant population survived, and in theory there should have been plenty of vacancies for translocated leopards of both sexes. At first the most likely reason that translocated leopards were not staying seemed to be possible saturation of the Park with resident leopards, whether from reproduction of the remnant resident population or from settlement by translocated leopards in the early 1970s or both. But after three years of study in Meru I believe the Park's leopard population is still small, and the possible explanation of a resident population reaching "saturation density" must be discounted. At the same time, however, I do not believe the resident population is too sparse to initiate site attachment in wandering translocated leopards. Why then did the majority of radio-collared leopards fail to integrate after release?

I believe the answer lies in the nature of the species. Like other carnivores, and particularly cats, the leopard appears to be an animal that does not take well to translocation. It has a proven homing ability but even when it does not make use of this it shows little inclination to settle in the area of release, even when this is selected - by humans admittedly - as being suitable for the purpose. Whether movements after release take the form of erratic zigzagging or straight directional travel, the result in Meru was usually to take the animal beyond the boundaries of the Park. And Meru is Kenya's third largest national park. While it is possible that the translocation of highland leopards to highland sanctuaries and lowland leopards to lowland sanctuaries might work better than moving stock-raiding highland leopards to lowland parks such as Tsavo and Meru, the social factors discussed earlier would still operate, and I doubt if such translocations would be any more successful. I believe we must face the fact that the leopard seems to be temperamentally unsuited to translocation. It simply does not like being forcibly moved from its own home area to a strange and unfamiliar place that usually differs in altitude, climate, and prey from what the animal has always known. And as the leopard is a species that shows strong attachment to a specific area, it probably resents exile more than most.

The experimental holding of translocated leopards in a pen before release made no obvious difference to their behaviour after release, although the sample size was admittedly very small. But I suggest it is not worth trying again, for the theoretical benefits of a period of acclimatisation and recovery from the trauma of trapping and travelling were violently offset by the animals' fury at confinement and their frantic attempts to escape every night. The stock-raiders held in Meru did not take at all kindly to captivity in a cage and resented the presence of man. They all remained intractable until release, even though two of them had already spent 1-5 months in captivity in Nairobi. The late Joy Adamson had the same experience with two translocated leopards she held in pens at Shaba (Adamson 1980). Indeed, the destruction wrought by Leopard 110 on her kennel seems to be an excellent illustration of the "high nervous tensions" that leopards often show in captivity, even in zoos (Crandall 1964).

It is probably true that a trapped wild leopard will eventually calm down during a period of prolonged captivity if it is treated correctly, but it is impractical in Kenya to hold translocated leopards for lengthy and expensive periods in cages at the site of

release, and difficult to justify when the results are of dubious value anyway. It is interesting that recent information from South Africa (Stewart, pers.comm.) suggests that holding some eighty translocated cheetah in pens for about a month before release does not seem to have worked well there: these translocations "were of limited success with many animals straying far afield after release."

Finally, it must be more than a coincidence that Leopard 111 and both those shot on the Rojewero and at Ngulia were all animals that had been held in the Nairobi Animal Orphanage. I believe there is sufficient disquieting evidence to suggest that leopards taken from the Orphanage after months or years of captivity there lose enough of their fear of man to become a danger after release. The practice of releasing leopards that have either been born in the Orphanage or held there for any length of time should therefore be discontinued.

3.4.4. Translocation: how not to do it

Before tackling the final question of whether or not to translocate, it is worth briefly examining translocation as it was being practised in 1980. Since the withdrawal of Meru National Park as a release area because of the results of my study there, 21 leopards have been translocated to other parts of the country, the majority of them being handled by the Orphanage as an intermediary. Thirteen went to Tsavo, five to the Masai Mara National Reserve, two to Lake Nakuru National Park, and one to Amboseli National Park.

A number of criticisms can be made, but I hope they will be received in the spirit in which they are given, for they are followed by a set of constructive proposals that I hope will be helpful if the Wildlife Department decides to continue to translocate leopards.

The first point is that the handling of trapped leopards has recently left much to be desired. Translocated leopards have often been transported not in the Department's proper travelling boxes but in relatively open weldmesh traps, often inadequately covered, if covered at all. And certainly not all the animals were adequately fed before release. These points are important because the leopard is a potentially violent animal that must be handled properly to prevent it from injuring itself or people, and it can be a dangerous animal if it is released half-starved.

Secondly, some of the translocations have been pointless. For example, one leopard caught near Kimana was moved to Amboseli National Park less than 40 km (25 miles) away, and another caught near Rongai was taken a similar distance to Lake Nakuru National Park: the chances of either of those leopards staying must have been negligible. The suitability of Amboseli, Lake Nakuru, and the Masai Mara as reception areas is also doubtful, for they are surrounded by some of the densest livestock populations in the whole country, and most of the Game Wardens in Masailand and Nakuru District already regard stock-raiding by leopards as a problem (Chapter 4).

Thirdly, the extraordinary practice of translocating leopards known to have taken human life should be discontinued immediately. Indeed it seems that Meru Park is not the only one to have been sent such a leopard, for Lake Nakuru National Park received a male leopard trapped in Alego location of Siaya District in August 1979 after it had killed a 12-year old girl ("Daily Nation" 7/8/79 &

Translocation Survey). This national park, which covers only 202 km^2 (78 sq.mi.) of which much is water, is only a few kilometres from Nakuru town and has received at least two other leopards from Siaya. In view of the incidence of attacks on people in Siaya District in particular and western Kenya in general ("Daily Nation" 7/8/79, 28/12/79; "Standard" 17/4/80, 13/2/81; Leopard Survey returns from Game Wardens), no marauding leopards trapped in Nyanza and Western Provinces should be translocated. They should be shot. The risks of translocating them are too great, even if a particular leopard is not actually known to have taken human life. But to translocate one known to have killed is irresponsible. Not only is it also bad conservation and worse management; it is potentially disastrous for public relations if the truth gets out. Moreover, it is well known that once a leopard establishes itself as a professional man-eater it is the most difficult of all the carnivores to eliminate (Corbett 1956, Ionides 1965).

Finally, I believe there is no strong case for translocating lions, cheetahs, and hyaenas in Kenya and suggest that this be discontinued. Neither lions nor hyaenas are rare or endangered in Kenya in 1981 and even the cheetah is less threatened than many people believe (Chapter 5). In South Africa lion and cheetah have been translocated more than leopard but the results are no more encouraging (Ebedes 1970, Eloff 1973a; Anderson, Hall-Martin, Stewart - pers.comm.) and the translocation of carnivores is now generally regarded as impractical there (Hall-Martin, pers.comm.).

If we are worried about the status of any of these species in Kenya we should protect them, effectively, from illegal killing. The answer does not lie in translocation.

3.4.5. Translocation: guide-lines

If further translocations are carried out in Kenya - and I have not yet recommended that they should be - the following guidelines should be followed.

1. The translocation of stock-raiding lions, cheetah, and hyaenas should be discontinued. They should be shot.
2. No leopards trapped in Nyanza and Western Provinces should be translocated. They should be shot.
3. No leopard from any other part of the country and known or strongly suspected to have taken human life should be translocated. It should be shot.
4. No leopard born in captivity or held in the Orphanage for more than three months should be released.
5. Leopards should only be transported in proper wooden travelling boxes to avoid self-inflicted injury and for the safety of the public. They should not be transported in weldmesh traps, whether adequately covered or not.
6. Leopards for translocation must be adequately fed and watered while in captivity. A smallish leopard (40 kg or 88 lb) should receive 2 kg (4.4 lb) of meat per day and a large one (more than 60 kg/132 lb) up to twice that amount.

7. Translocated leopards should not be released less than 100 km (62 miles) from the place of capture; the greater the distance the better.

8. Translocated leopards should not be detained in a cage at the site of release as the results do not justify the expense and manpower required to build the cage and look after the captive.

9. Translocated leopards should not be released near game lodges, safari camps, or any other human habitation in the area of release.

10. Translocated leopards that revert to stock-raiding after release and are recaptured should be shot. Even if this is debatable conservation it is good management.

11. Translocated leopards should not be released in the following areas for the reasons briefly given below:

    a. Ol Doinyo Sapuk National Park (18 km^2/7 sq.mi.): too small and surrounded by settlement.

    b. Nairobi National Park (117 km^2/45 sq.mi.): too small; too close to Nairobi and surrounded by settlement; already has a substantial leopard population.

    c. Lake Nakuru National Park (202 km^2/78 sq.mi.): too small as much of it is water; too close to Nakuru town and surrounded by ranches and settlement where stock-raiding by leopards is already a problem; has a substantial leopard population.

    d. Amboseli National Park (392 km^2/151 sq.mi.); Buffalo Springs National Reserve (339 km^2/131 sq.mi.); Shaba National Reserve (239 km^2/92 sq.mi.); Samburu National Reserve (225 km^2/87 sq.mi.): all are relatively small and are surrounded by some of the densest sheep and goat populations in the country.

    e. Meru National Park (872 km^2/337 sq.mi.) and the adjoining Bisanadi National Reserve (606 km^2/234 sq.mi.): translocation there has already proved largely worthless.

12. This rather negative review of release areas leaves the following. There are, however, objections to these too which should be borne in mind in deciding where to translocate.

    a. Aberdares National Park (766 km^2/296 sq.mi.) and Mount Kenya National Park (716 km^2/276 sq.mi.): good habitat for highland leopards but too close for those trapped in Meru and Laikipia; success of translocation doubtful as both mountains already carry some of the densest leopard populations in Kenya. I doubt if any useful conservation purpose is served by releasing more leopards there, especially as the farms near these mountains are those that suffer the greatest trouble from stock-raiding leopards.

b. Masai Mara National Reserve (1673 km^2/646 sq.mi.): probably large enough, with the adjoining Serengeti National Park, but already has a substantial leopard population (Chapter 4), which means that translocation is unlikely to work and will serve no useful purpose. Furthermore the Mara is surrounded by dense livestock populations which are already harassed by stock-raiding leopards. Further translocation of leopards is likely to add to the management problem, as well as being of doubtful value to public relations with the Masai.

c. Effectively this leaves only Tsavo National Park (20,821 km^2/8,037 sq.mi.), Kenya's largest. All the rest of the host of twenty or so other national parks and reserves not so far mentioned can be excluded because they are either too small or too remote or too lawless - or occasionally all three - for translocation to be a practical proposition.

Tsavo is large (although it was not large enough for the Nandi Hills leopard) and once again, after the heavy poaching of the 1970s, has a depleted leopard population: 24 years after the first translocated leopard arrived there! The wheel has turned full circle, and in so doing has demonstrated the futility of translocating animals if their security in the area of release cannot be guaranteed. However, because of habitat changes from the dense dikdik-infested Commiphora-Sansevieria bushland of the 1950s to the open bush grasslands of the 1980s, it may be that translocated leopards will not want to settle in what is now less suitable habitat for them. Moreover the future of Tsavo as a national park is under review. Is there therefore any point in continuing to translocate leopards there?

3.4.6. Conclusion: to translocate or not to translocate?

To translocate or not to translocate. That is the question.

The evidence presented in this chapter overwhelmingly suggests that the translocation of leopards has not been sufficiently successful to justify its continuation as a rational conservation and management policy, regrettable though this may be. Some leopards have stayed where released, without reverting to mischief, and have lived instead of being shot. But it appears that most do not stay where released and that some revert to stock-raiding or worse. Translocation is an expensive form of control; yet there is always the risk that translocated animals will either return home or else take to stock-raiding elsewhere. It is also evident that most of Kenya's national parks and national reserves are too small to serve as reception areas for widely-roaming translocated leopards or are unsuitable for other reasons. Finally, as Chapter 4 shows, the majority of stock-raiding leopards trapped for translocation are males; and it is debatable how important a contribution they make to the conservation objective of strengthening depleted populations.

Nevertheless the translocation of leopards has not been a total failure, and credit should be given to those who initiated the policy and to those who have carried it out so efficiently for so many years. It was right that translocation should have been tried. But it is right also that it should be reviewed in the light of experience gained.

In the light of this experience I conclude with regret that the policy and practice of leopard translocation in Kenya should be discontinued. Alternatives will be discussed in Chapter 6.

CHAPTER 4

STATUS OF THE SPECIES
A SURVEY

4.1. INTRODUCTION

The background to this part of the study was explained in the Introduction to this report. This chapter examines the past and present status of the leopard in Kenya and discusses prospects for the future. It also incorporates the results of a country-wide survey of the leopard as a stock-raider.

The leopard's secretive, nocturnal habits make it a very difficult animal to census, and attempts to determine its status at national or continental levels must inevitably be subjective to an extreme. Whereas most large herbivores can be counted sufficiently accurately to equate status with numbers, this is totally inappropriate with the leopard. Indeed I consider most endeavours to determine the status of this species on a numerical scale, as attempted by Eaton (1976), to be largely valueless.

Despite recent advances in the techniques of studying specific leopard populations, it is only possible to determine status in the two absolute classes of 'present' or 'absent' and, very subjectively, to state impressions of stability, increase, or decline. However, while it is important that the low scientific quality of any large scale survey of leopard status be clearly understood, the lack of hard data and objective assessment do not detract from the need to understand the present situation as best we can.

The peculiar circumstances pertaining to the leopard confine the sources of worthwhile information to two: those, such as stockmen, to whom leopards are attracted and upon whose livestock they prey, and those, such as professional hunters, who deliberately attract leopards to themselves in search of a trophy. Elsewhere contacts between leopards and humans are so infrequent and fortuitous that they provide little useful information. My assessment of the status of the leopard in Kenya is therefore based on information from these two sources.

Finally for the reasons given in Chapter 1 I have included information on the status of the cheetah.

4.2. METHODS

I obtained my information in this survey from questionnaires, personal interviews, correspondence, published reports, and my own observations.

Questionnaires were sent to the Wildlife Department's wardens through the Director's Office. Reproduced in Appendix 1, they were designed to find out how much of a problem the leopard presents as a stock-raider in different areas, how this compares with depredations by other predators, and to extract information on the numbers of leopards killed on control or trapped for translocation from 1977 to 1980. Each warden was also asked to assess the status of the leopard in his district.

Most of my information was obtained by talking to 53 professional hunters, game wardens, wildlife biologists, tour operators, and farmers, as well as a number of herdsmen and other local people. Although the choice of those interviewed in depth was governed to some extent by opportunity, I tried as far as possible to select professional hunters and game wardens of long experience and high standing. The most valuable single source of information proved to be the 21 professional hunters I interviewed. Although none had hunted in Kenya since the hunting ban imposed in 1977, they were interested, helpful, and informative, because by the nature of their livelihood they had had continuous reason to take an interest in leopard distributions, abundance and behaviour. On the whole the information from different hunters on the same area tallied remarkably well, and the occasional inconsistency could usually be explained. For this reason I have confidence in the accuracy of the information they gave me.

I have also extracted information from old Game Department and National Parks reports and other relevant publications. Unfortunately no annual reports have been published by either the Game Department or the Wildlife Conservation and Management Department since 1965 and many of the earlier reports have been lost. Apart from Casebeer (1975) there is no recent information on the activities of these departments, and this explains my frequent references to the 1950s and 1960s when records on carnivore control, translocation, and hunting offtakes were published annually. In view of the dearth of official publications since 1965 I cannot accept responsibility for any inaccuracies in this report relating to these departments during the period 1966-1981. I have done my best, however, with the fragmentary information available and have taken pains to check my facts, particularly on the sensitive subject of poaching.

Two points of clarification may be necessary here for those unfamiliar with Kenya. The first is the relationship between the Game Department, Kenya National Parks, and the Wildlife Conservation and Management Department. The Game Department, the oldest of the three, was the government department originally entrusted with game control, hunting regulation, and wildlife conservation throughout the country. In colonial times it was always very small, although it later expanded after Independence in 1963. Until 1957 the officer-in-charge was known as the Game Warden and his senior officers as Game Rangers; the titles then changed to Chief Game Warden and Game Wardens. The Kenya National Parks organisation was created in 1945 as a quasi-government body headed by a Director responsible to a Board of Trustees. The senior officers were called Wardens and the organisation was responsible for the national parks and some national reserves; the Game Department took care of all matters outside. On Friday 13th February 1976 the Kenya Government dissolved Kenya National Parks and merged it with the Game Department to form the present Wildlife Conservation and Management Department which is headed by a Director and comes under the Ministry of Environment and Natural Resources.

The second point is that by the term "professional hunter" I mean those hunters who were members of the East African Professional Hunters' Association (E.A.P.H.A.) and received their licences in the approved manner after serving an apprenticeship. I do not mean the numerous self-styled "professional hunters" who appeared in the 1970s and often showed scant regard for the ethics of hunting and the law of the land. Their activities did much to devalue sport hunting in Kenya and to destroy a system that had worked well in the past. Their effects on leopard populations will be considered in Chapter 6.

Finally I visited certain areas where I felt that my own observations and impressions might be of value. These included the Ngulia area of Tsavo West, scene of my earlier leopard studies; Tsavo East National Park where my assistant, Elui, used to hunt; the adjacent Galana and Kulalu ranches where I talked to the managers; the Nkuruman Forest of Narok District which enjoyed such a high reputation amongst the professional hunters; Kora and Shaba National Reserves where George and the late Joy Adamson were rehabilitating lions and a leopard; and, finally, Shimoni on the southern Kenya coast, where in the early days of this century leopards were exceptionally bold and numerous (Percival 1924).

4.3. STATUS SURVEY

4.3.1. Format

The results of this survey are presented district by district (Fig.4.1.) starting in north-western Kenya and covering the entire country in an anti-clockwise direction via south-western, south-eastern, central, coastal, north-eastern, and northern Kenya. Most of the larger districts outside the densely settled agricultural areas used to be divided into controlled areas or hunting blocks (Fig.4.2.) and reference will also be made to these.

Human population densities, which are highly relevant to the survey, have been calculated from the 1969 census figures (Statistical Abstract 1979) using a rate of population increase of 4% per annum (Mott & Mott 1980). They do not take into account any population movements since 1969 but they do provide, in the absence of figures from the 1979 census, rough estimates of current population densities.

4.3.2. Turkana District

Turkana District is a hot, arid, sparsely populated nomadic pastoral area of 60,824 km^2 of little agricultural potential inhabited by the Turkana people (4 persons/km^2).

Leopards were still reasonably plentiful in the early 1960s, particularly in the hills along the Uganda border, and reports of stock-raiding were frequently received by the Game Warden (Kapenguria). Although the Turkana, Karamojong and Suk peoples all used leopard skins in their ceremonial regalia, and these amounted to hundreds, leopards in the district were not endangered by this practice: perhaps partly because the Game Department used to control it by checking and branding or stamping with indelible ink skins already acquired, and allowing the people to keep these while prohibiting further acquisition. Despite this use and the general scarcity of game as a result of heavy poaching by the Turkana (Game Department 1950, 1956-57, 1958-59; Cullen & Downey 1960), the status of the leopard was satisfactory until the situation changed with the upsurge of commercial poaching in the late 1960s. By 1970 "nearly every waterhole had its leopard trap" (Anon. 1970) and Somalis were selling skins at Lokori. In 1979 and 1980 Somalis were still poaching leopards around Kaputirr and along the northern foothills of the Cherangani Range, so this decline is continuing. The Game Warden (Lodwar) considers leopards to be 'rare' and receives no reports of stock-raiding despite the district's enormous population of livestock (Dirschl, Mbugua & Wetmore 1978).

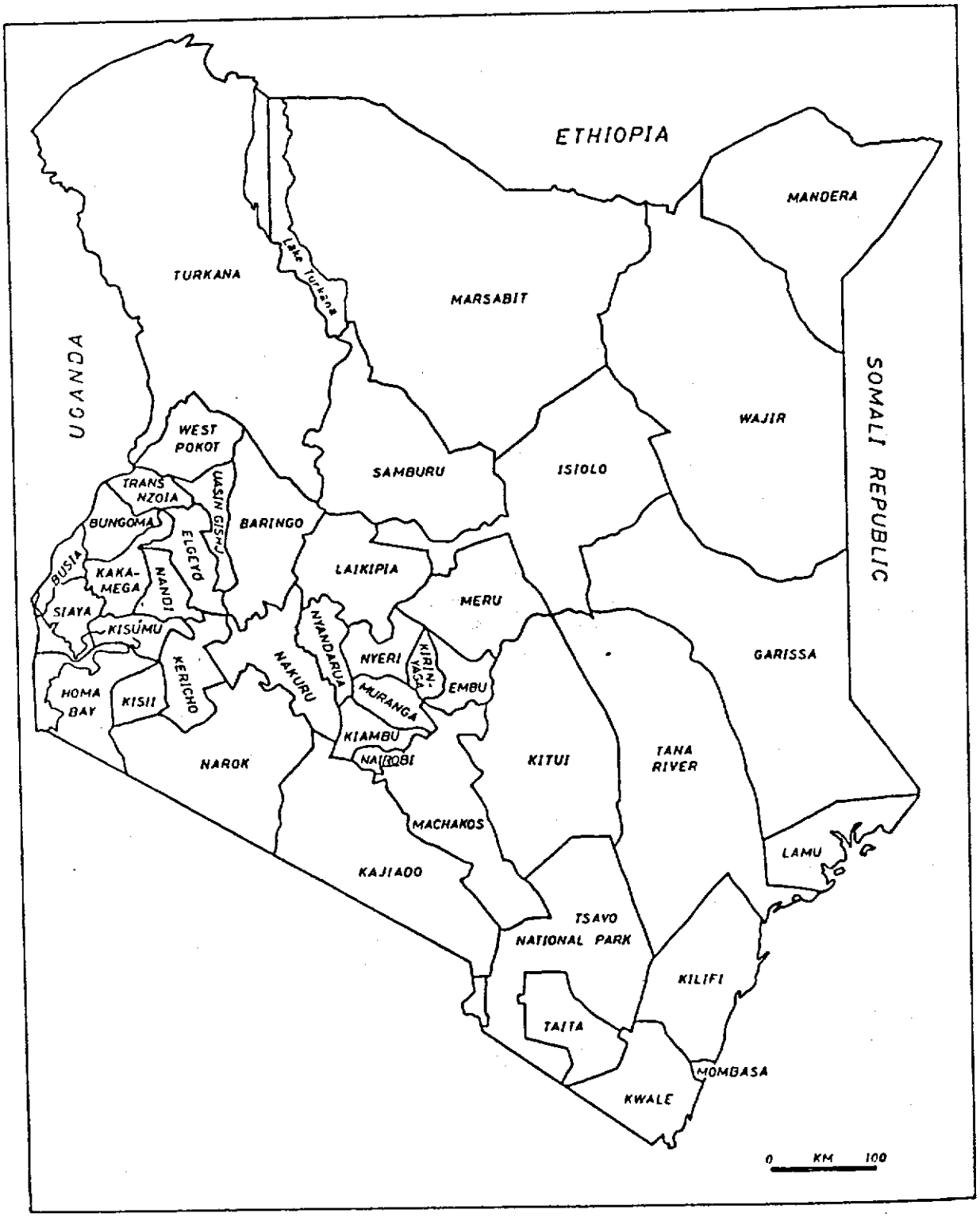

FIG.4.1. ADMINISTRATIVE DISTRICTS OF KENYA, with Tsavo National Park treated as a separate unit.

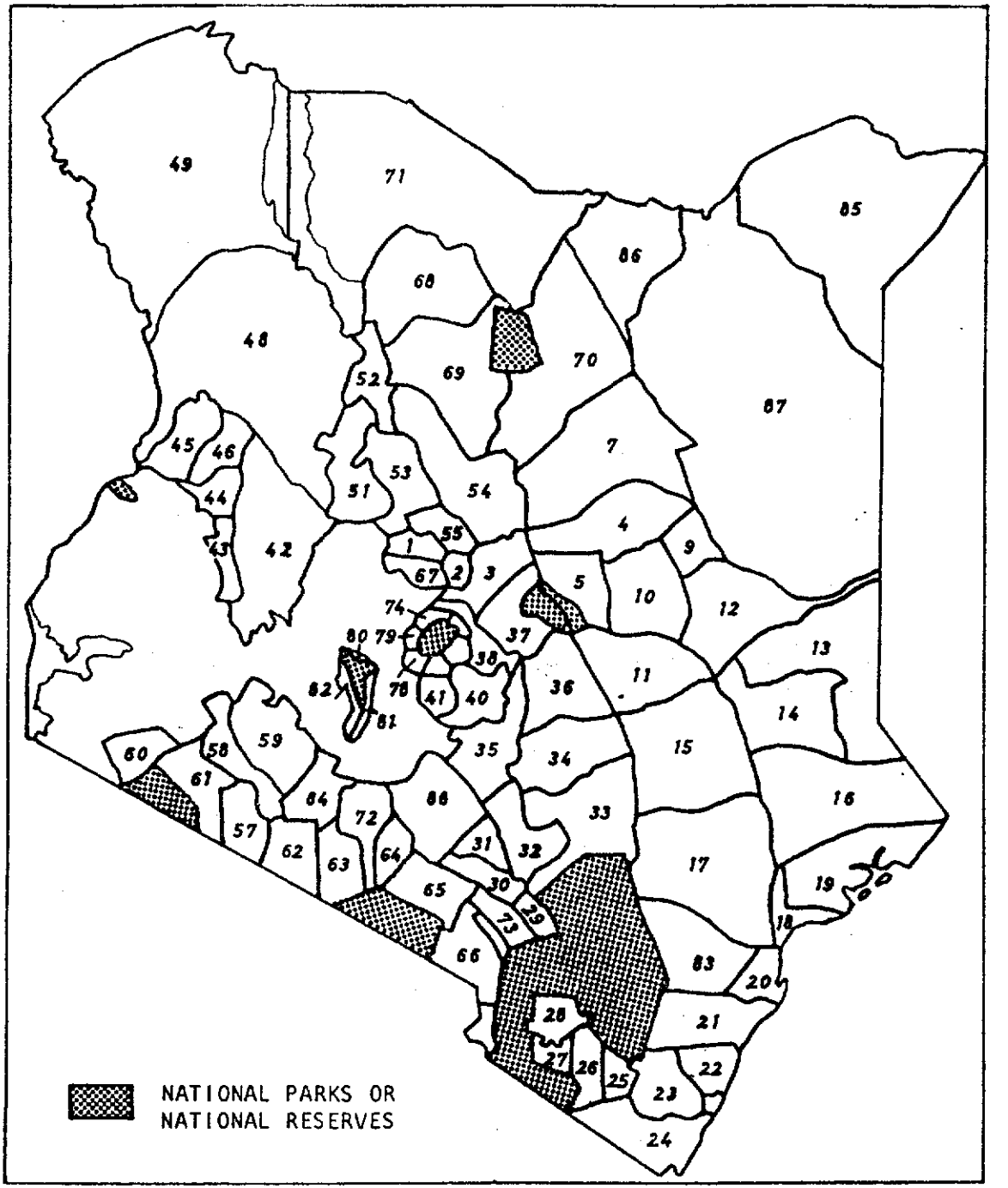

FIG.4.2. HUNTING MAP OF KENYA (1970) SHOWING CONTROLLED AREA BLOCKS.

From: Kenya Hunting Map, Survey of Kenya, 1970.

There are leopards left in Turkana but the subjective evidence available suggests that their numbers have been greatly reduced. Most of those remaining are probably in the hilly border country adjoining Uganda's turbulent Karamoja District, which used to be known for its abundance of leopards. Elsewhere they occur in the Turkwel Gorge and in the Lapurr and other scattered hills. The current poor security situation has had the effect, particularly in the border areas, of creating large expanses of 'no man's land' from which the local inhabitants have fled to avoid the roaming bands of armed Turkana 'ngorokos' and raiders from Uganda. If these bands are not poaching leopards, their depopulation of the border country will favour the species in the immediate future, but in the long-term the Government must reassert its control and when it does so the human population will return. The South Turkana National Reserve (1091 km^2) gazetted in 1979 is probably of no importance as a reservoir of leopards as it holds little game and is poorly protected. The continued operation of Somali poaching gangs in the vicinity in 1980 does not bode well, and Turkana herdsmen are also hostile to the leopard.

It is not known if cheetah have increased or decreased. They used to be plentiful along the Kerio Valley in the 1960s and are still present along the Turkwel. They are reported to be still relatively numerous in Pokot, Karapokot, and South Turkana as they have proved to be more difficult to hunt down than leopards. According to Dirschl, Mbugua & Wetmore (1978) Grant's gazelle, a major prey species, is still abundant, so their circumstances should be reasonable.

4.3.3. Baringo District

Baringo District is a mostly arid area of 10,627 km^2 of little agricultural potential inhabited largely by the Tugen (23 persons per km^2) and their livestock.

There is little information on leopards in Baringo District and their present status can only be assessed from an accumulation of subjective impressions. These indicate that leopards were numerous in the early 1960s. In the late 1960s and early 1970s they were poached widely and this is likely to have caused some decline. The Game Warden (Kabarnet) believes they are 'rare' but regards them as a minor stock-raiding problem. Local people, however, report that they are still fairly common, particularly in the hills around Lake Bogoria and east of Lake Baringo.

Cheetah are often seen in the district's arid Acacia scrub and sometimes take livestock. This has made them unpopular with the local Tugen tribesmen, who kill any cubs they encounter.

In view of the district's aridity, large area, and low human population both the leopard and the cheetah are likely to survive there.

4.3.4. West Pokot and Elgeyo-Marakwet Districts

West Pokot and Elgeyo-Marakwet districts (5,076 km^2 and 2,722 km^2) are relatively fertile highland areas containing the forested Cherangani Range (3,372m or 11,055') and human population densities of 25 persons/km^2 and 90 persons/km^2 respectively.

Leopards used to be plentiful in both these districts in the 1950s and early 1960s despite the use of their skins by the Suk for ceremonial dress. Although the Game Warden (Kapenguria) believes

they are still 'moderately numerous', more reliable local information indicates that they have undergone heavy decline since 1963 and are no longer common. One informed estimate suggests they may have decreased by 60-80%, with the heaviest decline in the highland areas. In the more densely settled parts of both districts leopards now have only vagrant status and if seen or heard are at once hunted with dogs by Wagishu, Marakwet and other local tribesmen; if this fails, traps are constructed. Leopards appear to be a very minor stock-raiding problem as during the period 1977-1980 inclusive the loss of sheep and goats reported to the Game Warden (Kapenguria) totalled only ten. But it is likely that more often than not the local people take matters into their own hands without ever reporting to the Wildlife Department.

In the rest of the highlands, leopards survive in small isolated pockets in the more inaccessible areas, but one reliable informant believes they could be wiped out in these areas during the next ten years. In the Cherangani Range, where they used to be particularly numerous and easy to see, few are believed to remain in the lower level forests which have suffered from extensive deforestation, increasing settlement, and unchecked poaching (Wrangham, Stanley Price & Chetham 1968, Brown & Glover 1971). Few of the larger game animals such as buffalo, bongo, giant forest hog, and waterbuck still exist, and even bushbuck are reported to be uncommon now. Deforestation continues. There are, however, some reports of greater numbers of leopards in some of the more inaccessible parts of the northern Cheranganis, such as Sondang in West Pokot, and in the Kamelogon and Kokwatantwa areas of Elgeyo-Marakwet where relatively large tracts of almost impenetrable bamboo still remain above the 9,000' contour.

In conclusion all the available evidence suggests that the leopard populations of these districts have been heavily depleted by poaching. In view of continuing habitat destruction, increasing agricultural settlement, and the hostility of the local people, their future looks bleak. The 92 km^2 (36 sq.mi.) Nasolot National Reserve is too small to make any difference to this assessment.

Cheetah are reported to have been reduced by up to 30% in the lowland areas but seem to survive and are not likely to be wiped out completely in the immediate future.

4.3.5. Uasin Gishu, Trans Nzoia and Nandi Districts

These are well populated agricultural highland districts covering 8,997 km^2 with increasing human populations (mean density of 90 persons/km^2), spreading settlement, and little long-term future for the leopard.

They once included some of the finest game country in East Africa (Simon 1962), where leopards were often seen in broad daylight (Johnston 1902), but are now almost entirely given over to cultivation. What little game still remained on European-owned farms in Trans Nzoia and Uasin Gishu at independence has largely disappeared under the twin pressures of African settlement, which has divided most of the large farms into smallholdings, and poaching, mainly by Wagishu tribesmen. Whereas in 1954 leopards were "on the increase" in Trans Nzoia and were causing damage to livestock (Game Department 1954-55), they are now uncommon and have only vagrant status over most of the district. They still raid stock occasionally but, like other predators, are harried from place to place until they meet their death.

The Game Warden (Kitale) believes leopards are 'moderately numerous' in Trans Nzoia. But this can be true only of Mount Elgon National Park (168 km^2), where they are reliably reported to be increasing. In the forestry lands adjoining the Park the trapping of leopards continues and deforestation proceeds unchecked. I have no information on poaching in the few isolated forests remaining in Uasin Gishu and Nandi but there is good evidence that the forests themselves have shrunk by 20% since 1972. Newspaper reports ("The Standard" 13/6/81) and my own observations from the air in 1981 show that this process is continuing.

Cheetah are now uncommon. They occur only as vagrants in Trans Nzoia where they occasionally kill livestock and, like other predators, are mercilessly harassed.

4.3.6. Nyanza and Western Provinces

These two provinces of 12,525 km^2 and 8,223 km^2 are the most densely populated in the country (261 persons/km^2 and 249/km^2) and are fertile high rainfall agricultural areas inhabited by the Luyia, Luo, and Kisii. Relatively little natural vegetation now remains apart from the Mount Elgon forests in Bungoma District, the Kakamega Forest in Kakamega District, the Lambwe National Reserve (308 km^2) in Homa Bay District, and isolated patches of dense bush, interspersed between cultivation, in Siaya District. Most of western Kenya's larger wildlife has long been eliminated (Game Dept. 1961, 1963) and it is not surprising that the remaining leopards, living in such close proximity to man and dense livestock populations, not infrequently feed on domestic animals.

In Kisii District, the most densely populated rural district in Kenya (473 persons/km^2), it is likely that leopards have been virtually exterminated, for there is scarcely anywhere for them to live and I have no reports of them stock-raiding.

In Kakamega District, the next most densely populated with 342 persons/km^2, leopards are regarded by the Game Warden (Kakamega) as major stock-raiders although the toll attributed to them from 1977 to September 1980 does not seem excessive: 32 goats, 11 calves, and 10 chickens. During this period the Department shot two leopards on control. In 1976 leopards were reported to be still abundant in the sugar cane around Mumias, but their chief refuge in the district is probably the 123 km^2 Kakamega Forest. However, this has shrunk by 14% since 1972 and is subject to numerous forms of disturbance, including deforestation, snaring, and the grazing of livestock.

In two districts, Homa Bay and Siaya, the leopard is regarded by the Wildlife Department's Wardens as the No. 1 problem predator, but both lion and cheetah are absent. During the period 1977-1980 inclusive leopards in Homa Bay District were attributed with taking 82 sheep and goats, three dogs, and two 'cows' from the settled areas adjoining the Lambwe National Reserve, but for such a densely populated area these losses do not seem excessive. However, their incidence may be on the increase: 8 losses were reported in 1977, 17 in 1978, 29 in 1979, and 33 in the first eight months of 1980. In Siaya District two children were killed and several other people were attacked by leopards from 1977-1980 and domestic animals were also taken. Three leopards were shot on control and seven were translocated. On the basis of this the Game Warden (Siaya) believes

leopards are 'very plentiful' but I suggest this assessment is mistaken: they are less numerous than they seem and have been thrust by their activities into a prominence that they would not otherwise warrant.

Finally, in Kisumu District, which is also densely populated (297 persons/km^2), a boy was killed by a leopard in Maseno Division in 1981 and "marauding leopards" were reported to be posing a danger to people and livestock ("Daily Nation" 13/2/81).

Cheetah are absent from western Kenya.

4.3.7. Nakuru and Kericho Districts

Nakuru and Kericho districts (7,024 km^2 and 4,890 km^2) are both high potential agricultural areas with substantial human populations (64 persons/km^2 and 151 persons/km^2) and considerable numbers of livestock which leopards sometimes raid. In both districts leopards are regarded by the Wildlife Department as 'major' stock-raiders, although their depredations are outweighed by those of other predators. In Nakuru District, where game wardens believe leopards are 'moderately numerous' to 'plentiful', one leopard was shot on control in 1977-1980 and ten were trapped for translocation. In Kericho District, where they are assessed as 'rare' by the Game Warden (Kericho), leopards were reported to be killing sheep, goats and cattle in Bomet Division, adjoining the Trans Mara forest, and in 1978 a person was mauled there.

In addition to extensive and increasing areas of smallholdings the two districts also contain some 2,000 km^2 of forest, mostly on the Mau Escarpment where leopards were still common in 1976. Unfortunately this habitat is coming under increasing pressure from deforestation, reafforestation with exotics, charcoal burning, and cultivation. A recent 5-week ecological survey of the Mount Londiani Forest Reserve failed to find any definite evidence of leopards but snares were plentiful (Cantrell & Roberts 1980).

Elsewhere leopards are reported to be numerous in the Rift Valley around Nakuru, Naivasha, and Elmenteita, where they indulge in periodic stock-raiding, and on the rugged slopes of the extinct volcano Mount Longonot. This adjoins what used to be Akira Ranch (280 km^2/108 sq.mi.) where from 1968 to 1973 inclusive about 31 leopards were legally shot by hunters, without any sign of a decline in the population (C.R. Field, pers.comm.). Leopards were also plentiful between Akira and the Escarpment forming the eastern wall of the Rift Valley, but in the early 1970s they were being poisoned with the potent acaricide 'Coopertox' along the foot of the escarpment.

Lake Nakuru National Park contains a dense leopard population (about 1/5 km^2 from data in Kutilek 1974) but because of its relatively small size (202 km^2 of which much is water) contributes little to overall numbers. Outside the Park , as elsewhere in Nakuru District, large farms are being subdivided for high density agricultural settlement: a change that can only be detrimental to the leopard's future there.

The cheetah is rare in Nakuru District and absent from Lake Nakuru National Park (Kutilek 1974) and Kericho District.

4.3.8. Narok District

Narok District is a nomadic pastoral highland area of 18,513 km^2 inhabited by Masai (10 persons/km^2) and their livestock and the largest wildlife populations in Kenya. But it also contains much land of high agricultural potential that is increasingly being brought under the plough, particularly for large scale wheat schemes.

In the early 1960s leopards were plentiful throughout the district, with the exception of the Loita Plains where there is little cover. The Loita Hills, the Nkuruman Escarpment, and the Masai Mara were all particularly noted for leopard, and it was easy to see these animals, even without the assistance of baits, and to hear them calling at night. Until the hunting ban of 1977 the district was one of the most popular for shooting leopards and in 1965, for example, it provided 40% of the 140 leopards shot on licence in controlled areas (Game Dept. 1965).

Since 1965 subjective impressions suggest that the leopard population has decreased substantially. Professional hunters first began to notice a decline in the controlled areas, particularly Blocks 57 and 60, in the early 1970s, and by 1975 it had become difficult to shoot trophy male leopards except in the remoter areas. There were two main reasons for this: uncontrolled sport hunting and poaching, both of which began to take effect at about the same time, that is to say from 1971/72 onwards.

The impact of sport hunting will be discussed in more detail later (Chapter 6), with particular reference to Narok District, but there can be little doubt that it had an adverse effect on leopard populations in several areas: particularly Block 57 between Morijo and Narosura and around Naikara, Block 58 along the Ewaso Ngiro River and near Lemek, and in the southern portion of Block 59. This manifested in an unusual preponderance of females coming to bait and a shortage of adult males. By 1975 it was necessary in some areas to put up as many as 10-15 baits in order to get even one male feeding, whereas three or four baits used to be sufficient.

But what really affected the leopards of Narok was the upsurge of commercial poaching in the 1970s coupled with deliberate attempts by the Masai to eliminate predators. The use of the toxaphene poison 'Coopertox' became widespread, for it was produced as a cattle dip and was not only cheap but readily available. Using poisoned meat the Masai killed a large number of leopards and other predators, with the exception of cheetah, throughout the district. All the hunting blocks were affected, with the possible exception of the Nkuruman Forest in Block 62. Not only did the professional hunters notice a decline in the numbers of leopards of both sexes, for poison is unselective; they also found poisoned leopards, hyaenas, and vultures. Moreover, they noticed a change in the behaviour of leopards coming to baits; often the animals fooled with the bait, particularly the extremity, and either failed to feed or merely nibbled the outside, indicating that they had survived poisoning and had become aware of the danger.

Coopertoxing probably reached its height in the years 1974-1977 and has, I believe, declined since then, but it has caused considerable depletion. Undoubtedly one motive was to reduce the predator populations but another was to kill leopards for their skins,

and in some areas, such as Block 57 near the Somali shop at Entesekera, the poisoning was obviously highly organised. It was, however, an inefficient method of poaching because poisoned leopards did not necessarily die near the bait and could not always be found, or were found and skinned after too long a delay, in which case the fur slipped. Indeed it is estimated that the poachers lost at least 20-30% of all the skins from leopards killed in this way. But poisoning was not the only method in use. Steel-jawed gin traps and guns were also used, particularly in Blocks 59, 60, and 61, and in the Masai Mara. One of the few places that seemed to escape from heavy poaching was the Nkuruman Escarpment Forest and plateau, where leopards were still numerous in 1977.

There is little doubt that the Masai Mara National Reserve (1,673 km^2) did not escape the attention of leopard poachers. Poaching of rhino, leopard, and possibly cheetah was taking place in the vicinity of Mara Serena Lodge in 1978 and 1979, when the Masai tended to blame Kuria tribesmen from neighbouring Tanzania (Burney 1980). But neither the Masai nor the Kuria were the only people involved. Indeed Burney, who was studying cheetah, remarked: "It is the opinion of many drivers and rangers that the value of leopard skins and the ease of baiting them makes it certain that any very tame and obvious leopard does not last long in the Mara." There is evidence to support this contention. In January 1976, for example, one such leopard was shot on bait with a .375 rifle near the Research Station, and in 1978 a safari operator saw a number of leopard baits along the Talek River, well inside the Reserve. On another occasion a different operator actually saw a shot leopard being loaded into a vehicle! Not surprisingly it became increasingly difficult to find leopards in the Mara, even around Keekorok Lodge and the Reserve Headquarters, and Burney reported that the typical response of leopards to vehicles in 1978/79 was to bolt. He observed no case in the Mara of habituated leopards allowing themselves to be watched by vehicles, as in the neighbouring Serengeti National Park in Tanzania, and leopards were seldom seen in trees. There was also evidence of poisoning, for example in the Ntiakitiak area in 1976, and two poisoned leopards were personally photographed near the Mara River by the Hon. John Konchellah, M.P., who claimed that leopards and lions were being wiped out in the Reserve.

As a result of all this, by 1977 the Masai Mara had lost its reputation as an area where leopards could be seen almost every day and heard almost every night. Writing of the period 1978/79, Burney (1980) remarked: "Few tourists in the Mara these days see a leopard - probably less than 1%." Since then there have been encouraging signs of a 'come-back'. Visitors are now beginning to see and hear leopards again and I know of no reports of poaching. One reliable observer has seen eight different adult leopards in an area of about 25 km^2 (10 sq.mi.), a density of 1/3 km^2 (1/1.2 sq.mi.), between 1978 and 1980, and reports that sightings of leopards have increased remarkably in the northern Mara in 1980/81. The flight distance of leopards seen is also slowly decreasing as the animals become less nervous. If this improvement continues, the Mara may once again regain its former reputation as the best place in Kenya for seeing leopards. There are also encouraging recent reports from other parts of Narok District.

There are, however, other ecological factors apart from man that may have affected the Mara leopard population. One is the

change of habitat wrought by elephants and fire over the past two decades: a change in which there has been a noticeable reduction in the bushland thickets and some of the riverine vegetation, resulting in a decrease in the cover available to leopards. The other is the density and distribution of the dominant carnivore, the lion. Burney (1980) found that whereas the greatest densities of lion were found inside the Reserve, where the species was at least partially protected, the reverse applied to leopards and cheetahs. He speculated that outside the Reserve lions in prides tend to become troublesome for the Masai and are likely to be driven away or even killed. Leopards, cheetah, and nomadic lions, however, are less conspicuous and co-exist better with pastoralism. For this reason, and because neither leopards nor cheetah get on well with lions, it is likely that the pastoral areas outside the Reserve afford a more favourable environment to these two species than the Reserve itself.

Despite the depletion caused by excessive sport hunting and heavy poaching, the status of the leopard seems to be better in Narok District than in most other parts of Kenya. Nevertheless the continued availability of 'Coopertox' and the tendency of the Masai to use it will pose a constant threat to the recovery of the species. Although leopards are currently regarded as minor stock-raiders in Narok, they are likely to come into greater conflict with man as their own numbers build up again and as human and livestock populations increase. Continued deforestation of the Mau and the forests near Lolgorien and increasing agricultural settlement will reduce the natural habitat available to leopards, but the large scale wheat schemes around Ngorengore and Lemek will not necessarily be detrimental as all predators are protected there.

The status of the cheetah appears to be good. This is certainly true of the Mara region where Burney (1980) carried out his excellent study of the species in a 2,495 km^2 (963 sq.mi.) study area which included pastoral land as well as the Reserve. He was able to account for 61 cheetahs, representing an overall density of 1/41 km^2 (1/16 sq.mi.) and in his primary study area found that cheetah density was twice as high outside the Reserve (1 cheetah/29 km^2) as inside (1/69 km^2). He found a high proportion of juveniles and subadults and suggested that the population was increasing. Poaching had had little impact, and cheetah seemed to co-exist peacefully with the local Masai. Tourism and related activities had also had minimal impact, although their effects on cheetah are now reported to be increasing and the animals are responding by moving away from the areas of greatest tourist concentration. Burney concluded: "The cheetah is thriving in the Mara region, with good potential for a population increase."

4.3.9. Kajiado District

Kajiado District mostly comprises arid and semi-arid nomadic pastoral country of 20,963 km^2 lying between 3000' and 5000' and inhabited by wildlife and Masai (6 persons/km^2) with their livestock. Unlike Narok District it has very little high potential agricultural land.

But like Narok District, Kajiado carried a large leopard population in the early 1960s, and in 1965 provided 42% of the 140 leopards shot on licence in controlled areas (Game Dept. 1965). All

the Kajiado hunting blocks were good but especially Block 62, along the Ewaso Ngiro River and the base of the Nkuruman Escarpment, and Block 63 near the Marble Quarries. But, as in Narok, there was a decline, and whereas in 1966 no less than 75 leopards were shot on licence in Kajiado, there was thereafter a steady decrease in both the number of leopards shot and Kajiado's proportion of the national total, as shown below:

TABLE 4.1. Number of leopards shot on licence in Kajiado District in 1965-1973. Source: Casebeer (1975).

Year	1965	1966	1968	1969	1972	1973
No. of leopards shot in Kajiado	59	75	46	27	18	6
% of leopards shot in controlled areas	42%	45%	38%	31%	26%	13%

A decline in the leopard population, as reflected by increasing difficulty in obtaining trophy leopards, was first noticed by some professional hunters in 1966 and 1967. Blocks 63 and 64, which are near Nairobi and readily accessible, were the worst affected and there is little doubt that excessive sport hunting was at least partly responsible. In Block 63, for example, a lack of males became evident, and of eleven different leopards that one hunter had feeding on baits all were females or young. In 1965 no less than 21 leopards were shot in this one block alone, and I believe that was too many. By 1973 very few leopards were being shot in Kajiado District for the good reason that they were then difficult to obtain.

But, once again as in Narok, predator poisoning and poaching for skins had a greater effect than excessive sport hunting. The Masai began to use 'Coopertox' in Ngong Division in the late 1960s in a deliberate, and according to them successful, attempt to eliminate predators. As the practice spread and as commercial poaching took hold too, the status of the leopard deteriorated, especially after 1970. Block 62 was particularly badly ravished below the Nkuruman Escarpment, where Sonjo settlers from Tanzania were setting baited snares on the ends of branches, and along the Ewaso River where the Masai were using 'Coopertox' in the early 1970s and there was also evidence of illegal shooting. Whereas in the 1960s a professional hunter who put up sixteen baits at the foot of the escarpment had every one taken by leopards, another who did the same in 1974 got no response at all. All this poaching, as well as the poaching of zebras, lions and rhino, took place despite the presence of a Game Department post on the Ewaso, in the very centre of the affected area.

In addition to the controlled areas, Kajiado District also contains Amboseli National Park (392 km^2) and the former Kitengela Game Conservation Unit (568 km^2) where in theory no hunting was allowed. Amboseli used to be renowned in the 1950s as a place where one could easily see all the "Big Five", including leopard, in a single day. It has now lost this reputation, although it is likely that habitat changes resulting from a rising water table are responsible rather than poaching. Since 1950 approximately 90% of the

trees in the Acacia xanthophloea woodlands that formed such an excellent habitat for leopards have been killed by increasing salinity and by expansion of the swamps (Western & Sindiyo 1972). The disappearance of large areas of woodland led to a decline in baboon, impala, and lesser kudu populations (Western, pers.comm.) and increasing visibility resulting in a higher effective tourist density in the Amboseli basin. Together these changes led to a local decline in the leopard population, probably through emigration, and increasing harassment of lions and cheetah by tourism. By 1960, when many of the large acacias had died, leopards were no longer often seen (Cullen & Downey 1960), and during the four-year period 1976-1979 one wildlife researcher working in Amboseli did not see a single leopard. Although the Park Warden still regards leopards as 'rare', they are beginning to be seen again as the woodlands regenerate.

In the Kitengela Conservation Unit which is ecologically so important to the small Nairobi National Park (117 km^2) which it adjoins, there was believed to be a small leopard population of 10-15 animals in 1974/75 (Rudnai 1979). This represents a density of only 1/38-57 km^2 which is unexpectedly light. For although the Kitengela largely comprises open Acacia drepanolobium wooded grasslands heavily used by Masai livestock, it also contains plenty of wildlife and is dissected by numerous rocky, bushy river valleys which should provide excellent leopard habitat. However, leopards were being snared on the Mbagathi and Kiserian rivers, near Masai Lodge, in 1971-1974, and it is well known that commercial poaching of zebra was rampant in the Conservation Unit in the early 1970s (Casebeer & Mbai 1974). The use of 'Coopertox' was also widespread then (Norris 1975).

So far as I can tell, the leopard now seems to be recovering in Kajiado District after the depletion of the 1960s and 1970s. It is regarded as a major stock-raiding problem by the Game Wardens (Loitokitok and Kajiado) who assess it as 'moderately numerous' and 'plentiful'. The Game Station at Loitokitok, at the foot of Mount Kilimanjaro, records known losses of 35 sheep and goats and one cow to leopards in the period 1977-1979, and in the Kajiado area leopards are reported to have taken 481 sheep and goats in 1979 and 112 during the first six months of 1980. Although only one leopard was shot on control in 1977-1980 and another translocated, the Game Warden (Kajiado reports that an unknown number were killed by Masai herdsmen in defence of their stock. In Block 66, where professional hunters were getting a poor response to their baits in 1975-1977, the local Masai told me in 1981 that leopards are now reasonably numerous, at least in the Iltilal area. I suspect that a similar recovery may have taken place throughout much of the district, though its extent can only be guessed. In the immediate future the status of the species seems likely to improve, with good prospects if the animal is left alone as less than 6% of the district has agricultural potential. On the other hand conflict with man can be expected to increase as leopard, livestock, and human populations all increase simultaneously.

The status of the cheetah appears on the evidence available to be good. In 1975 these animals continued to be seen regularly in areas such as Block 66 where leopards had undergone a decline, and during aerial surveys of Kajiado District in 1974-1976 I often saw them, usually in woodland or open bushland rather than on grassland. They occurred throughout the district and seem to have disappeared only from the Kitengela (Rudnai 1979), probably as a result of poaching with fire-arms and harassment by man and dogs.

4.3.10. Nairobi Province

Nairobi Province (684 km^2) consists of the capital and 590 km^2 of its environs and includes the 117 km^2 Nairobi National Park, as well as some 20 km^2 of forest.

Leopards have long been an occasional nuisance in the Nairobi area. In 1937 one took one of the Governor's dogs from Government House (now State House) only 2 km (1.2 miles) from the centre of Nairobi, and in 1957 and 1958 the "Karen killers" took over 100 dogs in the suburbs. In 1956 the Director of National Parks wrote: "In my opinion leopards are likely to be seen in the suburbs to the west of the Nairobi National Park for many years to come" (Royal National Parks 1956). In 1981, twenty-five years later, this is still true. Patches of indigenous forest, such as the Langata, Karura, Olulua, and National Park forests, which still contain bushbuck, warthog, duiker, suni, hyrax, monkeys, and baboons, provide their main refuge but there are plenty of river valleys and patches of dense bush that also provide suitable, if diminishing, cover.

Nowadays Nairobi leopards generally keep a low profile. They seldom call at night or disturb the peace by taking domestic animals, and keep well concealed during the day though they can occasionally be seen at night in the Karen and Langata areas. There is, however, no foundation for the extraordinary claim by Eaton (1979b) that "the density of the leopard in Nairobi is 0.62 per km^2"! I would be surprised if there were more than 45 leopards, including cubs and subadults, in the 684 km^2 of Nairobi Province. Nevertheless this is a remarkably respectable number if it is true and would represent a mean density of 1 leopard/15 km^2 which is greater than in many parts of Kenya. But it does not support the extravagant claim that "the leopard may achieve highest densities in heavily populated cities" (Eaton 1979b). The majority of Nairobi's leopards are not in the city but in the National Park, where in 1968 there was a high density; the Park's forest is the only place in Kenya where I have ever seen four different adult leopards in one night within an area of less than 25 km^2 (10 sq.mi.). Unfortunately there is reason to believe that the Park's leopard population has declined since, and in my status survey it was assessed as 'rare' by the Park authorities. C.E. Norris, who has kept remarkably detailed records of the predators of Nairobi National Park, including all leopard sightings known to him over the period 1972-1975, found the following trend:

TABLE 4.2. Leopard sightings recorded in Nairobi National Park 1972-75. Source: unpublished records of C.E. Norris.

Year	1972	1973	1974	1975
No. of sightings	71	44	27	25

The trend is clear. But there is no reason to believe that it reflects any variation in the time spent in the Park, for the observer was an Honorary Warden who was there virtually every day and also collected observations from the resident Park staff. In the first five months of 1976, after which recording unfortunately ceased, only five sightings were recorded and only one of these was in the southern portion where until 1975 leopards were often seen. The populations of the Park's lions and cheetahs also dropped

in 1974 (Norris 1976b) when a severe drought was at its height and large numbers of herbivores died of malnutrition (Norris 1974, Hillman & Hillman 1977). It is not known what effect the drought or its consequences had on the leopard population but it is known that the species was being poached along the Mbagathi River boundary in 1971-74, and in 1974 a leopard was even poached in the Nairobi Animal Orphanage at National Parks Headquarters! It is also known that snaring was then - and still is - widespread in Nairobi's forests outside the Park; this could have had some effect on the Park's population, for the boundary fence presents no obstacle to the movement of leopards, which probably cross it quite often. On one plot alone on Mbagathi Ridge two snared leopards from the Olulua Forest were found dead in 1970-73: evidence of the prevalence of leopards but evidence also of the prevalence of snares.

Nairobi National Park used to be an important habitat for cheetah and these have been the subject of specific studies (Eaton 1970a,b; McLaughlin 1970). McLaughlin estimated that in 1968 the Park contained 11 resident cheetah and 21 transients: a density of nearly 1/4 km^2. Since these studies Norris has continued to keep records based on the recognition of individual animals and has found the following trend:

TABLE 4.3. The cheetah population of Nairobi National Park 1973-75. Source: Norris (1976a).

Date	Jan 1974	Jan 1975	Jan 1976
Known cheetah population (including small cubs)	20	18	11

No less than twelve cubs were known to have died in 1975 and early 1976, although the reasons for this are not specifically known. But there is reason to believe that excessive harassment and probably poaching of cheetah in the Kitengela (Norris 1976a, 1976b), where poachers were hunting with rifles and where by 1974/75 cheetah could no longer be seen (Rudnai 1979), were partly responsible for the population's decline. The cheetah's status in Nairobi Park is not encouraging, and continued denial of the Kitengela dispersal area to these widely ranging animals could ultimately lead to the demise of this population. In the long term the continued expansion of human settlement and cultivation and the demarcation of group ranches south of the Mbagathi may make this inevitable.

4.3.11. Machakos and Kitui Districts

Machakos and Kitui districts (14,178 km^2 and 29,389 km^2) consist largely of semi-arid land of low agricultural potential, with the exception of the Machakos hills. Nevertheless they are both extensively cultivated, mostly at subsistence level, and carry rapidly increasing human populations (80/km^2 and 23/km^2). These densities, however, are based on the 1969 census, since when there has been considerable migration into the less populated areas of both districts but particularly Kitui.

In the 1950s these two districts used to provide some of the best big game hunting in East Africa but since then virtually all large mammalian wildlife has been exterminated by their Wakamba

inhabitants (Game Dept. 1950, 1954-55, 1956-57). Even the dikdik, a major source of leopard prey and once abundant throughout the Commiphora bushland, is now generally rare, even where its habitat remains.

What about the leopard? J.A. Hunter, Game Ranger at Makindu in 1954, wrote in his annual report that cheetah were on the increase but not leopards. This he attributed to constant persecution in the past, when numbers were whittled down to "a mere tithe", mainly by the use of gin and bow traps. "From such killings over years of uninterrupted hunting leopards have never recovered and will never be found in such numbers again." (Game Dept. 1953-54). Although some professional hunters were still able to find leopards up until 1962, Hunter's assessment is as valid in 1981 as it was in 1954. If anything the status of the leopard has declined further since then as a result of expansion of the human population, continued destruction of the dikdik and other wildlife, continued modification of natural vegetation and habitat, and increased poaching at the height of the leopard skin 'boom' in the early 1970s. Leopards still occur, particularly on the rugged rocky hills of Kitui District, but are nowhere numerous. The Wildlife Department's wardens regard them as 'rare' and record few cases of stock-raiding. But the Wakamba have a greater propensity than other tribes for trapping leopards and almost certainly kill most stock-raiders themselves, without the Wildlife Department ever knowing about it.

Cheetah still occur in Ukambani in small numbers and also take livestock, doubtless because the decline of the dikdik and other wildlife has reduced the natural prey available to them too.

In view of the continued spread of Wakamba settlers into areas not already cultivated, despite the lack of land suitable for agriculture, and given their propensity for hunting, neither the cheetah nor the leopard have any long term future in Ukambani. The existence of the North Kitui and other national reserves, which cover some 3,000 km^2, makes little difference to this assessment, as no wild animal with any commercial value is safe in Kamba country, as has been proved in the northern area of Tsavo National Park, most of which lies in Kitui District. Tsavo, however, will be considered as a separate unit in Section 4.3.14.

4.3.12. Central Kenya

This sector comprises Central Province, Embu and Meru districts and Laikipia District. It includes the Aberdares Range and Mount Kenya which will be considered separately as they span several districts.

Central Province, with 196 persons/km^2 in its 13,173 km^2, is one of the most densely populated areas of the country and consists almost entirely of high potential agricultural land. Most of this is now under cultivation, with the exception of the montane forests and moorlands, and offers little suitable habitat for leopards. Much the same applies to Embu District (2,714 km^2: 102 persons/km^2) and to the central part of Meru District (9,922 km^2: 93 persons/km^2). Nevertheless leopards occur throughout, albeit unevenly distributed, and are regarded by Wildlife Department wardens as 'moderately numerous' to 'plentiful', although this assessment is in most districts true only of the forested areas. They are minor

stock-raiders except in Nyandarua where they do more mischief, and most of their marauding seems to occur on farms adjoining the montane forests.

These forests, on the Aberdares and Mount Kenya, provide an excellent habitat for leopards, with plentiful prey and few lions. Before the hunting ban they enjoyed a high reputation amongst the professional hunters as the leopards there were large (60-95 kg/132-209 lb), abundant, and handsome, with melanistic individuals not uncommon, and provided fine trophies. Since 1963, when the Game Department lamented that in the new settlement schemes the attitude appeared to be that the game laws no longer applied (Game Dept. 1963), leopards in the forest reserve have suffered some depletion from poaching by snares and wooden box traps. In 1967 professional hunters found more snares than ever before on both mountains and one actually found a leopard caught in a snare. Yet at the same time that it became difficult for them to obtain leopards on the Aberdares, skins were circulating amongst the local people. Poaching continued into the 1970s, and as late as 1978 about 25 leopards are believed to have been taken from the north-western side of Mount Kenya. There was little poaching in the Aberdares National Park until 1978, since when the number of sightings of leopards at "The Ark", a game lodge in the Salient, has dropped by 50%, and other animals, such as rhino, are also less frequently seen. At the same time evidence of snaring has increased.

Nevertheless the forests on these mountains are probably still among the most important reservoirs of leopard in Kenya today. Unfortunately neither of the two national parks, the Aberdares (767 km^2) and Mount Kenya (716 km^2), provides protection for much of the forest as they are essentially high altitude parks consisting largely of bamboo and afro-alpine moorland above the 9000' contour. On both mountains the gazetted forests outside the parks are being consumed by deforestation at an alarming rate. The leopard's future on the Aberdares and Mount Kenya, and therefore its future in Central Province will largely depend upon the eventual fate of these diminishing forests.

There is some controversy on the densities that leopard populations in these forests attain. Myers (1976b) speculated on the basis of discussions with F.W. Woodley, Warden of Mountain National Parks for over twenty years, that the density may be as high as one leopard per km^2 in some areas. This figure was repeated by Eaton (1976, 1979b) but was in fact based on a misunderstanding. What Bill Woodley actually said was that he believed leopard densities might attain 1 per 2 km^2 (1/0.8 sq.mi.) in the Treetops Salient which is a small area of less than 130 km^2 (50 sq.mi.). He did not believe this density was typical of the rest of the Aberdares, where it is almost certainly lower. Neither he nor any of the professional hunters and wardens I interviewed believed that leopard densities attain 1 per km^2 anywhere on the mountains or in Kenya, and I received some forthright comments on this figure! In view of what is known of the social organisation of the leopard such a high density seems unlikely.

Nevertheless it seems that leopard populations can attain densities not far below this, as is shown elsewhere in this report. One high density estimate based on baiting leopards comes from Solio Ranch, just east of the Aberdares. There it is estimated that up to twenty leopards, including young, live in its 57 km^2 (22 sq.mi.) game reserve, which is surrounded by a leopard-proof electric fence. If this estimate is correct it represents a density of 1 leopard per 2.9 km^2 (1/1.1 sq.mi.) which is certainly impressive. But Solio

provides an exceptionally rich habitat with a far wider variety of vegetation types and greater diversity and numbers of suitable prey species than the montane forests.

By contrast, Meru National Park (872 km^2/337 sq.mi.), which occupies the south-eastern portion of Meru District, has a small leopard population. This area has long been heavily poached (Game Dept. 1930, 1936, 1950, 1953-54), particularly by the Tharaka and Wakamba, but the leopard population was able to withstand their trapping, and until 1959 when the Meru African District Council Game Reserve was created, professional hunters regarded the area as good for leopards. In 1963, however, the Somali secessionist campaign began in northern Kenya. Although the Game Reserve continued to function, there were no proper anti-poaching operations until 1969, after it had become a National Park, and 'shifta' gangs which had turned from guerilla activity to leopard trapping were able to operate largely unhindered. They were devastatingly effective. In 1969, for example, a prisoner taken from a large armed gang of 67 men claimed that in one week they had killed 30 leopards along the Ura River and around Kiorimba Hill. This figure may be exaggerated but it leaves no doubt as to what happened.

As a result, leopards were heavily depleted in Meru Park. Whereas in 1956 they were extremely numerous along the Ura and Tana Rivers and were almost always heard at night, their spoor is now seldom seen and they are seldom heard. And this applies to the rest of the Park too. During my three years in Meru I saw a total of four leopards on three occasions, excluding radio-collared animals. And despite walking in most parts of the Park with one of Kenya's best leopard hunters, my assistant Elui Nthengi, I seldom saw either spoor or droppings. Indeed our original intention of trapping and radio-collaring seven or eight resident leopards in the centre of the Park had to be abandoned after the failure of intensive baiting programmes in October 1977 and August-October 1978. Only three leopards were caught, all at Rainkombe kopje, and few of our other baits spread over 20 km^2 were even touched. Despite the release of 111 translocated leopards since 1969 the Park's population still seems to be small. Elui and I believe it has not yet recovered from the Somali onslaught of more than ten years ago. We believe it may well take another ten years, without any further poaching, for any substantial recovery to become evident, and perhaps fifteen to twenty before Meru's leopards regain their former abundance.

By contrast, cheetah are often seen, usually in the dense Commiphora bushland between the Rojewero and Tana rivers, and do not seem to have been affected by the poaching.

In Laikipia District (9,718 km^2) which is largely devoted to ranching (10 persons/km^2) in semi-arid country, leopards used to be abundant and professional hunters often took their clients there. But in the late 1960s Somali gangs from Isiolo District began to trap leopards along the base of the Mukogodo Range and on some of the eastern ranches. In Block 67 leopards were heavily depleted by 1977, although according to Wanderobo tribesmen living in the Mukogodos they are now becoming evident again.

At the present time leopards are regarded as a major stock-raiding problem in Laikipia, although wildlife is still plentiful, and the Game Warden (Nanyuki) estimates that they take 400 sheep and goats a month. This figure seems rather high to me but it may well

reflect increasing conflict with man as dense settlement spreads eastwards and northwards across Laikipia as large farms are subdivided and the Rumuruti, Ol Arabel and Marmanet forests are cut down to make way for smallholdings. On the large ranches stock-raiding leopards have been caught at a more or less steady rate of 10-15 per annum over the last twenty years, and in 1977-1980 several farms were trapping them at the rate of 1-2 a year. But on the whole losses of livestock to leopards are not great compared with those to other predators. On Mbori, for example, which runs some 15,000 sheep on the Laikipia/Meru boundary, recent losses to leopards have averaged about five sheep a year, each worth 250/-, compared with 20 per month to hyaenas.

Cheetah appear to be more important than leopards as stock-raiders in Laikipia. They are still relatively numerous and are more difficult to deal with as they cannot be trapped easily or poisoned. They are particularly partial to sheep, which they sometimes kill in large numbers; one farm, for example, recently lost 14 to a single male cheetah in two days. Cheetah numbers and depredations seem to have increased on many ranches since 1970. But this is probably because increasing intensive settlement has compressed their range and concentrated them on the remaining large land units.

In conclusion both leopards and cheetah are thriving in Laikipia District at the present time, and the former seem to have survived poisoning campaigns directed at hyaenas in the past, although the campaigns must have caused some depletion. However, as land use in the district changes and as their habitats disappear, both species will come into increasing conflict with man and their long term future is likely to be one of decline.

4.3.13. Taita District

The greater part of Taita District's 16,959 km^2 consists of Tsavo National Park (62%) which spans several districts and will be considered in the next section. Taita's estimated population of 170,900 people is therefore confined to 6,420 km^2 where the mean population density is 27 persons/km^2. On the Taita Hills, where most of the people are concentrated, densities exceed 100/km^2. Below the hills the arid Commiphora bushland has been divided into group ranches.

The controlled areas 25-28 used to contain a lot of leopards in the early 1960s, particularly around Kasigau and other rocky hills, and were good hunting areas. In the early 1970s, however, leopards began to become noticeably fewer, according to professional hunters, and there was evidence of poaching by Waliangulu and Somalis with bow and gin traps. Nevertheless it was still possible for professional hunters to find leopards for their clients in 1975. What has happened since then is uncertain but intensive Somali activity in the area since the 1977 hunting ban has probably inflicted further losses as the leopard was one of the main targets of Somali poachers operating in nearby Tsavo in the mid-1970s. The Game Warden (Voi) believes leopards are 'moderately numerous' but receives no complaints of them stock-raiding. From the subjective evidence available to me I believe the district's leopard populations are depleted and less than abundant. And as human population pressures increase and settlement continues to spread, as it has done between Maungu and Kasigau despite the low agricultural potential of the land, the leopard's long term future in Taita is questionable.

The cheetah occurs in the Commiphora bushland below the Taita Hills but I have no information on its status.

4.3.14. Tsavo National Park

Tsavo National Park, at 20,821 km^2 (8,037 sq.mi.) the largest in Kenya, used to contain a substantial leopard population in the 1940s before it became a national park. My tracker Elui used to hunt leopards there for their skins and found them throughout the area. They were particularly numerous along the Tsavo, Athi, Galana, and Tiva rivers and at Ngulia, Kiasa, and Jimetunda.

In 1948 when the Park was gazetted, most of it "was covered in dense bush consisting for the most part of Commiphora, Delonix, and Acacia with extensive beds of Sansevieria growing under the shade of these trees" (Sheldrick 1965). This habitat contained numerous lesser kudu, gerenuk, and dikdik. Under the twin influences of elephants and fire the tree-bush complex has been destroyed or thinned out in many areas, with replacement by bush grassland and grassland (Goddard 1970). Where this has happened these browsers have largely disappeared and have not yet been replaced by very much else. This change of habitat and prey has almost certainly been detrimental to the leopard, not least because by concentrating them in the remaining suitable areas it may have made them more vulnerable to poaching. Another adverse habitat change was the damage caused to riverine vegetation in 1961 when floods tore long stretches of forest from the banks of the Galana River (Game Dept. 1961).

Wakamba such as Elui have hunted leopards in Tsavo for many years. But although they undoubtedly depleted local populations, it seems that these were generally able to recover. One of Elui's favourite trapping areas in the 1940s was the Tsavo River below Ngulia. In September 1971 he and I spent five days walking along the river and saw no less than three leopards and two fresh kills purely by chance: no radio-collars! Leopard tracks were everywhere, and Elui believed that the population had fully recovered from his past depredations. In March 1980 we returned to the same area for a one-day reconnaissance which although admittedly brief should have been long enough for us to find some sign of leopards. We did not see any spoor whatsoever, fresh or old, at any of the many points along the river where we searched, or in five hours of walking in an area where formerly I would have guaranteed to see leopard tracks. This is not to say that there are no leopards left along this stretch of river - I know from Rangers' reports that there are - but it does reflect a drastic decline in numbers. Staff at Ngulia Lodge where in 1971-74 leopards quite often used to drink at the pool report that they no longer do so.

This decline can be attributed to the Somali gangs which operated in the Ngulia Range and along the Tsavo River in 1974-1977 when the leopard was once again one of their principal targets; some gangs were devoting their attention solely to leopards. I have seen the piles of snares recovered by the anti-poaching Field Force and believe the Somalis have done a thorough job. Other parts of Tsavo were probably similarly affected, for Somali leopard poachers operated in Tsavo East too. Moreover after the Government took over from Kenya National Parks in 1976 there was a temporary but crucial decline in the effectiveness of anti-poaching operations, as the spectacular decline of the Park's elephant and rhino populations since then confirms.

There are now, in 1981, signs of a leopard 'come-back' in the Ngulia area, according to recent reports from Rangers. This is encouraging but not entirely unexpected as it was unlikely that the Somalis had succeeded in trapping all the leopards living in this steep and rugged Range. Despite Tsavo's habitat changes, the Park's leopard populations are likely to recover from recent depletion and may be helped if, following the relaxation of elephant pressure, the present open vegetation reverts to Commiphora bushland, as present signs of regeneration suggest it may.

Cheetah are now being seen more often than in the past in both Tsavo East and Tsavo West.

4.3.15. Galana and Kulalu Ranches

These two large ranches, which between them cover over 7,600 km^2 (2,934 sq.mi.), lie in Coast Province adjoining Tsavo East National Park. Although they do not form a district of their own and have not been treated as a separate unit elsewhere in this report, I have taken them on their own here as there is quite a lot of information about them that is worth examining in detail. As in Tsavo, they have undergone extensive habitat changes and heavy poaching. Ecologically they are similar, consisting of modified Commiphora bushland of negligible agricultural potential.

According to the Waliangulu Galana used to be wetter than it is now. In the 1930s bees started to leave as it became drier. In the 1960s elephants began to open up the vegetation and fires followed. Leopards were then numerous and occurred throughout the area throughout the year, even on hills such as Dakadima and Dakadakatha (old hunting grounds of Elui) where in the dry season the nearest permanent water was over 70 km (43 miles) distant. In January 1962, for example, they could be heard almost every night on the Tiva, and in 1963 five different leopards fed simultaneously on baits set within an 8 square mile (20.7 km^2) area around Lali Hills: a density of 1 leopard per 4 km^2, which is high. However, for many years before and after 1960 leopards have been poached by the Wakamba and the Waliangulu. The former, using gin traps, used to operate along and from the Tiva, while the latter, using bow traps, operated along and from the Galana River. This poaching apparently increased in the early 1970s, and in 1977 Galana Ranch was invaded by armed Somali poachers who shot the Game Manager in combat and proceeded to kill elephant and rhino by the hundreds. Leopards were not their main concern but they probably trapped what they could. At any rate, whereas in 1973/74 it was not difficult to find sign of leopards, particularly along the Galana River and at Lali Hills, leopards and their tracks are now seldom seen. The same applies to the 971 km^2 (375 sq.mi.) Kulalu Ranch on the south bank where the Manager knows of only two leopards.

By contrast the Manager of Galana Ranch reports that cheetah are still often seen and it is his impression that their numbers have increased. The rise of the cheetah and the decline of the leopard are almost certainly correlated to some extent with the habitat changes that have occurred and in turn resulted in changes in the species composition and relative numbers of potential prey animals. Ian Parker, Game Warden on the Galana River Game Management Scheme from 1957-1964, believes that the main cause of the leopard's disappearance is in fact habitat change, for the transition from dense

Commiphora-Sansevieria bushland to open bush grassland has resulted in the virtual disappearance of lesser kudu, gerenuk, dikdik, and guinea fowl. Rodents are not abundant and shade is now at a premium. In 1963, for example, when Parker censused eight different study areas on Galana using the King transect method (Leopold 1933), he found dikdik densities ranging from 0-4/km^2 (0-10/sq.mi.) to 148/km^2 (384 per sq.mi.) with densities in several areas exceeding 40/km^2 (104 per sq.mi.). In a total census area of 2,958 km^2 (1,142 sq.mi.) he estimated the following herbivore populations:

72,033	dikdik	3,278	gerenuk
4,895	lesser kudu	2,116	oryx
4,731	warthog	1,141	Grant's gazelle.

He returned in 1980 and in driving the 70 km (43 miles) from Lali to Dakadima failed to see a single dikdik or guinea fowl. But whereas lesser kudu and gerenuk have also largely disappeared, oryx have increased in number to an estimated 7,000-10,000 and Grant's gazelle to 13,000-15,000. This change has benefitted the cheetah which is essentially a gazelle eater.

In conclusion the status of the leopard in the Galana region is poor and unlikely to improve much unless, as in Tsavo, there is a reversion to bushland. But this is improbable because the area is managed as a cattle ranch and has been favoured by the change from bushland to open bush grassland. The status of the cheetah, on the other hand, is good, despite the abundance of lions. Moreover it is likely to improve to the possible point of becoming a serious nuisance if the numbers of sheep and goats go up substantially as planned.

4.3.16. Kwale, Kilifi, Mombasa and Lamu Districts

These districts comprise 27,387 km^2 and include the fertile coastal strip which stretches about 20 km inland from the sea and carries substantial and increasing settlement and cultivation (44 persons/km^2).

Leopards used to be common throughout the coastal strip, particularly at Shimoni, near the Tanzanian border, where in 1901 they could often be heard calling during daylight (Percival 1924). Over the years, however, they have continuously been shot, trapped, and poisoned, particularly in the Boni country between Lamu and Kiunga (Game Dept. 1929, 1930, 1937, 1956-57, 1958-59) and are now less common. Wildlife Department wardens assess them as 'moderately numerous' in Kwale District and 'rare' in Lamu, but the assessment that they are absent from Kilifi District is wrong. No reports of stock-raiding by leopards were recorded in Coast Province from 1977 to 1980, a fact that could point to depletion. But the species has also been affected by loss of habitat such as reduction of the Arabuko-Sokoke, Diani, and Shimoni forests, the clearing of dense coastal bushland for the construction of beach houses and hotels, and the inland expansion of settlement and cultivation. Leopards are no longer as common at Diani as they were fifteen years ago, and although they still exist at Shimoni and are sometimes heard, their habitat is fast disappearing as fresh ground is cleared for cultivation inland. Except in the Shimba Hills National Reserve (193 km^2), where they are presently numerous, their long term future on the Coast between Shimoni and Malindi does not look promising. They will survive but not in any great numbers.

North of Malindi to the Somali border, loss of habitat has been much less marked and the human population is still sparse, except for the Lake Kenyatta settlement scheme near Lamu. But most of this land has high agricultural potential and will become increasingly heavily populated as people move in from other areas. The Game Department reports cited show that leopard poaching has long been heavy in Lamu District, and reports from professional hunters show that it continued into the 1970s when, for example, Bajunis were catching leopards between Kipini and Lamu with the peculiarly coastal technique of suspending baited shark hooks from branches. The Dodori National Reserve (877 km^2) provides dubious protection at present because of the 'shifta' and all patrolling has to be done in well-armed strength.

Cheetah do not occur in the coastal strip except in Lamu District where they are uncommon.

4.3.17. Tana River District

Tana River District (38,694 km^2; 2 persons/km^2) of Coast Province mostly consists of arid thorn-bushland sparsely populated by nomadic Orma and Galla herdsmen, with the exception of broken belts of Korokoro and Pokomo cultivation along the Tana between Mbalambala and Kipini. It includes parts of Galana Ranch and Tsavo National Park but these are excluded from consideration here, which is confined to the remainder of the district.

In the 1920s leopards used to be plentiful along the Tana and could be heard grunting every night (Watteville 1927). They were particularly numerous in the riverine forests, which have since then suffered heavily from burning and clearing, but they also occurred away from the river, though not in such numbers except perhaps along the Tiva. I believe the Game Department carried out a leopard poisoning campaign in the 1920s at the request of the local people, who complained of stock-raiding, but have not been able to lay my hands on annual reports from this period. Nevertheless despite this campaign, which must have caused many deaths, and despite trapping by the Wakamba, Waliangulu, Galla, and Pokomo in the late 1950s there were still reasonable numbers of leopards all along the Tana from Meru National Park to the coast in 1960.

In the 1960s, however, Somali gangs moved in with gin traps and by 1973 had heavily depleted leopard populations along the whole length of the Tana from the delta to Meru Park. In 1972 there was little evidence of leopards along the lower Tana near Wenje (Andrews, Groves & Horne 1975, & personal observations), where they used to be common, and in 1978 no sign of them between Bura and Nanigi. In the Kora National Reserve (1,788 km^2/690 sq.mi.) on the upper Tana just downstream of Meru Park, leopards were still evident in 1971 although there were signs everywhere of trapping by the Wakamba, Tharaka, and Orma. The Somalis then moved in and virtually wiped out the remainder. George Adamson, a retired Senior Game Warden who lives at Kora Rocks and visits all parts of the Reserve by vehicle and on foot, has seen only one leopard in nine years and believes the population of this large area now numbers less than a dozen: a density of less than 1/150 km^2 or 1/58 sq.mi. It will take a long time to recover and has not yet shown much sign of doing so.

Elsewhere on the Tana, particularly between Hola and Garsen, continued destruction of the riverine forest will adversely affect the recovery of the leopard from its present grave depletion. This recovery will not be assisted by the increasing human settlement and cultivation that can be expected to follow recent near-annihilation of the district's once large elephant populations. The 169 km^2 Tana River Primate Reserve is of little consequence because of its small size and scarcity of leopards.

By contrast the status of the cheetah appears to be good. The species still occurs throughout the Tana bushland, although probably not in the numbers of the 1950s when it was common to see them, occasionally even in groups of ten or twelve, on the Mwingi-Garissa, Garissa-Garsen and Garsen-Malindi roads. Even now, however, they are still often seen between Garsen and the coast. In Kora, where the leopard was so nearly exterminated, the status of the cheetah is excellent. The species was little affected by trapping and has increased in numbers such that George Adamson estimates there are at least 100: a density of 1/18 km^2 or 1/7 square miles. He sees them "pretty well every week". Cheetah in Kora probably live largely on dikdik and game birds - for there is little else - and may therefore have benefitted from the decline of the competing leopard. But they obviously thrive in this dense bushland habitat of unviolated Commiphora, where they have proved better able to survive man's onslaught than the much vaunted leopard.

4.3.18. Garissa District

Like Tana River, Garissa District (43,931 km^2) of North-Eastern Province consists of hot, flat, low-lying, arid land of negligible agricultural potential but is occupied by nomadic Somali herdsmen (2 persons/km^2).

Leopards undoubtedly still occur throughout the district but in a state of depletion. It is unlikely that they are now present anywhere in number, even in the Rahole and Arawale National Reserves (1,270 km^2 and 533 km^2) for these were subjected to Somali poaching no less than other areas. The Boni National Reserve (1,340 km^2), where leopards used to be numerous, is also of doubtful value, for the same reason as Dodori. The Game Warden (Garissa) regards leopards as 'rare' in the district and receives no reports of stock-raiding. It is not known what effect the District Council's hyaena poisoning campaigns in the early 1960s had on the leopard population but in 1963 alone the team accounted for 910 hyaenas (Game Dept. 1963) and it is likely that at least some leopards must have died too.

Cheetah also occur throughout the district and have even been recorded from the Boni Forest area (Graham & Parker 1965). Their status is better than that of the leopard, for the same reasons as in Tana River District.

4.3.19. Wajir and Mandera Districts

Wajir and Mandera districts (56,501 km^2 and 26,470 km^2) of North-Eastern Province both comprise hot, flat, low-lying arid land of negligible agricultural potential occupied by nomadic Somali herdsmen (2 persons/km^2 and 6 persons/km^2).

Professional hunters have not operated in North-Eastern Province for many years because of the security situation. But Wajir and Mandera were never among the most popular hunting areas. They were remote, suitable only for specialised hunting, and have been afflicted by 'shifta' guerilla activity ever since 1963. Most of my information on the area has come from Ken Smith, a recently retired Senior Warden who has kindly tapped local tribesmen and game rangers for up-to-date information.

Leopards are widely distributed and used to be abundant in both districts. Although the present Game Warden (Wajir) believes there are none in his district and has received no reports of stock-raiding, leopards do still occur in the northern portion along the Ethiopian border and at Korondil, Ali Gollo, Tarbaj, and Khorof Harar. At Ajao and Bute Helu they even do a certain amount of stock-raiding. There are no reports of leopards in the southern portion of Wajir District and this is believed to reflect a less favourable habitat of open scrub with few of the dry watercourses that leopards like so much, relatively little prey, and low livestock densities. I have no details of leopard poaching in Wajir but it has probably been substantial enough to deplete the leopard population, given the lack of anti-poaching operations and the proximity of Ethiopia and Somalia. Leopard trapping is certainly nothing new in Mandera District where even in the 1950s the country was heavily poached by Marehan tribesmen from across the border and indigenous Gurreh (Game Dept. 1954-55).

Recent reports suggest that the status of the leopard is better in Mandera District than in Wajir, despite some depletion. The Game Warden (Mandera) believes leopards are present in moderate numbers and receives some reports of stock-raiding. Information from Ken Smith suggests that leopards still occur along the River Daua, where they used to be numerous before the heavy poaching of the 1960s and 1970s, and are reasonably abundant near Melka Sala and in the Seir Hills where they are said to feed largely on baboons. They also occur at Finno on the Somali border, at Takaba, and in the Danissa and Bamba hills but are apparently absent at El Wak. Ironically it seems that the Somali leopard trappers have inflicted less damage in this Somali-inhabited district adjoining the Somali Republic than in the essentially non-Somali areas further westwards and southwards. The explanation for this may lie partly in the politics of secession. Much of the Somali poaching of wildlife in northern Kenya has had a political as well as economic motive: to reduce the value of the land to the Kenya Government by removing a potential attraction for tourism, sport hunting, and other forms of wildlife utilisation. The 'shifta' have tended to direct the brunt of their activities to Marsabit, Isiolo, Samburu, Meru, Laikipia, Garissa, and Tana River districts rather than Mandera and Wajir which are already 'in their bosom' so to speak.

Prospects for recovery of the leopard populations of Wajir and Mandera districts are reasonable if the Somalis refrain from further trapping; this is likely because recent information from Djibouti indicates that the market for leopard skins is not good now. Leopard prey such as Grant's gazelle, lesser kudu, gerenuk, and dikdik are still abundant (Dirschl, Mbugua & Wetmore 1978) and there is no likelihood of any major change in land-use in the foreseeable future as, apart from anything else, there is little permanent

water. Indeed in most parts of this arid country the resident lions, leopards and cheetahs have so little chance of drinking at the wells that they must be surviving without surface water for five or six months of every year.

The status of the cheetah is good. The species occurs throughout both districts, even where there is no surface water in the dry season, as between Wajir and Habaswein. Prey is plentiful, particularly in the form of gazelles, and there is no reason to believe that the species has suffered significantly from poaching. Its prospects look good.

4.3.20. Isiolo District

Isiolo District is an arid pastoral area of 25,605 km^2 occupied largely by nomadic herdsmen (2 persons/km^2). It used to be Boran country but since 1963 has been infiltrated by growing numbers of Somalis who are now dominant.

Until that year leopards occurred throughout the district, often in considerable abundance. Along the Merille lugga*, for example, there were according to one professional hunter "spectacularly a lot" in 1959. In the same year another hunter in the Shaba area saw three leopards in one day without the aid of baits. In Block 1 leopards were "everywhere", and in Block 2 occurred "in incredible numbers". They were found all along the Ewaso Ngiro River from Barsalinga to the Lorian Swamp and were especially numerous around Shaba.

After the Shifta Emergency of the mid-1960s Somali gangs with firearms and gin traps began to poach throughout the district and their poaching reached a peak in 1968-1970. These gangs operated from base camps hidden in deep luggas or dense vegetation and dispersed from there with their 20-40 traps. These they baited with meat from animals, often giraffe, that they shot. Sometimes the baits were placed in trees with a gin trap concealed at the base or strategically placed in a brushwood enclosure with only one entrance. More often a small hunk of meat was placed over a gin trap buried on a game trail where fresh leopard tracks had been seen, and the unfortunate leopards were frequently trapped by the muzzle. Large numbers of hyaenas were caught, lots of leopards, and quite a few lions but scarcely any cheetahs. Until 1973 the Game Department fought this menace with considerable success by ambushing baits or by following human footprints to base camps which were surrounded and attacked at dawn. At first these camps housed rather small groups of poachers (2-6) but later when the Turkana and Samburu had been coopted into poaching, large groups of 15-30 were encountered. One Game Department Corporal was killed in Isiolo District and others were wounded elsewhere, but the anti-poaching teams recovered a vast number of traps and killed over forty poachers. Unfortunately after 1973 changes in personnel led to declining efficiency and effectiveness, and the units proved unable to combat with the same success the massive slaughter of elephants and rhino that took place throughout Isiolo District, and northern Kenya generally, between 1973 and 1979.

The result of the trapping described was that by 1974 the leopard populations of Isiolo District had been heavily depleted: all information from professional hunters agrees on this. The 606 km^2 Bisanadi Conservation Area (now National Reserve) adjoining Meru Park

*dry or seasonal watercourse

did not escape. Nor did what is now the Shaba National Reserve (239 km^2) which includes the Shafa Dika area which used to be famous for leopards in the hunting days but where these animals are now rare (Adamson 1980). Finally a professional hunter who undertook a 220 km (137 mile) foot safari in 1976 from Ngare Ndare, west of Isiolo, to Mbalambala, on the Tana, via Garba Tula and Benane, found no leopard tracks whatsoever although he did see cheetah tracks on three occasions.

There has clearly been a major decline to which intensive poaching contributed heavily. But the possibility of other factors such as disease operating at the same time cannot be ruled out. Because viruses and bacteria are so much less obvious than poaching gangs and gin traps their presence can easily go unnoticed. The decline of leopards on some of the ranches, such as Kisima and Ol Maisor, on the upper Ewaso in neighbouring Laikipia, despite the absence of heavy poaching, suggests that fatal disease may well have taken a toll in some areas, although there is no definite evidence. The possibility should be borne in mind throughout any consideration of the decline of leopards in northern Kenya.

The Game Warden (Isiolo) regards leopards as rare and receives few reports of stock-raiding. There are now, however, signs of an incipient 'come-back' in some areas, such as blocks 1, 2, and 3. But it may be many years before leopards are again abundant, and that will depend upon them being given a chance.

By contrast the status of the cheetah is satisfactory.

4.3.21. Samburu District

Samburu District (20,808 km^2) is an arid pastoral area of low agricultural potential populated by the nomadic Samburu people (5 persons/km^2). But lying mostly above 3000' it contains several steep forested mountain ranges exceeding 7000' and including the Karisia Hills, Ol Doinyo Lenkiyio (or the Mathews Range), the Ndoto Mountains, and the Nyiru Range.

Until 1963 all reports suggest that the district contained an abundant leopard population. It was easy for professional hunters to find leopards in any of the blocks and they often heard them calling around their camps. In 1964 the situation began to deteriorate as a result of increased infiltration by the Turkana and the rise of the Somali shifta (Game Dept. 1964). By 1968-1970 leopard poaching was at its height and leopard populations were suffering heavily. The Turkana were using wheel traps and baited wire snares attached to a sapling. But they were outclassed by the Somalis using gin traps brought in by the hundred from Ethiopia and Somalia. As in Isiolo, Game Department patrols fought with considerable success, but the Somalis were very efficient and destroyed large numbers of leopards. They were later helped by the gradual breakdown of Game Department anti-poaching operations after the Divisional Warden at Maralal was transferred in 1971. By 1974 the Department was shooting large numbers of zebras for their skins in the Maralal area and there is reason to believe that some of this meat was used for baits. Professional hunters then had difficulty in finding leopards and one was "2,000% certain" of the reason for their disappearance. Later other hunters found evidence of poisoning around Maralal.

Until 1971 leopards were, despite the Turkana/Somali onslaught, still reasonably common in Blocks 51, 53, and 54. But from that date their decline accelerated. They managed to hold out in Block 51 in the Karisia Hills east of Maralal but elsewhere subjective impressions of professional hunters suggest they were heavily reduced in number. In Block 52, for example, they were almost exterminated on Mount Nyiru where they used to be so plentiful, and by 1973 their tracks were scarce, their calls were no longer heard, and baits were left untouched, even in the forest. In Block 53, which used to be one of the best blocks for leopard in Samburu, they were virtually eliminated along the Seiyia and Milgis luggas and I myself found little sign of their presence in 1978. In Block 54, which includes the Mathews and Ndotos ranges and the Milgis and Serolevi luggas, there is also evidence of decline and even now signs of leopard there are few and far between, though I have seen spoor in the Mathews forests. The Game Warden (Maralal) regards leopards as moderately numerous and as minor stock-raiders but I believe this assessment is true only of the vicinity of Maralal and does not yet apply throughout the district.

In conclusion the subjective evidence available indicates that leopard numbers have plunged almost as badly in Samburu District as anywhere else in Kenya. Within a period of less than eight years they were reduced from great abundance to severe depletion although the cheetah remained relatively unaffected and its status is still satisfactory. If leopards are left alone in Samburu for the next ten or fifteen years they should be able to recover, and the first signs of this have appeared. Major changes in land-use are unlikely in the foreseeable future but the Samburu, who have learnt the use of poison and have become accustomed to killing wild animals for profit, will probably keep leopard numbers down from now on.

4.3.22. Marsabit District

Marsabit District (72,732 km^2) consists of arid and very arid pastoral land of negligible agricultural potential, some of it verging on desert, with sparse nomadic populations of Rendille, Boran, and Samburu (1 person/km^2).

As elsewhere in northern Kenya subjective impressions based on tracks and sightings suggest that leopards were abundant in Marsabit District until 1960. In the Laisamis/Ilaut area, for example, they were "extremely numerous" in 1947 according to one professional hunter, often called in the daytime, and were so uninhibited that they used to break into labour camps in broad daylight to take sheep and goats. Indeed in 1954 tribesmen in the district were known to have killed no less than 26 leopards and 3 cheetah in defence of their livestock (Royal National Parks 1954). Leopards were also plentiful at Moyale, on the Ethiopian border, and on Mount Marsabit where they could often be heard calling in the forest. In the very arid lava country between Marsabit and Lake Turkana (formerly Lake Rudolf) they were less numerous but occurred widely on the hills, along the luggas, and near waterpoints. They were present on the Huri Hills and Mount Kulal but were absent from the Chalbi Desert. They were generally small in size.

Once again, as elsewhere in northern Kenya, they were subjected to heavy poaching. In 1963 the Game Department reported a sharp increase, with 27 leopards and 2 cheetah known to have been

killed illegally, compared with nine leopards in 1962 (Game Dept. 1963). The situation deteriorated in the mid-1960s with the appearance of Somali shifta and withdrawal of the Game Department from Marsabit in 1964 because of the security problem. There was extensive trapping of leopards on Mount Marsabit, not only in the luggas on its lower slopes but also in the forest; however, a massive decline in the bushbuck population since 1960, probably as a result of disease, cannot have helped. In Block 69 west of the mountain the Horr Valley is reported to have been poached out, and a professional hunter who now operates camel and foot safaris found no sign of leopards there in 1978.

The most recent information on the status of large carnivores in Marsabit District comes from Kruuk (1980) who carried out a 4-month survey of predation on livestock in a 20,000 km^2 (7,720 sq.mi.) study area that included all of Block 68, most of Block 69, and part of Block 71. He found that "leopards are very rare, recently almost wiped out by poaching, and largely confined to woodlands". By contrast: "Cheetah are fairly frequently seen; they are probably more common than lions, and my guess at their numbers is between 20 and 100." As in the rest of northern and north-eastern Kenya, Kruuk found that lions and hyaenas are the major stock-raiders.

The game wardens at Marsabit and Losai regard leopards as rare in their areas but the Game Warden (Moyale) says they are moderately numerous. This corresponds with information I received from professional hunters, who confirm from local reports that there are still quite a few leopards along the border escarpment and in the hills east of Moyale. Nevertheless they are far less numerous than they were before poaching by the shifta.

In conclusion the status of the leopard in Marsabit District is poor and will take a long time to improve, though I doubt if the species will ever regain its former abundance. The status of the cheetah is better but these animals are not and probably never were particularly numerous in this arid and often desolate country. But with prey animals such as gerenuk and Grant's gazelle still reasonably abundant (Dirschl, Mbugua & Wetmore 1978) the cheetah can be expected to survive for many years to come.

The results of this district by district status survey will be summarised and discussed in Chapter 5.

4.4. THE LEOPARD AS A STOCK-RAIDER

4.4.1. Introduction

The results of the country-wide stock-raiding survey are summarised in Table 4.4. with the contributing stations grouped in the administrative divisions used by the Wildlife Department. The geographical order of presentation is that used in the status survey. Apart from two game stations that failed to respond, questionnaires were completed by all the Department's wardens, but national parks and national reserves, whose wardens were seldom concerned with stock-raiding, have been excluded except when they provided information not otherwise available.

Two points must be borne in mind in assessing the results. The first is that whether a warden regards stock-raiding by leopards as a major or minor problem in his area depends on several factors: his experience and length of service as a warden, his familiarity with the area under his control, the density of its human and livestock populations, and the amount of stock-raiding by leopards and other predators. Secondly, many incidents in both pastoral and settled areas are not reported, and this can disguise the real extent of the problem. Where information given in this survey is known to be wrong (Meru and Wajir) I have corrected it to give a less distorted picture. Nevertheless despite these limitations the survey has produced some useful indications.

4.4.2. The occurrence of stock-raiding

The results in Table 4.4. show that of the 34 game stations listed, only 29% regarded the leopard as a major stock-raider. These stations were all either in western or central Kenya, with the exception of those in the southern district of Kajiado. In the rest of the country leopards were regarded either as minor stock-raiders (32%) or as presenting no problems at all (38%). Fig.4.3. shows this geographically, with corrections for Rumuruti, Meru, and Wajir.

Only four stations (12%) regarded the leopard as the No.1 problem predator, and these were all in western Kenya (Siaya, Lambwe, Kitale, and Kabarnet). In Siaya the occurrence of several recent attacks on man was responsible for this assessment. Only three other stations (Kericho, Mwingi, and Mutomo) recorded similar incidents, although Kisumu District, which did not respond, is known to have been the scene of two recent fatal attacks ("Daily Nation" 13/2/81, "Standard" 28/7/81). In most areas, however, the leopard was unpopular for taking sheep and goats and the occasional calf, dog, or chicken. In general other predators were regarded as presenting more serious problems than leopards.

TABLE 4.5. Game stations (with corrections for leopard) listing carnivores as stock-raiders.

Predator	Number of stations	% of total
Lion	24	71 %
LEOPARD	24	71 %
Hyaena	23	68 %
Wild dog	14	41 %
Cheetah	11	32 %
Jackal	10	29 %

Lion were recorded as stock-raiders throughout the country with the exception only of Nyanza and Western Provinces and appear to be particularly bad in Narok and Kajiado, and in northern and north-eastern Kenya where they attack both livestock and people. Hyaena were recorded throughout the country, including western Kenya, and were regarded as especially bad in Kericho, Nakuru, Nyandarua, and northern and north-eastern Kenya; they have also attacked people. Wild dog were widely reported but this category probably

TABLE 4.4. STOCK-RAIDING QUESTIONNAIRE SURVEY OF WILDLIFE CONSERVATION AND MANAGEMENT DEPARTMENT GAME STATIONS.

STATION	DISTRICT	LEOPARDS AS PROBLEM MAJOR	MINOR	NONE	ATTACKS ON MAN	CONTROL KILL	TRAP	STATUS VPMRA	OTHER CARNIVORES L	H	C	W	J	>	<
North-Western Division															
LODWAR	TURKANA			X	0	0	0	R		H			J	X	
KAPENGURIA	WEST POKOT		X		0	1	0	M*	L	H		W	J	X	
KITALE	TRANS NZOIA		X		0	1	0	M			C		J		X
KABARNET	BARINGO		X		0	0	0	R			C	W	J		X
KAKAMEGA	KAKAMEGA	X			0	2	0	P		H		W		X	
South-Western Division															X
SIAYA	SIAYA	X			several	3	7	V*		H					X
LAMBWE	HOMA BAY	X			0	0	0	M		H					
KERICHO	KERICHO	X			1	0	0	R		H		W		X	
NAKURU	NAKURU	X			0	0	8	M						X	
NAIVASHA	NAKURU	X			0	1	2	P	L	H					
NAROK	NAROK		X		0	0	0	M	L	H				X	
LOLGORIEN	NAROK		X		0	0	0	R	L					X	
South-Eastern Division															
KAJIADO	KAJIADO	X			0	0	0	P	L	H	C	W		X	
LOITOKITOK	KAJIADO	X			0	1	1	M	L	H	C			X	
KIBOKO	MACHAKOS			X	0	0	0		L	H	C			X	
MWINGI	KITUI		X		1	0	0	R	L	H	C	W	J	X	
MUTOMO	KITUI		X		1	0	0	R							
Central Division															
NYAHURURU	NYANDARUA	X			0	1	NR	P	L	H	C				
NANYUKI	LAIKIPIA	X			0	1	NR	P	L	H	C	W	J	X	
RUMURUTI	LAIKIPIA			X*	0	0	0	M	L	H	C			X	
EMBU	EMBU		X		0	0	0	M		H				X	
MERU	MERU			X*	0	0	NR	M	L	H	C	W	J	X	

TABLE 4.4. Continued.

STATION	DISTRICT	LEOPARDS AS PROBLEM			ATTACKS	CONTROL		STATUS	OTHER CARNIVORES						
		MAJOR	MINOR	NONE	ON MAN	KILL	TRAP	VPMRA	L	H	C	W	J	>	<
Coast Division															
VOI	TAITA			X	0	0	0	M	L					X	
SHIMBA/KWALE	KWALE			X	0	0	0	M	L			W		X	
MALINDI	KILIFI			X	0	0	0	A*	L	H		W		X	
LAMU	LAMU			X	0	0	0	R	L	H				X	
HOLA	TANA RIVER			X	0	0	0	R	L					X	
North-Eastern Division															
GARISSA	GARISSA			X	0	0	0	R	L					X	
WAJIR	WAJIR			X*	0	0	0	A*	L	H				X	
MANDERA	MANDERA	X			0	0	0	M	L	H	C	W	J	X	
Northern Division															
ISIOLO	ISIOLO	X			0	0	0	R	L			W	J	X	
MARALAL	SAMBURU	X			0	0	0	M	L			W		X	
MARSABIT	MARSABIT			X	0	0	0	R	L	H				X	
MOYALE	MARSABIT			X	0	0	0	M	L	H		W	J	X	

STATUS: V : VERY PLENTIFUL
P : PLENTIFUL
M : MODERATELY NUMEROUS
R : RARE
A : ABSENT

OTHER CARNIVORES: L : LION
H : HYAENA
C : CHEETAH
W : WILD DOG
J : JACKAL

> : WORSE THAN LEOPARD
< : LEOPARD WORSE
NR : NO RECORDS

* indicates suspect assessment not to be trusted because known from other information to be wrong.

Source: Questionnaires sent to Wildlife Conservation and Management Department Wardens. (Uncorrected). 1977-1980.

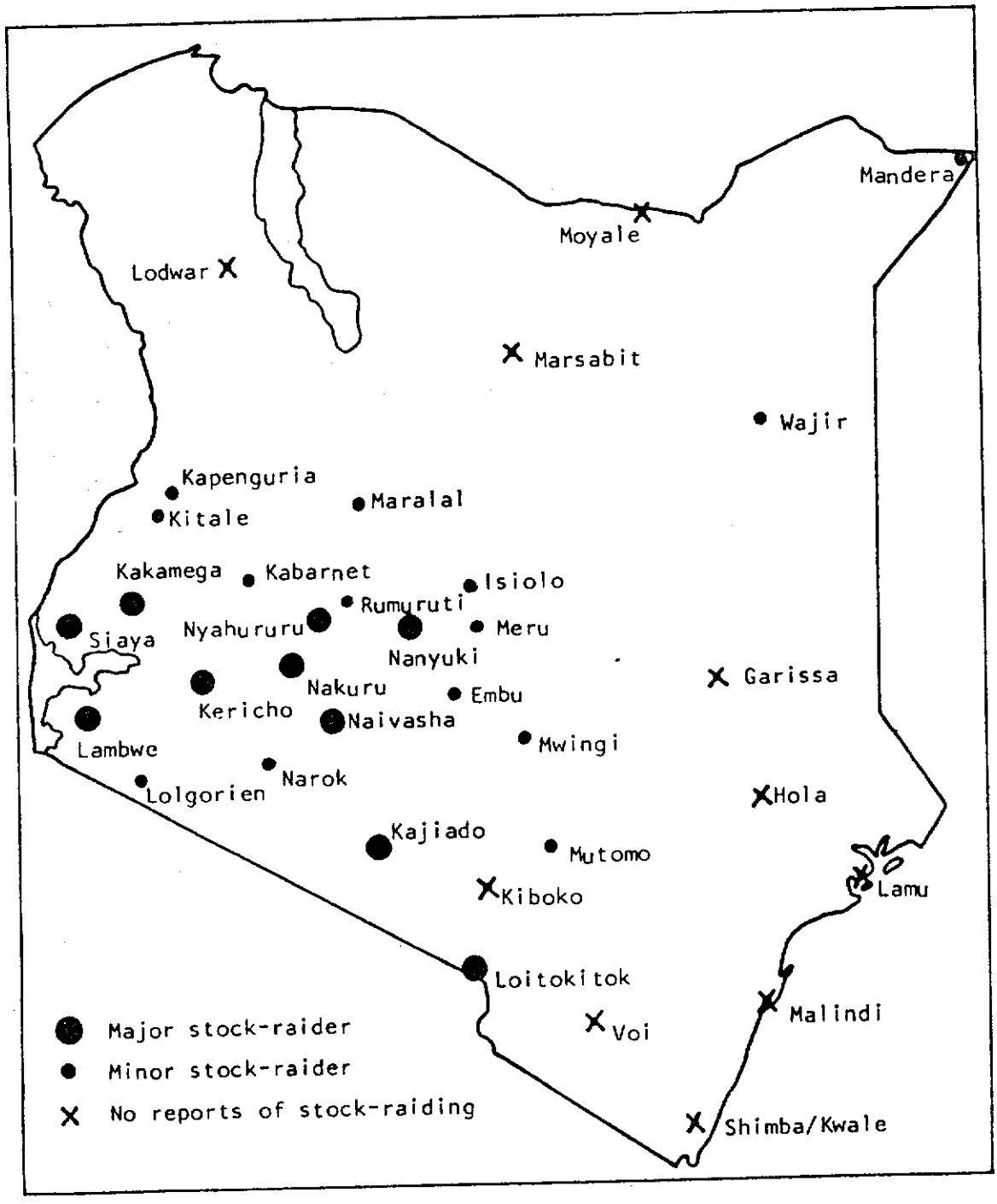

Fig.4.3. The leopard as a stock-raider. Source: assessments of Wildlife Department wardens, corrected where necessary.

includes feral domestic dogs as well as the true wild dog or Cape hunting dog Lycaon pictus. Cheetah were recorded as stock-raiders throughout the country, with the exception of western Kenya and the Coast, and were regarded as bad in the sheep-raising areas of Laikipia and Nyandarua. Stock-raiding by jackals was similarly distributed but seems to be less important.

4.4.3. Leopard control

The depredations caused by stock-raiding leopards form one aspect of the problem; attempts to bring the marauders to justice form another. It is useful to examine the data available on control.

Table 4.6. presents data on the numbers of leopards controlled by shooting and translocation by the Game Department and National Parks during the periods 1957-1965 and 1977-1980. The figures are almost certainly incomplete and can only be regarded as a rough guide.

TABLE 4.6. Leopards shot and trapped by Government agencies 1957-65 and 1977-1980. (Sources: Game Department and National Parks reports and returns from 1980 leopard survey).

Year	Number shot	Number trapped	Total controlled
1957	9	4	13
1958	16	5	21
1959	15	3	18
1960	14	31	45
1961	23	27	50
1962	19	22	41
1963	13	28	41
1964	16	24	40
1965	19	30	49
1966-1976	?	115+	115+
1977	2	10	12
1978	2	11	13
1979	6	17	23
1980	1	16	17
TOTALS	(155)	343+	(498+)

During the first three years, 1957-1959, before translocation had become official Game Department policy, 52 leopards or an average of 17.3 per annum were controlled by shooting and trapping. In the next three years, 1960-1962, 136 leopards or an average of 45.3 per annum were accounted for in this way, and in the next three years, 1963-1965, 130 or an average of 43.3 per annum. From 1960 onwards the number of leopards trapped annually was greater than the number shot by the Game Department and National Parks, the number shot remaining remarkably steady at the rate of about 15-20 per annum.

TABLE 4.7. ANALYSIS OF CARNIVORE CONTROL, 1961-1963.

Column	A	B	C (A+B)	D	C+D	E	F (A+E)	F+D
LEOPARD	Shot by GD & NP	Known killed by others	Total known killed	Total trapped	Total known controlled	Estimated killed by others	Total probably killed	Total probably controlled
1961	23	19	42	27	69	76	99	126
1962	19	24	43	22	65	96	115	137
1963	13	9	22	28	50	36	49	77
Average	18.3	17.3	35.7	25.7	61.3	69.3	87.7	113.3
LION								
1961	66	43	109	10	119	129	195	205
1962	53	27	80	1	81	81	134	135
1963	39	20	59	3	62	60	99	102
Average	52.7	30.0	82.7	4.7	87.3	90.0	142.7	147.3
CHEETAH								
1961	0	15	15	0	15	45	45	45
1962	0	2	2	0	2	6	6	6
1963	0	2	2	0	2	6	6	6
Average	0	6.3	6.3	0	6.3	19.0	19.0	19.0

Sources: Game Department and Kenya National Parks reports, 1961-1963. GD = Game Dept.; NP = National Parks.

I have no figures for the number of leopards shot on control by the Game Department in the next eleven years (1966-1976), but at least 115 were trapped for translocation during this period. This is equivalent to a rate of 10.5/annum and is, I strongly suspect, an underestimate attributable to incomplete data. The figures for 1977 to 1980 are also low: 11 leopards shot on control (2.8/annum) and 54 translocated (13.5/annum). The total number controlled by both methods amounted to 65: an average of 16.3/annum which is much lower than in the early 1960s. The 1977-1980 figures are probably incomplete, but even if they were doubled the number of leopards controlled by Government annually would still be less than in 1960-1965.

The figures given in Table 4.6. do not, however, reflect the true number of leopards killed in defence of livestock, as a more detailed breakdown for the years 1961-1963 shows (Table 4.7.). This is based on additional information from the Game Department which gives in Column B the number of leopards known to have been killed by Honorary Game Wardens working for the Department and by landowners and others acting in defence of livestock. However, although individuals were required by law to report all such killings to the Game Department, they did not always do so, and the Chief Game Warden believed a better approximation to the true figures would be obtained (Column C) by multiplying Column B by three for lion and cheetah and by four for leopard. It is likely then that about 88 leopards were killed each year during the period 1961-1963. This compares with averages of 143 lions and 19 cheetah per annum and very much larger though unspecified numbers of hyaenas. The total number of leopards controlled by killing and trapping was therefore probably more like 113/annum.

4.4.4. Sex ratio of stock-raiding leopards

Records of the sexes of 83 stock-raiding leopards trapped for translocation suggest that males predominate, as shown below.

TABLE.4.8. Sexes of 83 leopards trapped for translocation. (Sources: Mountain National Parks reports and records; 1977-1980 leopard survey; Meru translocation study).

Period	Males	Females	Sex ratio
1957-1974	24	15	1.6 : 1
1977-1980	27	17	1.6 : 1
TOTAL	51	32	1.6 : 1

Statistical analysis suggests that significantly more males are trapped than females (χ^2 one-sample test, $\chi^2 = 4.35$, d.f. = 1, $P<.05$).

The sex ratios for the two periods are identical and it is reasonable to assume that they reflect a consistent preponderance of males. This may be partly because females seem to be more wary of box traps than the bolder males. But I believe it also reflects a greater tendency on the part of males to raid stock, for of the 11 leopards shot on control in 1977-1980 the majority (8) were also males.

4.4.5. Discussion

In general, stock-raiding by leopards is not a major problem in Kenya. In northern, north-eastern, and coastal Kenya, an area comprising two-thirds of the country, leopards present at most a minor problem and in many districts none at all. There may be several reasons for this: their depletion over large areas, the failure of nomadic peoples to report incidents to the Wildlife Department, and the restraints currently imposed on travel by Government officers in some districts by the poor security situation. Only in western, central, and southern Kenya do the depredations of leopards assume any real significance: in the densely settled agricultural lands of Nyanza and Western Provinces, in the agricultural and ranching districts of Nyandarua, Nakuru, and Laikipia, and in the pastoral Masai district of Kajiado. Except in western Kenya, where they are regarded as the most important predator, leopards are less of a problem than other carnivores. The greatest damage to both human lives and livestock is usually inflicted by lions and hyaenas. These are widely distributed and often abundant and have both the ability and tendency to take large, valuable stock such as cattle and camels. Leopards and cheetah, by contrast, usually take sheep and goats, although they do kill the occasional calf or cow.

Leopards seldom attack man unless molested or wounded, and reports of man-eating in Kenya are rare: that of the leopard that killed and ate ten Turkana children near Baragoi in 1956/57 perhaps being the best known example (Game Dept. 1956-57). But in the last two years four children have been killed by leopards in western Kenya and several other people have been mauled. These attacks have aroused considerable concern and publicity and are worth discussing briefly.

Twenty years ago attacks by leopards on man were almost unknown in western Kenya although leopards were then more numerous. Most of the region's wildlife had already disappeared (Game Dept. 1961, 1963) but there probably remained sufficient small animals, such as hares, rodents, and duikers, to provide suitable natural prey. Since then, however, the human population of Nyanza and Western Provinces has doubled and little natural vegetation now remains except in Siaya District which also seems to have the worst leopard problem. I believe this explains why there is a problem there. There are still sufficient patches of exceedingly dense bush to provide a refuge for the remaining leopards. But these patches are broken, discontinuous, and isolated; they are entirely surrounded by human settlement and cultivation and often cover no more than a few hectares. Any leopard that wants to move from one island of bush to another has to trespass on man's land. It is not surprising that encounters with man or his livestock sometimes take place.

I do not believe that leopards in Siaya District or in other parts of western Kenya are any more ferocious than leopards elsewhere, and there is no firm evidence that any of them have become habitual man-eaters, so far as I know. Indeed at least one of the four recent fatal attacks on children seems to have been fortuitous: the child was pounced on while untethering a goat, and the leopard, after killing him, killed a cow also tethered nearby and dragged that into the bushes ("Standard" 13/2/81). Rather, I believe these leopards represent populations under stress and their occasional attacks on man - incidents that should be kept in

perspective - are manifestations of this. However, as human population pressures increase and expanding cultivation reduces the remaining patches of bush, the conflict between man and leopard in Siaya can only be expected to increase. It is desirable, therefore, that the Wildlife Department increases its efforts to control marauding leopards there. Greater deployment of box traps would undoubtedly help, but for the reasons given earlier trapped leopards should be shot rather than translocated. There is no long term future for leopards in western Kenya, except possibly on Mount Elgon, and they will eventually have to go. The sooner they do so, the better: for the leopard as well as for man.

Elsewhere in Kenya attacks on man are extremely rare and the depredations of leopards are confined to livestock. It is difficult, if not impossible, to quantify country-wide stock-raiding losses with any accuracy and I do not propose to try. What is important is not so much the actual monetary value of the stock taken as to whom it belongs. For whereas a large ranch running several thousand sheep can lose five or ten or even twenty a year to leopards without even noticing it financially, the same loss can spell disaster to a smallholder who may have only a dozen or so animals. In fact data from several Laikipia ranches suggest that total losses of livestock to leopards seldom exceed 0.5% per annum. As a result many ranchers do not unduly mind losing the occasional animal to leopards, and some regard this as a small price to pay for the privilege of harbouring a predator they believe does more good than harm by helping to control vermin. Most of the large ranches in Nakuru and Laikipia still carry substantial herds of impala, Thompson's gazelle, and other plains game, and it is probable that most of the leopards present confine their attention to these, without ever molesting livestock, though some may do so occasionally and others - the troublesome ones - begin to make a habit of it.

Occasional stock-raiders are often tolerated by ranchers - though not by smallholders - and it is only when a leopard takes to persistent raiding that it becomes an enemy. Few people are prepared to let a persistent raider continue, for even a single leopard can inflict substantial losses, either over a period of time or in a single night. In 1957, for example, a leopard in the Mbagathi Valley, Nairobi, killed three calves and 25 sheep in three months, and another leopard broke into a mud hut housing sheep and killed all 24, before killing another six sheep a few days later (Nairobi National Park quarterly reports 1957). In 1960 a large male trapped near Mweiga made over 20 kills in the nine months prior to capture (Mountain National Parks quarterly report, Jan-Mar 1960). Neither ranchers nor smallholders nor nomadic herdsmen are prepared to tolerate losses of this order. But whereas ranchers usually report a stock-raiding leopard to the Wildlife Department and have shown great co-operation in trapping for translocation, many nomadic herdsmen and smallholders probably never bother, unless they want to fight for compensation, and take matters into their own hands. The Game Warden (Kajiado) confirms that this is happening in Masailand now. The ready availability of cheap poisons, such as 'Coopertox', makes this easy and at the same time saves the stock owner the trouble of reporting to the nearest Wildlife Department station. In addition he can always find a ready market for the skin!

I believe this partly explains the decrease in the numbers of leopards controlled in Kenya by trapping and shooting in 1977-1980

(Table 4.6.). It also reflects decreased effort by the Government to undertake predator control itself; as Table 4.4. shows, the Wildlife Department carried out successful control in only a third of the places where leopards were reported to be stock-raiding. As this in turn encourages people to take matters into their own hands, we have the makings of a vicious circle.

Finally, the vexatious problem of what to do with stock-raiders, in view of the failure of translocation, will be considered in Chapter 6.

CHAPTER 5

STATUS OF THE SPECIES

DISCUSSION

5.1. THE LEOPARD IN KENYA

5.1.1. The Past

In the early part of this century leopards were "found everywhere throughout the country, save on the open plains" (Percival 1924). Like most species of wildlife then they were generally abundant and often locally very numerous. They must have enjoyed this enviable status for hundreds of thousands of years, only to lose it after the coming of the Europeans in the late 19th Century. The impact of this event on Kenya's wildlife has been described by Cullen & Downey (1960) and Simon (1962), who also outline the history of subsequent wildlife conservation before Independence.

Commercial killing of leopards for their skins started more than fifty years ago (Game Dept. 1929, 1930) and was bad in parts of northern Kenya even in 1932 (Game Dept. 1932-34). Nevertheless leopards were still "holding their own well" in 1955 (Game Dept. 1954-55) although some opinions (Royal National Parks 1956, 1957) were less optimistic. From then onwards, however, the poaching of elephant, rhino, leopards and other wildlife steadily increased despite the efforts of the small, poorly paid, and under-staffed Game Department and National Parks to control it. In 1956/57 these two organisations conducted, in close co-operation with the Police, a highly effective anti-poaching campaign which resulted in a marked improvement and showed what could be done. Unfortunately the pressure was not maintained, and by the end of 1959 poaching was rife again. Thereafter it deteriorated steadily. 1961 was one of the worst years on record, with drought, famine, and unsettled political conditions contributing. By 1962 Addis Ababa had become the centre of the leopard skin trade and the movement of illegal skins to Ethiopia and Somalia had markedly increased (Game Dept. 1962). In 1963 and 1964 'shifta' activity forced the Department to withdraw from northern and north-eastern Kenya and the Chief Game Warden reported that leopard skins had replaced rhinoceros horn as the principal article of the illegal trade in game trophies. He concluded, however, that although the leopard had suffered heavily in many areas "it can in no way be considered endangered." (Game Dept. 1963, 1964).

In 1962 Simon assessing the status of the species concluded: "With the exception of the Mara region and high altitude forests ...leopards are no longer plentiful." With the benefit of hindsight we can see that this assessment was unduly pessimistic for 1962 when, most professional hunters agree, leopards were still abundant and their status was generally good despite decades of shooting, poisoning, and trapping.

5.1.2. The Decline

The first question to ask is: "Has there been one?" For it cannot be taken for granted. According to the "New York Times" of 22/2/74: "The leopard has been found still existing in abundant numbers in every African country south of the Sahara", although in the report on which this was based Myers (1976b) had in fact concluded that the leopard's status had "declined markedly in many parts of Africa while remaining stable in other parts." He also concluded that "leopard have declined in numbers and distribution in Kenya during the last decade." By contrast Eaton (1976), after a questionnaire survey of nine people in Kenya, claimed that "the leopard in Kenya has a satisfactory status" and added that "poaching may have been important in the decline of leopards only in one country of Africa, Somalia." What then is the truth? Has there been a decline in Kenya or not?

This question can only be answered in the context of the low scientific quality of the data available. There are no census figures to prove either an increase or a decrease in Kenya's leopard population. All we can say is that on the evidence of the subjective impressions available, whereas leopards seemed to be abundant in Kenya in 1962, they are now no longer abundant and in many, often extensive, areas they seem to be rare. What is the evidence for this?

Table 4.4. summarises the information given by Wildlife Department wardens throughout the country, including their subjective assessments of the status of the leopard in their districts. Some of these assessments are wrong (e.g. Kilifi, Wajir) while others are questionable (e.g. Siaya, West Pokot, Trans Nzoia) but nevertheless it is worth examining them.

The 34 game stations listed in Table 4.4. and shown in Fig. 4.3. gave, with one exception, the following uncorrected assessments:

VERY PLENTIFUL	1	3 %	61 %
PLENTIFUL	5	15 %	
MODERATELY NUMEROUS	14	42 %	
RARE	11	33 %	39 %
ABSENT	2	6 %	

Two features are striking. One is the relatively low proportion (18%) that assessed the leopard as plentiful or very plentiful. The other is the unexpectedly high proportion (39%) assessing it as rare or absent. While it could be argued that the majority of stations (61%) regarded the leopard as moderately numerous to very plentiful, that still leaves 39% assessing it as rare or absent in a country where leopards were generally abundant in 1962.

The response of national park and national reserve wardens was also interesting, for of the sixteen headquarters that gave assessments only eight (Mount Kenya, Mount Elgon, Lake Nakuru, Tsavo East, Tsavo West, Lambwe, Samburu/Shaba, and Shimba Hills) classified leopards as plentiful or moderately numerous. All the others (Meru, Nairobi, Ol Doinyo Sapuk, Amboseli, Sibiloi, Dodori, Kora, and Losai) assessed leopards as rare. As these are all 'protected areas' this is not what one would expect - unless something has indeed happened to their leopard populations. But it could be argued, as one professional hunter said to me, "there have always been many more leopards than is commonly believed." I think he is right. Nevertheless the results of this questionnaire survey suggest that there may have been a decline. Is there any other evidence to support or refute this?

Table 5.1. summarises the results of the district by district status survey presented in Chapter 4. Not only was this conducted independently of the survey of Wildlife Department wardens; it was also based on much more information, even though this was largely subjective.

It shows that in at least 21 of the country's 42 districts (including Nairobi, Mombasa, and Tsavo National Park as separate units) there is subjective evidence of substantial decline. But although these districts represent only 50% of the total, they cover some 80% of the country. In at least 16 districts (38%) there has been evidence of known heavy leopard poaching since 1962, and these 16 cover 75% of Kenya. In another five districts, covering 5% of the country, known leopard poaching can be classified as moderate. In other words, in 26 districts covering 85% of the country there is good reason to believe that leopard poaching has been moderate or heavy, although this on its own is not necessarily evidence of decline. The subjective evidence of this survey suggests, however, that leopard populations have declined over four-fifths of Kenya since 1962 and that this decline has been associated with evidence of heavy leopard poaching. This finding refutes the statements of Eaton (1977) that "there is no evidence indicating that poaching can actually harm a leopard population", and that "if poaching has increased in Kenya this in no way means that the leopard's status has worsened, nor that it will."

A further independent source of information is provided by Game Department data on hunting offtakes in controlled areas in relation to the numbers of special licences bought for leopards (Table 5.2.). It is reasonable to assume that for any given species the percentage of special licences successfully filled should remain more or less constant from year to year if there is no significant change in the populations of that species or in hunting patterns. At the same time it also reflects the difficulty of hunting different species. For example, from 1958 to 1966 84% and 74% of special licences bought for elephant and rhino were filled, whereas for less numerous and more difficult species such as greater kudu and bongo the success rates were as low as 32% and 14%.

TABLE 5.2. Numbers of special licences bought for leopards in 1958-1973 and numbers of leopards shot in controlled areas.

YEAR	No. of S.L.s bought	No. of leopards shot in C.A.s	% of S.L.s filled in controlled areas
1958	138	56	41 %
1959	139	84	60 %
1960	134	72	54 %
1961	154	81	53 %
1962	159	92	58 %
1963	196	104	53 %
1964	188	102	54 %
1965	269	140	52 %
1966	343	165	48 %
1969	339	86	25 %
1972	195	69	35 %
1973	187	45	24 %

Source: Game Department (1958-1965); Casebeer (1975).
Note: Statistics for 1967, 1968, 1970, & 1971 are not available.

TABLE 5.1. STATUS OF THE LEOPARD IN THE DISTRICTS OF KENYA.

DISTRICT	AREA km²	POP d per km²	S-R H L O	WCMD SURVEY V P M R A	THIS SURVEY H M L S R A	1960-80 I S D	CAUSES T P S H	POACHING H M L O	1981 I S D	PROSPECTS G H D
TURKANA	60,824	4	O	R	S	D	T	H	D	?
BARINGO	10,627	23	L	R	L	D	T	M	?	?
WEST POKOT	5,076	25	L	M	S	D	T H	H	D	D
E-MARAKWET	2,722	90	L		S	D	T H	H	D	D
TRANS NZOIA	2,468	77	L	M	L	D	T H	H	D	D
UASIN GISHU	3,784	78			S	D	T H	H	D	D
NANDI	2,745	117			S				?	D
KISII	2,196	473			R				D	D
KISUMU	2,093	297			S				?	D
SIAYA	2,523	233	H	V	S				?	D
HOMA BAY	5,714	179	H	M	S				?	D
BUNGOMA	3,074	173			S				?	?
BUSIA	1,629	189			R				?	D
KAKAMEGA	3,520	342	H	P	S				?	D
KERICHO	4,890	151	H	R	L				?	D
NAKURU	7,024	64	H	P M	M				I	?
NAROK	18,513	10	L	M R	H	D	P S H	H	I	?
KAJIADO	20,963	6	H	P M	M	D	T P S	H	?	D
NAIROBI	684	1,146	L	R	M	D	T P H	M	?	D
MACHAKOS	13,629	80	O	R	S				?	D
KITUI	23,020	23	L	R	S				?	H
MURANGA	2,476	277			L				?	H
KIAMBU	2,448	299			L				?	H
NYERI	3,284	169			H	D	T	M	?	H
NYANDARUA	3,528	77	H	P	M	D	T	M	?	H
KIRINYAGA	1,437	232			M				?	H
EMBU	2,714	102	L	M	L				?	H
MERU	9,922	93	O	M	L	D	T P	H	?	H

TABLE 5.1. Continued.

DISTRICT	AREA km²	POP d per km²	S-R H	S-R L	S-R O	WCMD SURVEY V	WCMD SURVEY P	WCMD SURVEY M	WCMD SURVEY R	WCMD SURVEY A	THIS SURVEY H	THIS SURVEY M	THIS SURVEY L	THIS SURVEY S	THIS SURVEY R	THIS SURVEY A	1960-80 I	1960-80 S	1960-80 D	CAUSES T	CAUSES P	CAUSES S	CAUSES H	POACHING H	POACHING M	POACHING L	POACHING O	1981 I	1981 S	1981 D	PROSPECTS G	PROSPECTS H	PROSPECTS D
LAIKIPIA	9,718	10	H		0		P	M				M							D	T	P	S			M			?			?	
TAITA	6,420	27			0			M					L															?			?	
TSAVO	20,821	0			0			M					L						D	T			H		H		I			?		
TANA RIVER	35,237	2			0				R					S					D	T	P				H			?			?	
KWALE	8,257	38			0			M					L															?			?	
KILIFI	12,414	38			0					A			L															?			?	
MOMBASA	210	1,811			0					A					A													?			?	
LAMU	6,506	5			0				R				L													0							
GARISSA	43,931	2			0				R					S					D	T				H			?			?	
WAJIR	56,501	2			0					A				S					D	T				H			?			?	
MANDERA	26,470	6		L				M						S					D	T				H			?			?	
ISIOLO	25,605	2		L					R					S					D	T				H			?			?	
SAMBURU	20,809	5		L				M					L						D	T	P			H			I			?	
MARSABIT	73,952	1			0			M	R						R				D	T				H			?			?	

KEY: POP d: POPULATION DENSITY in PERSONS/km².
S-R : STOCK-RAIDING: H: HEAVY; L: LIGHT; O: NONE. From Wildlife Conservation & Management Department (WCMD) survey (uncorrected).
WCMD SURVEY: LEOPARD STATUS ASSESSMENTS: V: VERY PLENTIFUL; P: PLENTIFUL; M: MODERATELY NUMEROUS; R: RARE; A: ABSENT.
THIS SURVEY: LEOPARD STATUS ASSESSMENTS: H: HIGH DENSITY; M: MODERATE DENSITY; L: LIGHT DENSITY; S: SPARSE; R: RARE; A: ABSENT.
1960-80: LEOPARD POPULATION TREND (where known): I: INCREASE; S: STABLE; D: DECLINE.
CAUSES OF DECLINE: T: TRAPPING; P: POISON; S: SPORT HUNTING; H: HABITAT CHANGE.
POACHING: POACHING INTENSITY: H: HEAVY; M: MODERATE; L: LIGHT; O: NONE. Assessments given only where data are sufficient
1981: LEOPARD POPULATION TREND. Initial indicates confident assessment; question mark indicates informed guess.
PROSPECTS: 1981-2000 A.D.: G: Likely to be GOOD; H: likely to HOLD; D: likely to DECLINE. These are informed guesses. Initials indicate confident assessments.

Table 5.2. shows that whereas the success rate for leopards was remarkably consistent between 1958 and 1966, with a 9-year average of 53%, there was a noticeable decline from 1969 onwards. This decline is inadequately documented because of the incompleteness of the data but there is little doubt of its existence; unfortunately there are no figures for the three years of greatest interest that preceded the 1977 hunting ban. Although this trend may to some extent reflect a change in hunting patterns, such as more hunting of leopards on private land outside the controlled areas, it does, nevertheless, point to greater difficulty in filling the licences. It is supported by Table 4.1. which showed a similar decline in the numbers of leopards shot in Kajiado District between 1965 and 1973, the fall-off in trophy size recorded by the taxidermist Zimmermann's ("East African Standard" of 18/5/70), and the high proportion of female leopards shot in 1972 and 1973 (Casebeer 1975).

In conclusion several different lines of evidence independently suggest that Kenya's leopard populations have undergone widespread and drastic decline since 1962. The only point open to debate is the exact extent of this decline: a decline which Myers (1976b) underestimated and Eaton (1976, 1977) ignored.

5.1.3. Extent of the Decline

As Myers (1976a) points out, all African wildlife is declining and the leopard's decline must be seen in this context: "The point of issue is not whether the numbers of leopard are declining, but whether they are declining faster than would be expected given the constraints under which wildlife communities now exist in emergent Africa." Has the leopard's decline in Kenya been faster than expected? The answer must be 'yes'. But has the offtake from poaching and other causes exceeded the sustainable yield?

The subjective evidence suggests that it must have done: otherwise there would be no signs of a decline. But we do not know how many leopards Kenya had in 1962, or has now, or how many have been born or have died in the meantime. Although it is beyond the scope of this report to investigate the international fur trade, it is worth examining some known offtakes in relation to their possible effect on Kenya's leopard populations.

In 1968 the United States alone imported 1,527 leopard skins from Kenya, representing 16% of the 9,556 leopard skins legally imported in that year. It also imported 1,741 (or 18%) from Ethiopia, although some of the "Ethiopian" skins had almost certainly come from leopards killed in Kenya (Myers 1973, 1976b): let us assume a modest 10% or 174 although the real number was probably greater. In 1968, therefore, some 1,700 Kenyan leopard skins must have left for the United States, even though their original owners may not all have been killed in that year. And according to Myers (1976b) it is likely that as many again went to Europe, particularly the United Kingdom and West Germany. Furthermore he found it is generally agreed in the trade that for every skin leaving Africa another is rejected as useless: the skins of some leopards are destroyed or damaged by hyaenas before the trapper reaches them; others from leopards killed by poison are spoiled by the fur 'slipping' while yet others are ruined by poor curi finally, if a female with a litter is killed, the subsequent death of her cubs can also be attributed to the fur trade. On the evidence available it is reasonable to assume, therefore, that in 1968 some

1,700 leopard skins from Kenya went to the United States and a further 1,700 to Europe, and that 3,400 other leopards died but provided no skins of use to the fur trade. This makes a conservative total of 6,800, which ignores 'illicit' skins. If this figure had represented a reasonable 10-15% offtake from Kenya's total leopard population, the latter would have had to number 45,000-68,000: representing a mean density of one leopard per 8-13 km^2 over the whole of Kenya. Such high densities were probably likely in 1910 but not in 1968, when the leopard's range had contracted and the poaching offtake in the 1960s had already been substantial.

These calculations are admittedly crude and based on rough assumptions. But they do provide, independently of all other information, reason to believe that the offtake from Kenya's leopards in 1967/68 substantially exceeded 10-15% per annum, the likely range of any sustainable yield offtake. Moreover they are based on the relatively modest figures for 1968. Similar calculations based on those for 1969, when United States imports of leopard skins from Kenya were 24% higher, produce an estimated offtake of 8,000 leopards per annum.

All this points to an offtake far greater than any possible sustainable yield. It also suggests that, far from being a factor "favoring the leopard" (Eaton 1976), the demand for furs to supply the international fur trade was the principal cause of the leopard's decline in Kenya.

5.1.4. Where, When, and Why?

Table 5.1. shows that the decline has been particularly noticeable in western Kenya, Masailand, and northern and north-eastern Kenya.

In the western districts of West Pokot, Elgeyo-Marakwet, Trans Nzoia and Uasin Gishu, the increase of human settlement as large farms were divided into smallholdings, with consequent reduction of both habitat and human toleration of carnivores, has probably had more effect than commercial poaching for skins. These changes began to take place at about the time of Kenya's independence in 1963. Since then similar changes have occurred, and are still underway, in parts of Nyeri, Nyandarua, Nakuru and Laikipia districts but cannot yet be said to have caused any marked decline.

In Masailand the widespread use of poison for deliberate predator control, and to a lesser extent uncontrolled sport hunting, probably had as much effect as commercial poaching. The use of poison by the Masai began in the 1960s and seemed to reach a peak in the mid-1970s, at about the same time as sport hunting got out of control and commercial poaching in southern Kenya was at its height.

In northern and north-eastern Kenya, including Turkana, Tana River, and parts of Laikipia, covering more than half the country, commercial poaching was the principal cause of the leopard's decline although in Tana River, Laikipia, and Samburu poison may also have taken some toll. The conclusion of Myers (1976b), which was repeated by Eaton (1976), that the northern arid zone of Kenya was "the present stronghold of the leopard" was regrettably mistaken. Although Myers did point out that "the northern region appears to have experienced, and continues to experience, extensive poaching", he added, "to what extent this has inflicted a marked decline in the leopard

population is a matter of much dispute." I found it a matter of no dispute. There was unanimous agreement among professional hunters and game wardens familiar with northern Kenya that the northern leopard populations have been heavily depleted by commercial poaching; in most areas this has been so severe that the affected populations have not yet recovered, ten years after the poaching had reached its peak. So much for Eaton's statements, cited earlier, dismissing the effects of poaching on leopard populations, and his opinion that "there is no reason to believe that the leopard was ever threatened or that the skin trade was causing a serious decline except possibly in some local areas" (Eaton 1977).

The timing of commercial leopard poaching in northern Kenya preceded that in Masailand. Game Department reports (1962, 1963, 1964) show that leopard poaching was beginning to increase in the early 1960s. But it reached its height in 1968-1970 when Somali 'shifta' gangs had turned their attention from guerilla activities against the Kenya Government to commercial poaching. At first the leopard was their principal target and they killed elephant and rhino largely to finance the long sojourns in the bush that leopard trapping required. But in the early 1970s, when leopards were becoming scarce, they increasingly turned their attention to elephant and rhino, and their killing of these animals reached a peak in many areas after the Kenya Government's ban on elephant hunting in 1973 and on all hunting in 1977.

It is not surprising that leopard poaching in Kenya reached unprecedented heights in the late 1960s and early 1970s. The growing demand for skins for the international fur trade was accompanied by rising prices, including an increase of X 2½ in six years (Myers 1973). Demand was regrettably boosted after a well known personality in the United States was photographed in a leopard skin coat in 1964, thereby triggering a fashion stampede from which Kenya's leopards have not yet recovered. In 1968 and 1969 alone the United States legally imported 17,490 leopard skins, of which 20% came from Kenya and 16% from "Ethiopia". The majority of these skins, however, can not have been legally exported in the first place, for the official 1968 export figures for Kenya and Ethiopia were 80 and 312 respectively. In other words 88% of the 3,268 Kenyan and Ethiopian skins legally imported into the United States in 1968 were illegally exported from Africa, although they may have had 'permits' obtained in the manner described by Myers (1973). Fortunately recognition of this fact was one of the reasons that led the United States to impose its commendable ban in 1972. Unfortunately the demand for skins in 1973 was greater from France, Italy, Spain, Scandinavia, and Japan than ever before (Myers 1976a), and the Kenya Government's own bans on the importation and commercial export of spotted skins (LN 53 of 18/3/70 and LN 38 of 23/2/72) are reported to have reduced exports by only one third in 1973 (Myers 1976b).

Other factors operating in Kenya since 1962 have also contributed to the decline of the country's leopards: the ready availability of cheap but highly toxic poisons and the willingness of stockmen to use them to destroy predators; the poor security situation in northern Kenya; the breakdown of controlled hunting; increasingly ineffectual anti-poaching operations; derisory penalties for offences even when convictions could be obtained; and, finally, the presence in Nairobi in 1970 of over 400 shops selling articles made from leopard skins.

The direct impact of man has now been discussed in sufficient detail to leave little room for doubt as to the principal cause

of the leopard's decline in Kenya. In some areas, however, other ecological factors may have been operating too. The possibility of a fatal disease in parts of Laikipia, and maybe other districts, has already been mentioned. And, as Myers (1976b) pointed out, natural habitat changes can also affect leopard populations by altering the carrying capacity of the land. Amboseli, where increasing soil salinity killed the Acacia woodlands, is one example discussed in Chapter 4. The Tsavo-Galana complex and the Masai Mara, where elephants and fire have been the major influences, are others. The important point they illustrate is that not all declines in leopard populations can be attributed solely to man or poaching. And sometimes these habitat changes can be quite extensive: the Tsavo-Galana complex for example accounts for 5% of Kenya's total land area. Nevertheless the evidence for poaching as the most important single cause of the leopard's decline remains overwhelming.

5.1.5. Present Status

My assessments of the present status of the leopard in Kenya are summarised in Table 5.1. and Fig.5.1. They are based on all the information available to me, but once again I must emphasise its subjective nature. Nevertheless it is all we have, and I am confident that it does in fact reflect the true situation.

In trying to reach these assessments I must confess to having attempted to calculate 'maximum likely', 'minimum likely', and 'likely' leopard populations for each of Kenya's 42 districts. I do not propose to publish the figures in this report as to do so could give them unwarranted credibility, and I have already expressed my reservations on attempts to calculate the size of leopard populations. Nevertheless, after submitting the results of this exercise to several professional hunters for comments which led to minor modification, I believe it was not entirely valueless. For whereas Eaton (1976) merely took large chunks of Kenya with incorrectly calculated areas and assigned them some highly questionable leopard densities, my approach was scientific, even if the results themselves are scientifically unreliable.

Each district was treated as a separate unit, with the following considerations taken into account: the district's land area and the proportions of it occupied by urban areas, forests, registered smallholdings, national parks and national reserves; the distribution and density of its human population and its tribal composition; my own knowledge of its vegetation types and habitats derived from experience on the ground and the fact that in the last nine years I have flown at low level, often in aerial surveys, over every district in Kenya with the sole exceptions of Marsabit, Mandera, Wajir, and Mombasa; and, finally, all available information on the district's past and present leopard populations, including the effects of habitat change, human settlement, sport hunting, predator control, and poaching. Possible leopard populations were estimated on the basis of one adult per x km^2 as this was easier to visualise than a motley of adults, subadults, and cubs of various sizes. The number of adult leopards was then multiplied by 1.7* to take immature animals into account and to derive densities expressed as the number of km^2 per leopard. The densities of the known high density populations in the Tsavo and Kruger National Parks were used as 'yardsticks' on which to base speculative densities elsewhere.

* Chapter 6

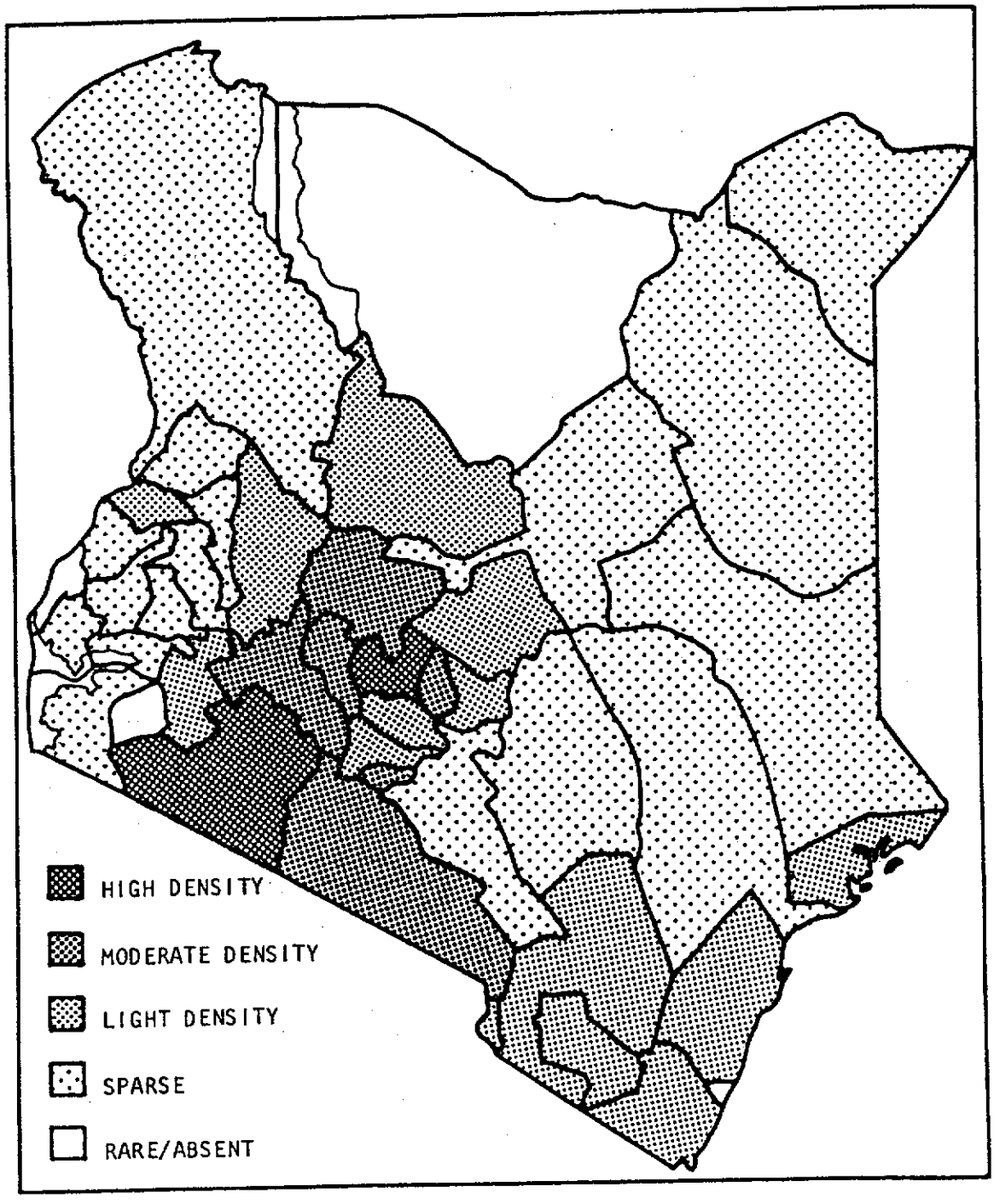

FIG.5.1. RELATIVE DENSITIES OF THE LEOPARD POPULATIONS OF KENYA.

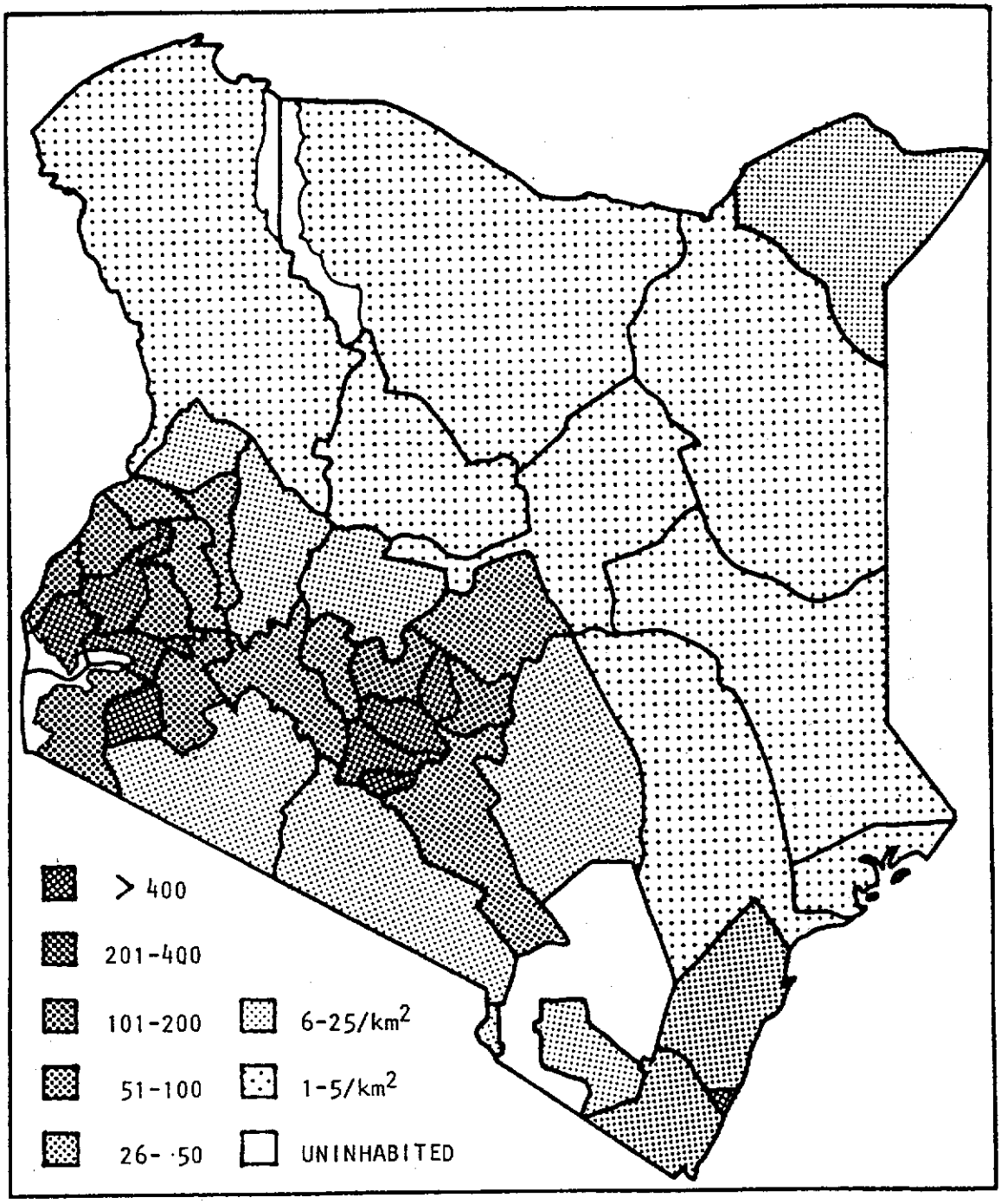

FIG.5.2. RELATIVE DENSITIES OF THE HUMAN POPULATIONS OF KENYA IN 1980. Calculated from 1969 Census and expressed in persons/km^2.

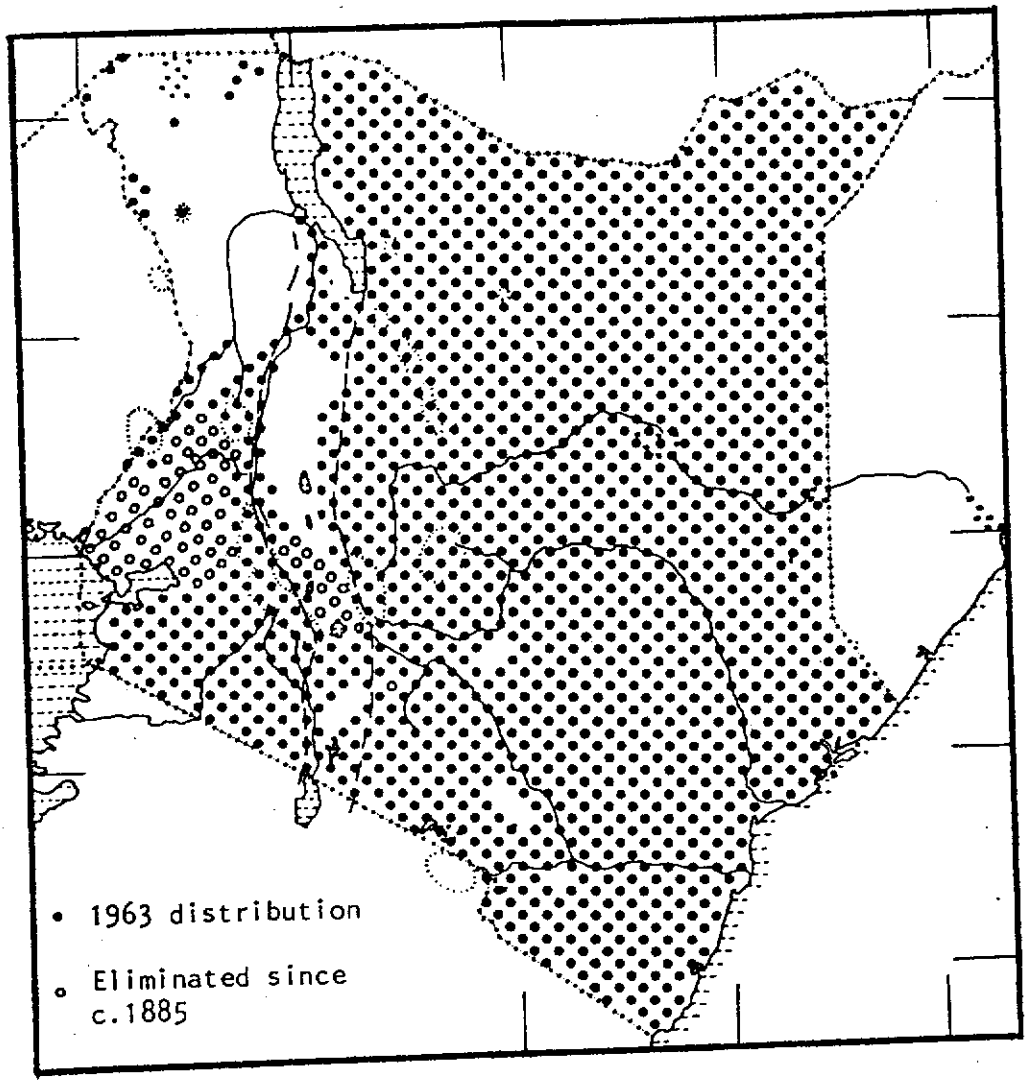

FIG.5.3. DISTRIBUTION OF THE LEOPARD IN KENYA IN 1963.
From: Stewart & Stewart (1963).

Note: Leopards still occur (in 1981) in Kakamega, Kisumu, Siaya, and Nandi districts, where Stewart & Stewart (1963) believed they had been eliminated.

TABLE 5.4. ASSESSED STATUS OF THE LEOPARD POPULATIONS OF KENYA'S DISTRICTS GROUPED IN DENSITY CATEGORIES.

DENSITY	DISTRICT	km^2	REMARKS
High	NAROK	18,513	Widespread; recovering from depletion.
	NYERI	3,284	Mostly in Aberdares & Mount Kenya forests.
Moderate	NAKURU	7,024	Mostly in Mau forests; also on ranches.
	KAJIADO	20,963	Widespread; recovering from depletion.
	NAIROBI	684	Mostly in Nairobi National Park.
	NYANDARUA	3,528	Mostly in Aberdares forests.
	KIRINYAGA	1,437	Mostly in Mount Kenya forests.
	LAIKIPIA	9,718	Mostly in forests & on Laikipia ranches.
Light	BARINGO	10,627	Mostly E. and N. parts of district.
	TRANS NZOIA	2,468	Mostly in Mount Elgon forests.
	KERICHO	4,890	Mostly in Mau forests.
	MURANGA	2,476	Mostly in Aberdares forests.
	KIAMBU	2,448	Mostly in Aberdares forests.
	EMBU	2,714	Mostly in Mount Kenya forests.
	MERU	9,922	Mostly in Mount Kenya forests.
	TAITA	6,420	Mostly on lowland ranches.
	TSAVO	20,821	Recovering from depletion.
	KWALE	8,257	Interspersed with settlement.
	KILIFI	12,414	Interspersed with settlement.
	LAMU	6,506	Probably widespread though depleted.
	SAMBURU	20,809	Mostly in Leroghi & other forests; depleted.
Sparse	TURKANA	60,824	Depleted by poaching
	WEST POKOT	5,076	Depleted by poaching & loss of habitat.
	E-MARAKWET	2,722	Depleted as above; surviving in forests.
	UASIN GISHU	3,784	Vagrant status except in forests.
	NANDI	2,745	Mostly in remaining forests.
	KISUMU	2,093	Remnant population in conflict with man.
	SIAYA	2,523	Remnant population in conflict with man.
	HOMA BAY	5,714	Remnant population; mostly in Lambwe.
	BUNGOMA	3,074	Remnant population; Mount Elgon forests.
	KAKAMEGA	3,520	Remnant population; Kakamega forest.
	MACHAKOS	13,629	Interspersed with settlement.
	KITUI	23,020	Interspersed with settlement.
	TANA RIVER	35,237	Heavily depleted by poaching.
	GARISSA	43,931	Heavily depleted by poaching.
	WAJIR	56,501	Depleted by poaching.
	MANDERA	26,470	Depleted by poaching.
	ISIOLO	25,605	Heavily depleted by poaching.
Rare	KISII	2,196	Very small remnant population, if present.
	BUSIA	1,629	Very small remnant population, if present.
	MARSABIT	73,952	Heavily depleted by poaching.
Absent	MOMBASA	210	Urban.

Notes: All areas are land areas from Statistical Abstract (1979).

The portions of Tsavo National Park falling within Machakos, Kitui, Taita, and Tana River districts have been subtracted from those districts.

The resulting calculations produced estimates of possible leopard populations for each district. These were converted to densities, and the 'likely' densities were used to compile Fig.5.1. Leopard populations were assessed as falling into the following broad categories:

HIGH DENSITY	1 - 15	km^2/leopard
MODERATE DENSITY	16 - 25	km^2/leopard
LIGHT DENSITY	26 - 50	km^2/leopard
SPARSE	51 - 150	km^2/leopard
RARE	> 150	km^2/leopard.

Although these categories are arbitrary, they are based on our present knowledge of leopard populations and are open to improvement. But I believe they represent the best attempt so far to say how many leopards make few or many in an area.

Table 5.3. and Table 5.4. summarise the district by district status assessments given in Table 5.1, while Fig.5.1. shows their geographical distribution and Fig.5.2. shows estimated human population densities for comparison.

TABLE 5.3. Assessed status of leopard populations in Kenya grouped in density categories.

Leopard population density	No. of districts	% of districts	Area (km^2)	% of Kenya
HIGH DENSITY	2	5 %	21,797	4 %
MODERATE DENSITY	6	14 %	43,354	8 %
LIGHT DENSITY	13	31 %	110,772	19 %
SPARSE	17	40 %	316,468	56 %
RARE	3	7 %	77,777	14 %
ABSENT	1	2 %	210	0 %

These data show that in only two districts (Narok and Nyeri) are leopard populations believed to be high in 1981. In six others also in central or southern Kenya (Nakuru, Kajiado, Nairobi, Nyandarua-Kirinyaga, and Laikipia) they are believed to be moderate. But although these eight districts represent 19% of the total, they cover only 12% of the country: a 12% which rather surprisingly includes some of the most densely populated parts of Kenya (Fig.5.2.). This does not, however, reflect any ability on the part of the leopard to survive amidst dense human settlement: it reflects the existence of large expanses of forest on the slopes of Mount Kenya, the Aberdares, and the Mau Escarpment. Were it not for these forests the leopard populations of such densely settled districts as Nyeri, Nyandarua, and Kirinyaga would be small, as they are in western Kenya, and indeed outside these forests leopards are uncommon, except in Laikipia and Masailand.

Fig.5.1. shows that the majority of the 13 districts believed to be carrying 'light' leopard populations, and covering 19% of the country, are in central and western Kenya and the coast. But as Table 5.4. shows, the existence of most of the central and western populations depends heavily upon the forests. In the less densely settled coastal districts this is not so.

The 'sparse' and 'rare' leopard populations are distributed between 20 districts covering two-thirds of Kenya: mostly in the sparsely inhabited north and north-east, where once abundant populations have been depleted by heavy poaching, and in the more densely settled parts of the west where the pressures of human population growth have reduced leopard populations to remnants.

Based on my unpublished calculations of 'likely' leopard populations, the geographical apportionment of Kenya's leopards can be expressed in another way, as shown below in Table 5.5.

TABLE 5.5. Estimated distribution of Kenya's leopards.

Estimated % of Kenya's leopards	% of Kenya	Geographical area
30 %	54 %	Northern & North-Eastern (Turkana, Samburu, Marsabit, Isiolo, Mandera, Wajir, Garissa).
21 %	7 %	Masailand (Narok & Kajiado).
15 %	6 %	Central (Central Province, Nairobi, Embu, Meru, Laikipia).
12 %	12 %	Coast (Taita, Kwale, Kilifi, Mombasa, Tana River, Lamu).
10 %	7 %	'Settled Rift' (West Pokot, Elgeyo-Marakwet, Uasin Gishu, Trans Nzoia, Nandi, Baringo, Kericho, Nakuru).
6 %	4 %	Tsavo National Park.
3 %	6 %	Ukambani (Machakos, Kitui).
2 %	4 %	Nyanza & Western Provinces.
10 %	4.5 %	National Parks.
5 %	3.1 %	National Reserves.
18 %	2.8 %	Forest Reserves.
67 %	89.6 %	Rest of Kenya.

To summarise, Masailand and the forested mountains of central Kenya seem to carry moderate to high density leopard populations and constitute the present stronghold of the species in Kenya. The Coast, Tsavo National Park, and what I have called the 'settled Rift' carry light though substantial leopard populations. In the remaining two-thirds of the country, including the whole of the north and north-east apart from Samburu, leopards are either sparsely distributed or rare. In Mombasa, a densely settled urban area, they are absent, and they may possibly be absent in Kisii District too though I have listed them as 'rare'. 'Protected areas' probably contain no more than one-third of the country's leopards, and the forest reserves are more important than the national parks or national reserves, many of which are small and have been heavily poached. In conclusion, the leopard's status in Kenya has changed within a period of 10-15 years from one of widespread abundance to one of widespread scarcity. In

view of this it is difficult to see how the leopard's status in Kenya can be described as "satisfactory" (Eaton 1976): "unsatisfactory" or "poor" would be more appropriate terms of assessment.

I am not prepared to give any specific figure for Kenya's present leopard population. However, in an attempt to counter some of the wild estimates that have been published, I am prepared to put forward my 'minimum likely', 'maximum likely', and 'likely' estimates based on the calculations mentioned earlier. I do so reluctantly and with the reminder that they are heavily dependent upon subjective data and assumptions and should not be regarded as necessarily accurate or reliable.

With this proviso, I would be very surprised if Kenya's present leopard population numbers less than 6,000 or more than 18,000. I believe 10,000-12,000 is probably the closest approximation. These estimates represent mean densities of 1 leopard/95 km^2, 1 leopard/32 km^2, and 1 leopard/47-57 km^2 over the country as a whole.

By contrast, Eaton (1976) put forward 'conservative' and 'realistic' estimates of 25,640 (1 leopard/22 km^2) and 35,000 (1 leopard/16 km^2) respectively. I believe these figures are grossly inflated, scientifically unjustified, and highly misleading. They are based on so many misconceptions as to render them valueless, and I suggest this also applies to many of his estimates for other countries in Africa.

5.1.6. The Leopard's Future in Kenya

What is the leopard's future in Kenya? Is it likely to be as promising as Eaton (1976) suggests?

The most basic fact of life in Kenya today is that the country has the highest rate of population growth (4% per annum) in the entire world (Mott & Mott 1980), although the African continent as a whole, with 2.9%, is not far behind (Myers 1981). The combination of decreasing mortality and increasing fertility has created a population with a youthful age structure whose momentum alone will result in the population doubling even if fertility were to drop immediately by 75% (Mott & Mott 1980). Short of calamitous war, famine, or pestilence, most projections suggest that Kenya's human population will double from its present 16,000,000 to over 30,000,000 by the year 2000 (Mott & Mott 1980, I.B.R.D. 1980): it could reach 60,000,000 by the year 2012 (Kenya Government Economic Survey 1979).

Yet in 1980 the country was able to support its present population only by importing food from abroad, and the resulting pressures to increase agricultural production are very great. This can be achieved either by better and more intensive use of land already under cultivation, which will have no significant effect on leopard populations, or by bringing new areas under cultivation. This is the traditional African way of increasing agricultural production and it is taking place on a massive scale, both spontaneously and under Government sponsorship. In the highland areas it is resulting in extensive deforestation, and in the lowland areas in the invasion of hitherto sparsely populated semi-arid lands. The adverse effects of these habitat changes on Kenya's leopard populations are likely to be substantial. It is most unlikely that they could favour the leopard, as suggested by Eaton (1976).

The current deforestation of Kenya's remaining forests, which already cover less than 3% of its total area, is the most alarming habitat change for the leopard. I suggested earlier that the forest reserves outside the national parks and national reserves system probably contain nearly 20% of the country's leopards. Yet almost every one is now under attack: Elgon, Kakamega, Nandi, Tinderet, Kaisungur, Lolgorien, Mau, Rumuruti, Mount Kenya, the Aberdares, the Nyambenis, Arabuko Sokoke, Marsabit, and the hills of Machakos and Kitui. Anybody who doubts this need only take an aeroplane and see for himself. The Presidential ban on the felling of indigenous forests seems to be honoured more in the breach than in compliance, and the Forest Department appears to be either unable or unwilling to protect the forests entrusted to its care. Some national forests, such as Lelan in the Cherangani Range, are so full of illegal squatters that enforcement of the forest regulations was given up long ago (Wrangham et al. 1968) and the term 'national forest' has become meaningless. There are numerous other examples.

In the face of such an onslaught it is not surprising that Kenya's forests are contracting. Recent study suggests that some of western Kenya's forests are diminishing at the rate of 2-3% per annum. This may not sound very much, but it represents a contraction of 20-30% in a decade, or a forest life span of only 30-50 years if deforestation continues at this rate. Fortunately the rate is not so high elsewhere, but high oil prices and frequent shortages of kerosene are likely to continue to exacerbate the situation because the ever-increasing rural demand for fuel is a major cause of deforestation in densely populated areas.

The leopard's future in Kenya will depend heavily upon what happens to these forests. The leopard populations in western Kenya and Central Province are particularly dependent upon them and will be reduced to mere remnants, probably in constant conflict with man, if the forests are allowed to disappear. And, as Fig.5.1. shows, central Kenya is the present stronghold of the species.

In the arid and semi-arid lands which cover 80% of Kenya and are mostly unsuitable for arable agriculture (Brown 1968) habitat changes are likely to be less acute for the leopard, largely because of the size of these areas and their hostility to intensive land-use. Nevertheless, population pressures and the cultural desire for land are resulting in increasing movement of people into the semi-arid areas, even where the land is not suitable or the rainfall is inadequate for cultivation. This movement is followed by the destruction of natural vegetation to clear the land and to provide building materials, firewood, and charcoal. Moreover these activities are often accompanied by poaching of the wildlife on which leopards prey. The twin effects are to reduce the habitat available for leopards and to reduce the natural prey on which they feed. At the same time greater emphasis on livestock production, and changes in land tenure such as the adjudication of private land and group ranches, conspire to reduce the tolerance of stockmen, whether ranchers or smallholders, towards predators. And as the number of wild animals declines in the newly settled areas, so the temptation - if not necessity - for leopards to kill livestock increases, resulting in greater conflict with man. This conflict can only be expected to increase and to the leopard's detriment as it provokes deliberate attempts to kill it. Only by giving the leopard monetary value to the landowner, as suggested in Chapter 6, will attempts to exterminate the species be forestalled.

Nevertheless it remains true that the leopard, with its secretive habits and catholic diet, is an "exceptionally adaptable predator" (Myers 1975). Its ability to survive in places such as Siaya, where Stewart & Stewart (1963) recorded it as extinct, is proof of this. But I believe that both Myers (1976b) and Eaton (1976) have overestimated the ability of leopards to survive in such situations without conflict with man. In Siaya and many other densely populated districts they survive but in a state of war. Even in areas such as Laikipia and Masailand where human populations are sparse and wildlife is still plentiful, conflict occurs. Indeed, as Percival (1924) shows, this is nothing new in Kenya: even in the early part of this century leopards were reported to trouble the Kikuyu greatly with their depredations. Although the number of offending leopards may be small, their activities can bring hostility on all, and this must form the background to any assessment of the future of the species.

Myers (1976b) believed that the greatest threat to the leopard's future is the increasing use of poison, and that this "is of more consequence than traps, snares, guns and all other forms of combatting the leopard put together." I disagree. It is true that poison must have killed many leopards, particularly in Masailand, but reports from Narok, Kajiado, Laikipia, and Samburu suggest that not all leopards (or lions) succumb and that those that survive learn not to scavenge or to do so with great caution. Indeed for many years leopards seem to have survived successfully in areas where the Game Department and others have carried out extensive strychnine-poisoning campaigns directed at hyaenas (Game Dept. 1930, 1950, 1960, 1963, 1964). However, both strychnine and 'Coopertox' are rapid in their action, and it seems that leopards are better able to adapt to them than to the more insidious, slower-acting cumulative poisons such as arsenite of soda. This was used by the Game Department in 1958/59 against baboons near Taveta, and the local people attributed the subsequent virtual extermination of leopards in the Kitobo Forest to their scavenging on the carcases of poisoned baboons. It is likely, therefore, that some of the Game Department's other baboon poisoning campaigns also accounted for significant numbers of leopards.

Nevertheless I believe leopards have proved to be more vulnerable to traps, snares, and guns, as the present study has shown. There is no foundation for the belief expressed by Eaton (1977) that the leopard is 'well adapted to the steel trap", unless he means the box trap. My Tsavo study showed that not all leopards would enter these, but cumbersome steel box traps are seldom, if ever, used by leopard poachers in Kenya. On the contrary, the weapon of choice for professional leopard poachers is the steel gin trap, which has probably caught more leopards in the country than all other types put together. The leopard's propensity for scavenging ensures its effectiveness and it can be readily concealed. Moreover, unlike a leopard that swallows a piece of poisoned meat and has the opportunity of regurgitating it, a leopard seized by the muzzle or a limb in the cruel serrated jaws of a gin trap seldom has a second chance. If it does escape it does so only at the cost of mutilation. Usually all it can do is await in agony the return of the trapper, who despatches it with a merciful arrow or, so as not to spoil the skin for the furrier, beats it to death by bludgeoning the skull with a heavy club or rock. THIS is the basis of the international fur trade.

The gin trap and the fur trade will continue to present the greatest single threat to the survival of the leopard in Kenya. The species can cope with an increasing human population and spreading

settlement so long as it is not molested. But it is vulnerable to poaching and there are limits to what it can withstand. It certainly cannot thrive in the face of highly organised and systematic onslaughts such as those of the 1960s and 1970s. Contrary to the claim that the leopard is "not even in danger of danger" (Eaton 1976), another similar country-wide attack on it in Kenya could reduce the country's remaining leopard populations to a state of great scarcity, even rarity. I do not believe, however, that the species is ever likely to be exterminated completely in Kenya. The country provides enough inaccessible and hostile habitats in which the leopard can seek refuge and where its adaptability will ensure its survival. Furthermore, commercial leopard poaching does have a self-limiting mechanism in that when leopard densities fall to such low levels that the return per unit effort is no longer worthwhile, poaching of the species is abandoned, leaving the wary survivors to recover and reproduce. In that sense the leopard's survival in Kenya - or in Africa - is secure. But its existence in numbers is not.

At the present time I believe, on the subjective evidence available, that a recovery is under way and that, following the relaxation of poaching pressure for the reason given above, Kenya's leopard population is increasing again. Recent reports from Masailand and parts of Samburu District are encouraging. I doubt, however, if the country's leopard population will ever regain its former abunddance, except locally and only then if the fur trade does not once again intervene. The northern populations in particular are so depleted that recovery will take a long time: the experience of Meru National Park and Kora National Reserve suggests that even ten years of respite is not enough to result in any significant improvement. Many of Kenya's leopard populations may require another ten or fifteen years. But by that time the country's human population will have attained almost 30,000,000 and the leopard's environment will be far less favourable, even in the semi-arid lands. Unless, however, there is a resurgence of commercial poaching, the species' prospects for eventual recovery in the north are reasonable. In western Kenya and parts of central Kenya continued decline is inevitable under the pressures of human population increase, agricultural expansion, and deforestation.

5.2. THE LEOPARD IN AFRICA

The same factors that have affected leopard populations in Kenya affect those in other African countries. Although they may do so to different degrees in different countries, the lessons of Kenya are widely applicable and need no further elaboration. Only two points need brief consideration: the status of the leopard in Africa as a whole, and possibilities for commercial utilisation of the leopard on a sustained yield basis.

What is the leopard's status in Africa? According to Eaton (1976) "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." Although this conclusion was partly based on an assessment of the far more detailed survey carried out by Myers (1976b), Myers' own conclusion was very different: his study showed that the leopard has been reduced to mere remnant numbers in at least 20 countries of sub-Saharan Africa and maintains substantial numbers, i.e. many thousands, in less than ten countries, notably Zaire, Gabon,

Congo, Zambia, Tanzania, Botswana, South West Africa, and Sudan. Moreover, Myers believes (pers.comm.) that the conclusions Eaton drew from his assessment of Myers' data are unjustified and invalid and he dissociates himself from Eaton's statistics for leopard populations in Africa south of the Sahara. My own feeling is that Myers' survey remains the most comprehensive and reliable to date for Africa as a whole.

The present study has shown that for Kenya at least, Eaton's assessments and figures are invalid and that many of his sweeping statements on sport hunting, poaching, leopard densities, and the international fur trade are contrary to the known facts. While I have no desire whatsoever to belittle his work, I feel it is my duty to point out, because of the implications, that some of his assessments for other countries also have no scientific justification. For example, although he says that the status of the leopard in Nigeria "appears to be unknown", he assigns the country a 'realistic' leopard population of no less than 20,000: a density of 1/46 km^2 in one of the most densely populated countries in Africa, in which most large wildlife has already been eliminated and even small prey has been diminished by the demand for 'bush meat', and where Myers (1976b) concluded that leopards are uncommon and declining! Eaton also assigns Ghana a 'realistic' population of 20,000 leopards, despite saying the status of the leopard is "largely unknown", and this represents a mean density of 1/12 km^2 (!) in a country for which the evidence given by Myers suggests the leopard is certainly not common and may even be rare. I believe Eaton's 'conservative' estimates are also often too high, as in the case of Kenya, and that his assessments for several other countries are very much open to question.

Nevertheless despite Eaton's inflated figures and misleading assessments and his sometimes doubtful conclusions, the leopard as a species cannot yet be considered "endangered" in the true sense of the word. For, as the U.S. Congress instruction to the Department of the Interior states: "A serious reduction in numbers in a single country is not an adequate basis for placing a species or subspecies on the endangered list when that same species or subspecies is plentiful elsewhere." The leopard's numbers have been greatly reduced in many countries of sub-Saharan Africa but, as Myers (1976b) showed, it still occurs in substantial numbers in the countries mentioned earlier and is not about to become extinct. Even in Kenya, where the present study shows it has suffered savage depletion, it still remains in many thousands.

The leopard's status in Africa is, however, almost certainly less satisfactory than Eaton (1976, 1977) suggests, and his claim that the species "achieves higher densities and total numbers over millions of square kilometers than any larger mammal" is invalid for Kenya and probably most other African countries too. But even if the leopard is not "endangered", it should still be regarded as "threatened", for the Kenyan experience has shown what can happen to an abundant population within the short period of ten to fifteen years. As Myers (1976a) points out, the virtual elimination of the leopard from North Africa and from many parts of southern Africa should serve as a warning to those who insist that the leopard will always survive in significant numbers no matter what the impact of man.

Finally, Myers (1976a, 1976b) suggested that the harvesting of leopards for their skins on a sustained yield basis might represent a sensible conservation and management policy for the species. Although I dislike many of the methods used to catch leopards, such a scheme could give the species considerable economic value to the producing countries if the international fur trade could be soundly regulated in Africa as well as outside. But the fur trade is not adequately regulated in the developed countries and there is no meaningful, honest, and effective control in most African countries. As Myers points out, the spotted fur trade has so far proved "ecologically and economically inefficient to an extreme degree, has overexploited certain leopard populations while leaving others untouched, and has tended to institutionalize corruption among wildlife authorities in emergent Africa." There is no reason to believe that the world is any more ready now than it was in the 1970s to implement a sound and workable system with the desired controls and safeguards. And it is certain that many leopard populations are not yet ready for such exploitation. Indeed, according to Myers (pers.comm.1980): "The leopard's status in Africa continues to be undermined, in many instances severely, by poaching for the international fur trade." I believe, like him, that nothing should be done to encourage this trade at the present time. Kenya's experience should be a lesson for all.

I therefore recommend that the United States Government, while reclassifying the leopard as "threatened" and while permitting sport hunters to import legally acquired hunting trophies under the conditions discussed in Chapter 6, should continue to retain the leopard's classification in Appendix 1 of C.I.T.E.S. and to prohibit the importation of leopard skins into the United States for commercial purposes.

5.3. STATUS OF THE CHEETAH IN KENYA AND AFRICA

Throughout this survey of the status of the leopard in Kenya frequent references, usually favourable, have been made to the cheetah. The purpose of this section is to examine the status of the cheetah more carefully and to discuss the species' prospects for the future. The cheetah's ecology has been the subject of several studies (e.g. McLaughlin 1970, Schaller 1972, Eaton 1974, Labuschagne 1974, Frame & Frame 1977, Bertram 1978, and Burney 1980) and I propose only to refer briefly to certain aspects where relevant. In addition there have been two special studies of the status of the species in East Africa (Graham & Parker 1965) and Africa (Myers 1975).

There is no reason to believe that cheetah have ever been very numerous in Kenya, even when the country was mostly wilderness (Percival 1924, Simon 1962, Myers 1975). Indeed even before the First World War there was concern over its status and talk of decline (Myers 1975). In 1955, after cheetah had been made Royal Game, the Game Department (1954-55) commented that protection had only just come in time. In 1962 it noted that the species had "declined alarmingly throughout its range during the last thirty years" and estimated that there were probably only 1,500-2,000 cheetah in Kenya outside the national parks and reserves (Game Dept. 1962). Two years before that, Cullen & Downey (1960) had wondered if even 100 were left, and wrote, "Cheetah in Kenya have been steadily going, and the population has now dropped to the point of problematical recovery." Bere (1962) declared: "Once common in East Africa they

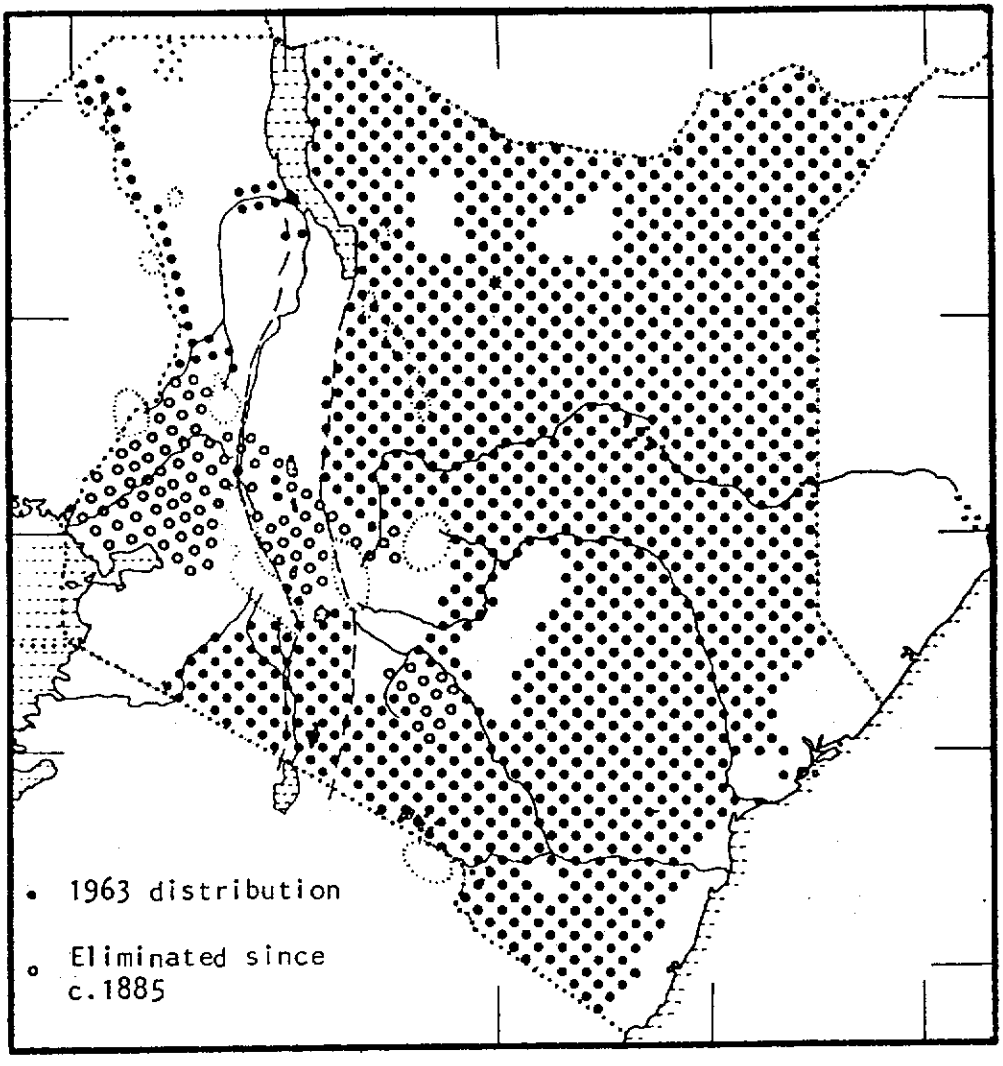

FIG.5.4. DISTRIBUTION OF THE CHEETAH IN KENYA IN 1963.
From: Stewart & Stewart (1963).

are now becoming increasingly rare," and Simon (1962) concluded: "In Kenya the species is balanced precariously on the brink of extinction and may already have passed the point of no return." This was echoed by Stewart & Stewart (1963) who wrote: "It is probably in more danger of elimination than most species." Only Graham & Parker (1965) and Myers (1975) took a less gloomy view. The former could find no evidence to suggest that the cheetah was a declining species in East Africa, and the latter concluded: "Cheetah should persist in the extensive arid environments for a good many years." But even Myers, in estimating their numbers in Kenya at 1,000-3,000, believed they would probably decline by 25-50% by 1980. Now that 1981 has arrived it is a good time to ask: what is the cheetah's present status in Kenya?

As for the leopard, only subjective information is available, apart from one or two detailed studies (McLaughlin 1970, Burney 1980), and the same difficulties of interpretation apply. For although the cheetah is largely diurnal it is a shy and widely roaming species and is not easy to census. Moreover, as Myers (1975) points out, assessments of numbers, such as 'plentiful' or 'rare', need to be applied in a context different from that of the leopard which has probably always been more abundant and often occurs in relatively high densities. But with these constraints in mind, what does the present status survey indicate?

In the first place there is no evidence that the cheetah's distribution in 1981 is any different from that in 1965 despite the spread of human settlement and agriculture. So far as I know, its distribution still conforms to those given by Stewart & Stewart (1963) and Graham & Parker (1965). Indeed cheetah are still reported from Trans Nzoia District where Stewart & Stewart (1963) believed they had been eliminated. In general the species still occurs throughout Kenya, with the exception of forests, montane moorland, and swamp, and areas of dense human settlement and cultivation. Only in Nyanza and Western Provinces and the more densely settled parts of Central Province does it appear to have been entirely eliminated, while its absence from most parts of the coastal strip probably reflects a combination of unsuitable habitat, lack of prey, and extensive human populations. It still occurs on ranches at Athi River, Thika, Nanyuki, Rumuruti, and Timau, as mentioned by Graham & Parker (1965), and continues to raid livestock, and the prediction of Myers (1975) that it might be exterminated on the Laikipia ranches by 1980 has not been fulfilled.

Reports from southern Kenya are encouraging. Burney (1980) found that the cheetah is thriving in the Mara region, particularly outside the National Reserve, with good prospects for the future, and other reports suggest that cheetah have adapted well to the large scale wheat schemes in Narok where they take advantage of the abundance of prey and the protection afforded to predators. As in 1950 (Game Dept. 1950), they continue to co-exist well with the Narok Masai, whose stock they do not attack (Burney 1980). They occur throughout Kajiado and are still reported from Ukambani, although in these areas they do take some stock. In Tsavo they are now seen more often than before, and on Galana Ranch, where similar habitat changes have taken place, their numbers appear to be increasing. In northern Kenya they still appear to occur throughout, with the possible exception of parts of Turkana, and it is generally agreed by professional hunters and game wardens familiar with northern and north-eastern

Kenya that there is no evidence of any marked decline there. In many districts the status of the cheetah now compares favourably with that of the leopard and although poaching must have caused some losses, it has not had the same effect as on the leopard. Indeed, on the contrary, its wholesale reduction of the lion, leopard, and hyaena populations has almost certainly benefitted the cheetah by removing its enemies and competitors.

In conclusion, few of the professional hunters and wardens I spoke to believed the cheetah is in danger of extinction in Kenya, while most believed it is either holding its own or actually increasing. Most also believed that its status in the northern two-thirds of the country is better than that of the leopard. As one professional hunter who knows that area well wrote in his diary in 1976, "I think the concerned ones have got it all wrong in their fears for the cheetah. It is the leopard that has vanished from Northern Kenya..." I believe he is right.

How is it, then, that this "timid creature, unable to withstand changing conditions and increased disturbance" (Dorst & Dandelot 1970) "racing toward extinction" (Eaton 1974) has confounded all prophesies of its extinction in Kenya? How is it that it has survived the onslaught of the fur trade and now thrives over vast areas where the much-vaunted leopard has been reduced to depletion? Can it be that the cheetah is not, after all, the rather pathetic predator of its public image? And that in fact it is far more adaptable and less vulnerable than is generally believed?

First, is it true that the cheetah is largely an animal of open country and grassy plains, as suggested by Burton (1962), Astley Maberley (1962), Denis (1964), Dorst & Dandelot (1970), Weigel (1975), and popular belief? As Eaton (1974) and Myers (1975) both point out, the cheetah is able to use a wider variety of habitats than is often supposed, and it is probably the animal's ready visibility on the publicised grasslands of the Serengeti, Masai Mara, Nairobi Park, and Amboseli that has given rise to the impression that it prefers open habitats. Yet Frame & Frame (1977), who have recently completed a study of cheetah in the Serengeti, write: "We were surprised to learn how unsuited cheetahs are for living and hunting in short grasslands. They are very much dependent on cover for stalking their prey, for hiding from other predators, and for shade during the heat of the afternoon." Burney (1980) also found that they showed a preference for areas with a moderate amount of cover for hunting and resting. And George Adamson, who knows northern Kenya better than most people alive today, writes (pers.comm.): "The general impression has always been that cheetah are creatures of the open plains. The reverse is true for Kenya. There are far more in the dense bush areas to the North than in the more open areas to the South." My information from other sources suggests he is right.

Myers (1975) admits that the cheetah is frequently found in bushlands, particularly in Kenya and southern Africa, but suggests: "This should not be taken as evidence that the cheetah can subsist as satisfactorily in dense vegetation." Indeed, he regards bushland as "only moderately suitable" and suggests that the cheetah that inhabit it do so for want of any better alternative nearby. I suggest, like George Adamson and many of the professional hunters I interviewed, that bushland - even dense Commiphora bushland - is perfectly good cheetah habitat and that the species is well adapted to living

and hunting in it. Indeed if it were not, how is it that it thrives so successfully in places such as the bushland of Meru National Park and Kora? Certainly Kenya's professional hunters left me in no doubt that most of them regard the cheetah as as much of a bush animal as an open country animal, while several unequivocally pronounced it to be predominantly a bush animal. In view of all this it is difficult to see why bush encroachment is necessarily "poor for the cheetah" (Myers 1976a).

But if the cheetah is essentially a gazelle-feeder that depends on eyesight, speed, and open terrain to approach and catch its prey (Estes 1967, Kruuk & Turner 1967, Dorst & Dandelot 1970), how does it survive in bushland habitats? In fact, as Myers (1975) points out, "The cheetah is basically adapted to hunting in habitats with a modicum of cover in which stalking techniques dependent on individual stealth pay off best." The recent studies of McLaughlin (1970), Frame & Frame (1977), and Burney (1980) all confirm the importance of stalking, and the number of bushbuck taken by cheetah in the Kruger National Park (Pienaar 1969) shows that the cheetah can hunt successfully in dense bush habitats. George Adamson believes that in northern Kenya they feed largely on lesser kudu, gerenuk, dikdik, and guinea fowl - the same prey as the leopard - and that, like the leopard with which it is competing, they take it by stealth. Reports from the Serengeti (Frame & Frame 1977) and southern Africa (Labuschagne, in Myers 1975) show that cheetah often take hares and spring hares when antelope prey are not available, and Graham & Parker (1965) also record kills of hares, guinea fowl, greater bustard, and a mole rat. As Myers (1975) points out, perhaps the cheetah's diet is more varied and adaptable than is generally believed.

Other aspects of the cheetah's behaviour may also be more flexible than popular belief supposes. Although the species is primarily diurnal, Burney (1980) observed cheetahs in the Mara hunting, feeding, and moving at night and wrote: "Frame (pers.comm.) suspects that cheetahs in the Serengeti are somewhat more nocturnal than the popular notion." Burney concluded: "In many respects cheetahs may be said to exhibit flexibility in their behaviour and their utilization of the available resources. Daily activity patterns, prey selection, hunting behaviour, choice of habitats, and the interval between meals were all characterized by a high degree of variation."

Cheetahs also appear to be better adapted in regard to man than is often supposed and I suggest that they are not, as Myers (1976b) believed, "hyper-sensitive to marginal changes in land-use patterns." It is true that they are less capable than the leopard of adapting to the expansion of human settlement and agriculture and the loss of their natural prey. But their persistence in areas such as Trans Nzoia and Kiambu districts and Ukambani does demonstrate a respectable ability to survive, even if not in any number and in conflict with man. However, in the semi-arid pastoral areas that cover most of Kenya the cheetah has great advantages over the leopard, quite apart from the lesser value of its skin.

In the first place, while it is true that the ease with which it is "disturbed by man's mere appearance in the landscape" (Myers 1975) has adverse effects upon it in those national parks where it is harassed by tourism, this timidity is precisely the quality that helps to keep it out of trouble in pastoral lands. Burney (1980) observed in Narok: "Masai almost never even see

cheetahs because the cheetahs see them first and run away or hide." And he concluded: "They are probably seldom killed by the Masai simply because they quite effectively avoid men and do not appear to take much interest in attended livestock." By contrast, although the leopard can be far more secretive and has the advantage of being more nocturnal, its greater boldness renders it more liable to raid stock and thereby to provoke conflict with man. Where the cheetah gets into trouble is where commercial ranching, particularly of sheep, has replaced nomadic pastoralism as the principal form of land use, as in Laikipia. There cheetah seem to have lost much of their shyness but they remain one of the more difficult predators to deal with, especially while farmers are not allowed to shoot them; the Wildlife Department's attempts to trap them alive have proved largely futile.

Far from being "easily destroyed" (Simon 1962) the cheetah has demonstrated by its survival in Kenya that it has a remarkable resistance to attack by man. While it is true that it is vulnerable to firearms and the capture of its cubs and can be bayed with dogs or run down on horseback or by vehicle and, unlike the leopard, is not dangerous when cornered, it is much less susceptible than most other carnivores to poison and traps because it will not scavenge or return to a kill. By virtue of this single characteristic the cheetah has been able to survive relatively unscathed the onslaught that so depleted the leopard in Kenya. Some cheetah were undoubtedly snared in the same way as any other animal and others were caught, usually accidentally, by concealed gin traps set on game trails. But being less of a creature of habit than the leopard, which likes to use the same trails regularly, the cheetah was far less likely to fall foul of these and was not often caught. Moreover, its tendency to roam over much wider areas than the leopard, which lives in a relatively small and well-defined home range, made it much more difficult to poach. Indeed the removal by poachers of other competing carnivores can only have done the cheetah a service; on balance it may even have benefitted from the trapping and poisoning! I believe the greatest threat to its survival in Kenya is the firearm. Unfortunately these are on the increase, particularly in northern Kenya, but the cheetah's alertness may keep it out of trouble and it will certainly be safer in bushland than in open country: another reason why bushland is a good habitat for it.

If the cheetah is so successful at avoiding many of man's attempts to kill it, why is it not more numerous? Those who have studied cheetahs do not seem to be sure why, but most agree that the species does suffer from very high cub mortality, the major causes of which appear to be predation and disease. But, as if to compensate, it has a much higher potential reproductive rate than the lion and the leopard: it attains sexual maturity and independence earlier, produces larger litters, and has a shorter interval between births. It is likely that, as Burney (1980) suggests, cub mortality among cheetahs may be density-dependent, both inter-specifically with the density of competing carnivores and intra-specifically through the mechanisms of disease and infanticide. Intra-specific population regulation is particularly likely in an essentially solitary yet widely roaming diurnal species, such as the cheetah, which tends to avoid encounters with others of its own kind (McLaughlin 1970, Eaton 1970, Bertram 1978). But whatever factors are operating, the species does appear to be capable of maintaining a viable population at low densities (Schaller 1972, Burney 1980) and this is surely a strong point

in its favour. As Myers (1975) points out, scarcity is the norm and is in itself no sufficient reason for regarding the cheetah as endangered.

I suggest, however, that in the light of recent studies and the subjective information presented in this report, his estimates of cheetah numbers in Africa may need to be revised. Myers believed that a density of one cheetah to 50 km^2 was about the maximum in savannah while in arid environments it dropped to one to 150-300 km^2. But in reality cheetah densities are often substantially greater. McLaughlin (1970) found that in Nairobi National Park resident cheetahs attained a density of 1/11 km^2 and if transients were included this rose to 1/4 km^2. Nairobi may be atypical, as Myers believed. But Burney's (1980) study in Narok District revealed densities of up to 1/29 km^2 outside the Mara Reserve, and it may well be that similar densities occur in other parts of pastoral Masailand. It is also clear that we can no longer continue to regard northern Kenya's bushland as poor or marginal cheetah habitat. George Adamson's guess of at least 100 cheetah in Kora's 1,788 km^2 (1/18 km^2) may be wrong but it does give an indication we cannot ignore. Moreover from my own observations in Meru Park I know the cheetah density in the Commiphora bushland there cannot be less than 1/60 km^2 and is almost certainly greater.

In view of this I believe it is likely that Kenya's present cheetah population is substantially more than the 1,200 that Myers (1975) predicted for 1980: perhaps two or three times that number, although that is only a guess. But if this is true of Kenya, it follows that cheetah populations in other African countries may also have been underestimated, and the status of the species in Africa may be appreciably better than Myers believed. Moreover Myers also predicted that a massive decline in Africa's cheetah populations was likely to take place throughout Africa between 1974 and 1980 unless stringent conservation measures were implemented. There is no reason to believe that such measures have been implemented but there is also no reason to believe that the predicted decline has taken place, at least in East Africa. It has certainly not occurred in Kenya, so far as we know, where the subjective evidence available suggests that the cheetah is not only thriving but may even be on the increase. Recent (1981) information from one of the principal trophy dealers in Djibouti, a major outlet for East African cheetah skins, confirms this impression. Cheetah skins are said to be more common now than ten years ago, at the height of the spotted fur boom, although there is no great market for them and they are not being offered or bought on any grand commercial scale. Their availability in greater numbers, however, does not suggest a declining population in the Horn of Africa.

Are we justified, then, in continuing to regard the cheetah as a species in danger of imminent extinction? I do not think we are. According to Myers' 1975 report the species is still widely distributed in Africa and is relatively numerous in several countries in eastern and southern Africa, including Kenya, Botswana, and South West Africa. The total numbers may not be great but high densities are not characteristic of cheetah populations and we should accept this. Only if Myers' prediction of major decline between 1974 and 1980 has come true, should we be gravely worried about the species' status. But if the cheetah can thrive in Kenya, a country with the highest rate of human population growth in the

entire world and one in which the commercial poaching of all wildlife has been especially heavy in the last 10-15 years, is it not reasonable to suggest that it may have been successful elsewhere too? I believe it is. And I suggest that a more realistic assessment of its status is "threatened" rather than "endangered". But whether we call it "threatened" or "endangered" is largely a matter of semantics, for I believe and strongly recommend that it should continue to be retained in Appendix 1 of C.I.T.E.S. and protected from all forms of commercial exploitation, whether by the fur trade or the live-export trade. Its populations are not numerically great enough to withstand undisciplined large scale commercial exploitation. Like the leopard, the cheetah will have enough difficulties in trying to cope with the ever-increasing pressures of Africa's exploding human populations.

In conclusion, for a species that has been hovering for so long "on the brink of extinction" in Kenya, the cheetah seems to be doing remarkably well. It seems to be well adapted to bushland habitats and better able than the leopard to co-exist with nomadic pastoralism. Unlike the leopard it does not scavenge and is difficult to trap or poison, and therein lies its secret of survival. Like the leopard it will suffer from loss of habitat and natural prey as the human populations of Kenya, and Africa, proliferate and spread, and like all wildlife on the continent it is doomed to further inevitable decline. But in the vast arid and semi-arid rangelands, which in Kenya will be the last areas to succumb to 'development', its prospects in the immediate future (1981-2000) look reasonable so long as nomadic pastoralism remains the principal form of land use and enough natural prey remains. Elsewhere the spread of commercial and group ranching is likely to bring it into greater conflict with man and it may ultimately disappear, though less easily than people often suppose. The spread of illegal and legal firearms is also likely to pose a threat so long as the cheetah's skin has any value, and the Kenya Government's present plans to arm 'home guards' in northern Kenya can only be regarded with concern: for all wildlife as well as the cheetah. But if the cheetah and its prey can survive this threat, the species should still be with us in Kenya at the turn of the century.

Instead of dismissing the cheetah as a feeble and poorly adapted predator racing towards extinction, perhaps we should look upon it in a new light: as a remarkably successful predator that has defied the prophets of doom and is supremely adapted to surviving at low densities over large expanses of often waterless arid and semi-arid lands. Perhaps it is not a failure after all?

CHAPTER 6

THE LEOPARD AS A HUNTING TROPHY AND TOURIST ATTRACTION

6.1. INTRODUCTION

The preceding chapters have shown that the leopard has a negative economic value as a stock-raider. But the species also has a positive value as a potential hunting trophy and as a tourist attraction. The purpose of this chapter is to examine these aspects of the leopard's relationship with man in Kenya.

Although hunting was banned in Kenya in May 1977 (LN 120 of 19/5/77) it was never the intention to impose a permanent ban, and there is a growing likelihood that the country will have to consider the reopening of hunting if it is to make the best use of its wildlife resource. For the truth is that at the present time wildlife has very little economic value to the people of Kenya except as a tourist attraction. Yet the national parks and national reserves to which the majority of game-viewing tourists go, cover a mere 5% of the country. In most of the other 95% wildlife has no economic value as a tourist attraction and since the hunting ban it has not contributed any revenue from hunting fees or even been used as a source of protein to feed the people. The ordinary 'wananchi' (citizens) currently derive no benefit at all except from illegal killing for commercial profit or subsistence or to deal with crop- and stock-raiders, of whose harmful activities they are only too well aware. Their attitude is often one of hostility to wild animals and this can be expected to become more widespread and intense as the human population expands and man and wildlife come into greater conflict with each other. In such circumstances wildlife cannot be expected to survive in the long term outside the national parks and reserves. But even there its future is far from assured, even if the animals are protected properly, for most of Kenya's parks and reserves are too small to be viable ecological units and many of the most important, such as Meru, Amboseli, Nairobi, and the Masai Mara, are heavily dependent on the dispersal areas outside. Wildlife in the country only has a future if it can survive outside the parks, and it will only be able to do so if it can show the people of the other 95% of Kenya that it does have a positive economic value to them. Aesthetics carry little weight in a poor country with a human population expanding at such a rate that it threatens to outstrip the country's resources.

The leopard is an especially controversial animal, widely feared and seldom loved, and it must prove that it too has some positive value. Controlled sport hunting can give it this. This chapter therefore includes recommendations on the reopening of leopard hunting, should the Kenya Government decide to lift its ban.

6.2. LEGISLATIVE HISTORY

Until 1933 the leopard was regarded in Kenya as vermin and could be killed in unlimited numbers without any permit. Towards the end of 1932, however, the Game Department became concerned because

the trapping of leopards had assumed alarming porportions (Game Dept. 1932-34) and on 1st January 1933 placed the leopard on the Third Schedule of the Game Ordinance. This had the effect of declaring the leopard a 'game animal' and prohibiting the sale and export of its skin without a permit from the Game Warden's Office. At the same time the setting of all traps capable of catching a game animal was prohibited on Crown land without written consent of the Game Warden (Ord. 49 of 31/12/32). In 1951 a new Wild Animals Protection Ordinance was introduced and a special licence costing 200/- was introduced for leopards (Order 18 of 17/4/51). In 1953 the importation of steel gin traps was prohibited without sanction of the Game Warden (Customs Management Ordinance 1953). Between 1951 and 1971 the special licence fee rose to 1,000/- (Legal Notice 157 of 1958, LN 131 of 1964, LN 94 of 1967, LN 65 of 1971) and controlled area fees rose to 2,000/- for a male leopard and 4,000/- for a female (LN 130 of 1964, LN 93 of 1967, LN 156 of 1968, LN 66 of 1971). In March 1970 the Government banned dealing in cheetah and imported leopard skins and parts thereof (LN 53 of 18/3/70). At that time, according to the Chief Game Warden, large numbers of leopard skins were coming into the country from the United Kingdom and West Germany, with the country of origin shown as Nigeria, and many skins originating illegally from Kenya were re-entering the country as legitimate imports. In March 1972 all dealing in leopard skins or parts thereof was banned (LN 38 of 23/2/72) but this was modified by LN 184 of 28/8/72 which exempted leopard and cheetah skins purchased from Government by any person for 'non-commercial purposes' (whatever these might be) and leopard skins imported for 'non-commercial purposes'. Finally, with the hunting ban of May 1977 (LN 120) leopards became, like everything else, a fully protected species - at least in law - and the export of their skins was banned by LN 181 of August 1979.

6.3. BACKGROUND TO THE HUNTING INDUSTRY IN KENYA

After the introduction of the Wild Animals Protection Ordinance in 1951 the main game areas of Kenya were declared Controlled Areas under Section 7 of this legislation. Each of these was subdivided into numbered hunting blocks (Fig.4.2.) which were allocated to licensed hunting parties by the Game Department Headquarters in Nairobi. Normally only one party was permitted to hunt in a block at any one time but after 1963 double booking was introduced in the southern blocks to compensate for closure of the northern and north-eastern blocks by the poor security situation. Controlled areas excluded private land, and game management was carried out by attaching to the Controlled Area Permits certain conditions and restrictions which varied from place to place and from time to time. A controlled area booking fee was charged in respect of each area, and for any animal shot there the hunter had to pay an additional fee which varied with the species and the area. These fees went to the districts concerned and provided local authorities with income directly derived from their wildlife resource. At the time of the hunting ban the controlled area fees for leopards were 2,000/- for males and 4,000/- for females and exceeded those for all other species except elephant and rhinoceros. The leopard was therefore a highly rated trophy.

Each person hunting in Kenya was also required to purchase a regular hunting licence, of which there were several categories:

non-resident, resident non-citizen, resident citizen, 14-day (non-residents only), private land, and bird licences. To hunt some species, such as the leopard after 1951, an additional Special Licence was required, the fee varying with the species. For the leopard it was 1,000/- at the time of the hunting ban when, like the controlled area fee, it was higher than those for all other species except elephant and rhino. Like the hunting licence fee, the special licence fee was payable in advance and all such fees went into central government revenue and not, as Eaton (1976) supposed, into Game Department revenue. The special licence fee was not refunded if no leopard was shot, but the controlled area fee for a leopard was only paid if the hunter succeeded in shooting his trophy. Special licences were only granted to the holder of a full licence and were not issued for leopard for a safari of less than three weeks.

Non-resident hunters, who provided the bulk of the country's revenue from licensed sport hunting, were obliged to accompany a professional hunter and no more than two hunting clients at a time were allowed to each fully qualified professional hunter. The professional hunters themselves also had to be licensed, their licence being known as an Assistant's Permit. There were three categories of this: full, restricted, and learner. Until 1965 a stringent selection procedure used to operate, and nobody could become a fully licensed professional hunter before having served a period of apprenticeship during which his licence was initially restricted to non-dangerous game. Even then a candidate had to be approved by a joint committee of the East African Professional Hunters Association and the Game Department before he could obtain a full Assistant's Permit, and approval was far from automatic; in the early 1960s at least 20% of all applications were turned down. Indeed there was an informal agreement that the Game Department would not issue licences to people who were not recommended by the Association and would withdraw the licence of any hunter expelled from the Association for illegal or unethical conduct.

The Association was formed in 1934, with the Game Warden of Kenya among its founding members. Its aims were: "To keep the sport of big game shooting clean and wholesome....to collaborate with the officers of the game departments and administrative services....to prevent and punish illegal and unsportsmanlike practices ....and to insist upon honourable and sportsmanlike conduct..in the practice of the profession and sport of hunting." (Dyer 1979). Not all its members lived up to this, and there have been a number of expulsions as well as prosecutions by the Game Department, but the Association did regulate the behaviour of its members and played a constructive role in helping to make controlled hunting work. In turn it was treated by the Government as a respectable professional body. Relationships with the Game Department were generally cordial, as Game Department reports show (1935, 1936, 1937, 1950, 1956-57, 1960, 1962), and the Chief Game Warden used to be invited to meetings of the Association's Executive Committee. Indeed, until about 1964 a number of professional hunters used to be Honorary Game Wardens with full powers of arrest under the Wild Animals Protection Act. The cordial relationship continued until about 1970, when it unfortunately began to break down and the Department increasingly ignored the Association.

6.4. THE LEOPARD AS A HUNTING TROPHY

Tables 6.1., 6.2., and 6.3. detail the financial contribution of the leopard to both Government (special licence) and county council (controlled area fees) revenue in 1965 and 1972. Table 6.1. shows that in the country as a whole, leopards contributed nearly 11% of all special licence revenue in 1965 and nearly 7% in 1972. Similarly leopards shot in controlled areas contributed over 16% of all controlled area fees in 1965 and over 9% in 1972. In 1973 the species' contributions to special licence and controlled area revenue had dropped to 4.1% and 4.5% respectively, reflecting the decreasing number of leopards shot on licence in controlled areas.

TABLE 6.1. Contribution of the leopard to special licence revenue and controlled area fees in 1965, 1972, and 1973.

YEAR	1965	1972*	1973*
No. of special licences sold	269	195	187
Revenue therefrom (K.shs.)**	67,250/-	195,000/-	187,000/-
% of all special licence revenue	10.9%	6.8%	4.1%
No. of leopards shot in C.A.s	140	69	45
Revenue therefrom (K.shs.)***	70,000/-	150,000/-	101,000/-
% of all controlled area fees	16.2%	9.2%	4.5%

* 1972 and 1973 figures for controlled area revenue are questionable.
** Special licence fees: 1965: 250/-; 1972: 1,000/-.
*** Controlled area fees: 1965: 500/-; 1972: male 2,000/-; female 4,000/-.

Sources: Game Department (1965); Casebeer (1975).

Tables 6.2. and 6.3. show the importance of the leopard as a revenue earner in relation to other species in 1965 and 1972-1974. The leopard consistently ranked among the top four and was sometimes second only to the elephant. Its importance in this context is obvious.

TABLE 6.2. Relative contributions of different species to revenue from special licences.

RANK	1965	1972	1973	1974
1.	Elephant 62%	Ele. 56%	Ele. 62%	Ele. 16%
2.	LEOPARD 11%	LPD. 7%	Zebra 5%	Zebra 15%
3.	Rhino 8%	Lion 5%	Lion 4%	LPD. 11%
4.	Lion 7%	Zebra 4%	LPD. 4%	Lion 9%
5.	Others 12%	Others 28%	Others 25%	Others 49%

Notes:
i. All percentages rounded off to nearest whole number.
ii. Only 85 special licences for elephant sold in 1974; cf. 1,351 in 1973.
iii. Zebra: common or Burchell's zebra.
iv. Source: Casebeer (1975).

TABLE 6.3. Relative contributions of different species to local authority revenue from controlled area fees.

RANK	1965	1972	1973	1974
1.	Elephant 41%	Ele. 31%	Ele. 37%	NO DATA
2.	LEOPARD 16%	LPD. 9%	Zebra 14%	
3.	Lion 6%	Zebra 8%	Rhino 5%	
4.	Rhino 6%	Lion 6%	LPD. 4%	
5.	Others 31%	Others 46%	Others 40%	

Notes: i. 1972 and 1973 figures questionable.
ii. Source: Casebeer (1975).

Table 6.4. presents data on the contribution of the leopard to the controlled area fees earned by Narok and Kajiado county councils in 1965, the last year for which published figures are available. Apart from confirming the importance of Masailand as a reservoir of leopards at that time, it shows that the species contributed more than a quarter of the controlled area fees earned by the two Masai county councils in 1965. This is an impressive contribution, considering it was made 16 years ago, but could have been much greater if the controlled area fee for leopards had been more than a modest 500/-; it was raised to 1,000/- in 1967.

TABLE 6.4. Contribution of the leopard to controlled area fees earned by Narok and Kajiado county councils in 1965.

No. of leopards shot Narok/Kajiado	% of leopards shot in all C.A.s	C.A. fees from leopards	% of C.A. revenue from all species
113	81 %	56,500/-	26 %

Sources: Game Department (1965); Casebeer (1975).

In addition to the revenue directly earned by the leopard in specific fees, the species was responsible for much indirectly earned revenue derived from, for example, the cost of general hunting and firearms licences and assistant's permits. Table 6.5. (p.107) shows the growth of the hunting industry in the years 1959, 1964, 1969, and 1974, as reflected by the numbers of general and special hunting licences issued and the revenue derived therefrom. Non-resident hunters were by far the most important contributors, not only in terms of the amounts involved but also because they were bringing in valuable foreign exchange to cover the costs of their safaris and in so doing provided employment in the hunting industry for over 3,000 Kenyans in 1977. From an analysis of the industry in 1966, Clarke & Mitchell (1968) showed that the average hunting visitor spent 31 days in Kenya and 29,460/- per person, compared with visitors on outfitted photographic safaris who spent an average of 19 days and 11,200/- per person. These

costs exclude transport within the country and the photographic safaris exclude cheap package tours. Ten years later Eaton (1976) estimated from a survey of American sport hunters that the average American sportsman hunting leopards, amongst other species, in Africa spent a total of U.S. $ 11,743 in Africa per safari, or the equivalent in Kenya currency of nearly 100,000/- at that time.

TABLE 6.5. Number of general and special hunting licences issued and revenue derived therefrom in selected years between 1959 and 1974.

No. of licences issued	1959	1964	1969	1974
Resident's licences	531	715	878	976
Non-resident's licences	232	313	508	1,371
Special licences*	1,572	2,192	4,325	3,076
Revenue therefrom (K£)	**1959**	**1964**	**1969**	**1974**
Resident's licences	2,215	2,465	4,290	8,790
Non-resident's licences	9,340	10,235	24,075	75,925
Special licences*	25,800	20,115	60,590	129,895

Source: Casebeer (1975).

The conclusion of Eaton (1976) that the leopard is highly valued as a trophy by American and European sport hunters is correct. All the professional hunters I spoke to in Kenya believed that their clients rated the leopard very desirable. Most clients rated it below elephant but above lion and to some extent this is reflected in the numbers of special licences bought. But although most clients were satisfied with a single leopard trophy, whereas they often returned again and again for elephant, the leopard was often sufficiently desirable to sell a safari. There is little doubt, therefore, of the attraction exerted by the species, and it is likely that the 1972 U.S. ban on the importation of leopard trophies into the United States significantly reduced Kenya's attractiveness to American sportsmen thereafter.

6.5. THE LEOPARD AS A TOURIST ATTRACTION

In 1980 the tourist industry earned Kenya K£ 74,000,000 in foreign exchange, of which it is a major contributor to the country's economy, second only to agriculture. Tourism has grown enormously since 1963 when it contributed a mere K£ 7.3 million, and there is little doubt that Kenya's wildlife has been one of the chief attractions, particularly for the lucrative American market, as visitor statistics for national parks and game lodges show. Mitchell (1968) discusses the economic value of wildlife viewing as a form of land use.

It is impossible to quantify the leopard's financial contribution to the foreign exchange earned by tourism. But the species' importance as an attraction - even if seldom seen - must be greater than that of most others. The leopard is one of "The Big Five", with a dangerous though somewhat embellished reputation, and a "glamour animal" regrettably popularised by the international fur trade. It is also a carnivore, a type of animal that seems to arouse unusual interest in man, perhaps because we are made of meat! Research in

Amboseli (Henry 1975) and observations in the Mara (Burney 1980) have shown that the feline carnivores are usually the animals most sought by game-viewing visitors. Indeed such is their importance that in Amboseli the total numbers of lion and cheetah and their tolerance of tourism are the primary factors determining the visitor capacity of the Park and hence its potential for earning revenue (Western & Henry 1979). Western (pers.comm.) has calculated from relating revenue from tourism to the proportion of time that game-viewing visitors devote to watching different species, that each of Amboseli's approximately fifty lions is worth 336,000/- a year or (at 8.9 shs. to the dollar in 1981) U.S. $ 37,750, while each of its fifteen cheetahs is worth 600,000/- or $ 67,420 a year. He did not include the leopard in these calculations because it is so seldom seen; but when it is seen it attracts very great interest and on a value per animal basis must also rate very high.

But even if the leopard is seldom seen, its mere presence and the exciting possibility that it might be seen constitute a powerful attraction. With the appalling decline of another member of the Big Five, the rhinoceros, to the point where visitors to Kenya can no longer be sure of seeing even one during a three-week safari, the importance of the leopard (and the cheetah) has increased. At a time when Kenya seems to be experiencing a decline in both the number of visitors coming and in revenue from tourism ("The Standard", 31/1/81), it needs all the attractions it can offer. Conservation of the spotted cats is therefore economically important for this reason alone.

Finally it is worth mentioning that in some places the leopard has in fact been the principal attraction. This was so at the Secret Valley Forest Lodge, unfortunately burnt down in 1981, where leopards in the Mount Kenya forests were baited and at one time the management offered to refund the money of visitors who failed to see one. Two other game lodges, Samburu and Maralal, currently benefit from baiting leopards, and at the Ark, in the forests of the Aberdares National Park, the leopard is, together with the bongo, one of the principal attractions.

6.6. EFFECTS OF SPORT HUNTING ON LEOPARD POPULATIONS

What effects does sport hunting have on leopard populations? According to Eaton (1976) it has no effect, but strictly speaking this cannot be true. Any human activity such as sport hunting that reduces the number of animals in a population obviously has an effect in that animals shot are removed from the population. If these are only adult males and if they are taken in moderation, leaving sufficient others unharmed, there is no significant detrimental effect on the population as a whole - which is probably what Eaton meant to say. Indeed, as Myers (1973) has pointed out, leopard populations, like the lion population in the Kruger National Park during predator culling, almost certainly respond to hunting pressure by increasing their reproductive and recruitment rates. Moderate hunting may therefore stimulate breeding and thereby compensate for the loss of those animals removed from the population. Such was the resilience of Narok's leopard population until 1970, when heavy poaching intervened, that such a mechanism must have been operating; one professional hunter, for example, took three big males from the same tree in Block 60 on three consecutive safaris within a period of three months, and another remarked to me that there seemed to be an endless supply of male leopards

on some of the leopard populations of Masailand. I suggest that the evidence from Kajiado and Narok contradicts the sweeping statement of Eaton (1976) that "there is no evidence from any source that trophy hunting in Africa is harmful to any wildlife or game populations."

Eaton also declared: "Trophy hunting is not a problem as far as regulation is concerned." This too is contradicted by the Kenyan experience. Regulation became a major problem before the hunting ban. But the distinction between controlled and uncontrolled hunting is important. Until 1965 control was still reasonably exercised, although I believe that the legal shooting of leopards was being permitted to excess in that year when, for example, 21 leopards were shot in each of blocks 57 and 63, and in 1966 when 165 leopards were shot in controlled areas, 75 of them in Kajiado District alone; it was at about this time that some of the more experienced professional hunters began to notice greater difficulty in obtaining leopards there. The moral is that even perfectly legitimate licensed controlled hunting can be carried to excess, and this does not apply only to the leopard; lion and rhino were also overshot in some areas (Game Dept. 1950, 1956-57, 1958-59). But whenever this was recognised in the days of controlled hunting the Department immediately took remedial action, often at the instigation of concerned professional hunters who drew the Government's attention to the need for such action. Indeed in the early 1970s the E.A.P.H.A. recommended that the decline of the leopard warranted the suspension of sport hunting of that species for a number of years (Myers 1973) but unfortunately the Association had by then lost all influence with Government.

Uncontrolled hunting, although in theory licensed and therefore perfectly legal, had by that time begun to predominate. The control which the Game Department used to exercise by restricting the bookings of controlled area blocks by hunting parties, by limiting the numbers and types of licences issued, and by enforcing the law, broke down. The controlled area system became increasingly chaotic after 1972 and hunting blocks were no longer restricted to one or two parties at a time. In 1973, for example, there were sometimes as many as six hunting parties in Block 37 at the same time, reducing the concepts of 'control' and 'controlled areas' to a farce. The issue of licences also got out of hand. Assistant's Permits were granted to people - many of them recent arrivals from the European continent - who served no apprenticeship and were usually totally unqualified to conduct clients on safari, quite apart from their frequently demonstrated lack of ethics. The result was a sharp fall in the average level of competence of those granted Assistant's Permits and this in turn brought the hunting industry and the profession into disrepute. Within a few years the Chief Game Warden had granted full professional licences to over fifty self-styled 'professional hunters' to whom the Association could never have given even probationary membership as they did not and could not meet the required standard. Yet as far back as 1956, when there were only 64 persons with Assistant's Permits, the Game Department warned: "Licensed hunting has now reached such proportions that it could seriously threaten the existence of certain game animals" (Game Dept. 1956-57). This was probably an overstatement but from 1965 onwards, when there were substantially fewer animals, the Department issued Assistant's Permits and other licences in increasing numbers, as shown in Table 6.6.

TABLE 6.6. Numbers of permits and licences of various categories issued by the Game Department between 1960 and 1974.

YEAR	1960	1965	1969	1970	1971	1972	1973	1974
Assistant's Permits	70	71	116	114	105	137	133	189
C.G.W. Permits	?	?	479	215	217	156	163	2,407
Elephant S.L.s	222	247	383	?	543	805	1,351	85
Leopard S.L.s	134	269	339	?	176	195	187	280
Lion S.L.s	120	177	297	?	227	296	400	508

C.G.W. = Chief Game Warden; S.L. = Special Licences.

Source: Casebeer (1975).

1972 marked the turning point. In that year alone the number of Assistant's Permits issued jumped by 30% and in 1974 by a further 38%. The numbers of special licences issued for lions and leopards also began to increase again at a time when the Department would have been wise to reduce them. Chief Game Warden's Permits, which were in effect 'carte blanche' permits that could allow the hunting of any species in any place (except national parks and private land) at any time and by any means, increased by 1,377% from 1973 to 1974. No official statistics are available for 1975 and thereafter but it is known that some 2,000 permits for elephant were issued in 1975 after the closure of elephant hunting in 1973 (Dyer 1979). A concession system introduced in Narok and some other areas in 1976 was not a success as some concessionnaires who had little or no idea of game management principles severely overshot for short-term profit, and the system was brought to a timely end by the hunting ban in 1977.

Finally, an indirect effect of sport hunting on leopard populations, mentioned by Eaton (1976), was its possible depressive effect on the level of poaching. Although several game wardens disagreed, most of the professional hunters who expressed any opinion on the subject believed that until the breakdown of controlled hunting their presence in remote areas did have some deterrent effect because they were usually conscientious in reporting signs of poaching to the Game Department, destroyed any traps and snares they found, and even occasionally arrested poachers they came across. However, after both sport hunting and poaching got out of control in the 1970s their deterrent effect became less and less. By 1972 they were powerless to do anything about poaching, no matter how flagrant and brazen, as the activities of so many people seemed to be beyond reach of the law. Thereafter, contrary to Eaton's supposition, sport hunting had no depressive effect on poaching and an increasingly deleterious effect on leopard populations by adding to the already excessive offtake by poachers.

6.7. DISCUSSION

6.7.1. To hunt or not to hunt?

To hunt or not to hunt? That is the question. Eaton (1976, 1977) strongly advocated the sport hunting of leopards in view of the species' "satisfactory and promising status" in Africa and condemned the decision by the U.S. Government to ban the importation of leopard trophies legally obtained by American hunters on safari in Africa. This stand was also supported by Teer & Swank (1977).

What do Kenya's professional hunters think? Without exception those I spoke to regarded the U.S. ban as inappropriate and unhelpful. But they showed far less enthusiasm than Eaton for the reopening of leopard hunting and few agreed with his rosy assessment of the status of the species in Kenya. The overwhelming consensus of opinion was that sport hunting of leopards could be reopened in certain selected areas (though very few) but only under the most stringent conditions, which would include a return to a system of controlled hunting and a total ban on the shooting of females. Moreover most of the hunters and wardens I interviewed expressed reservations. Several doubted if leopards are numerous enough yet to justify the reopening of sport hunting and recommended at least a few more years of respite to allow depleted populations to recover from the onslaught of the 1970s. Most expressed reservations on whether controlled hunting could ever work again in the light of what happened from 1970 to 1977 and all were adamant that there should be no question whatsoever of hunting reopening except under a system of honest and effective control, with heavy penalties for infraction.

If controlled hunting could be made to work again in Kenya, with appropriate improvements, should the leopard again be made available to sport hunting? I believe it should. Although sport hunting is opposed by many conservationists, particularly those outside Africa, there are many wealthy people in Europe, Asia, and the Americas who are prepared to pay large sums of money to hunt in Africa. And as I have already showed, the leopard is a prime attraction. One aspect of the economic argument for reopening it to licensed hunting is that the species could earn Kenya valuable and much-needed foreign exchange. In Botswana, where leopard hunting is permitted, it was calculated that in 1976 the average value to the Government of leopards shot by licensed sport hunters (mostly non-residents) was 1,875 Pula per leopard (Murray 1978). This is roughly equivalent to K.shs. 20,600/- or U.S. $ 2,315 at the current rates of exchange.

In 1968 Clarke & Mitchell (1968) reviewed the economic value of hunting and photographic safaris in East Africa and concluded: "There is no doubt that the major economic benefits currently yielded by wildlife are derived from hunting and game-viewing....it will be a long time before the returns from other forms of utilization can compare with the tourist/recreational value of wildlife." This is no less true in Kenya in 1981 than it was in 1968. If anything our use of the country's wildlife resource has regressed since then as hunting now makes no contribution to the economy or the people of Kenya. Yet the economic argument in favour of hunting is also a powerful argument for conservation. It is well summed up by Mr. Daniel Sindiyo, Kenya's Director of Wildlife Conservation and Management, in Teer & Swank (1977):

"It seems very clear to me that no one is going to conserve and manage a resource that is not going to provide some financial return to them. This applies to the Masai or any other landowners. The leopard does cause damage to the livestock, and it can not be expected that the Masai will live happily with an animal that has only negative benefits.....The preservation of wildlife with no return today has no chance.....What I would like to see is conservation of wildlife through a management system; that is, take into consideration all the biology and habitat of the species and manage it for an economic return, whether this be hunting or viewing, so we can justify the existence of the animal to the landowner."

This is the reality of wildlife conservation in Africa today. And it must be accepted before attempting to formulate any policy for conserving the leopard. As Myers (1976) also emphasised, this controversial predator has got to "pay its way" if it is to survive in any number. I believe this is particularly true of Masailand which is now one of Kenya's major, though admittedly depleted, reservoirs of leopard. If the leopards there have no positive value to offset against their depredations as stock-raiders, they will be poisoned or killed in other ways, and ultimately few might survive. As the system of land tenure changes, as it is now doing, from nomadic pastoralism to a system of group ranches with defined, adjudicated boundaries, and as the Masai increasingly enter the cash economy, so the need to give the leopard monetary value will become increasingly crucial to its survival. Controlled sport hunting can give it this value in Masailand and elsewhere.

I suggest therefore that subject to the restrictions and reservations discussed below the Kenya Government should consider reinstating the leopard as a hunting trophy species in Kenya.

6.7.2. Where?

If licensed sport hunting is reinstated in Kenya and if the leopard is designated a trophy species, where could the controlled hunting of leopards be envisaged?

The results of this survey (Chapter 4 and Chapter 5) indicate that most parts of Kenya cannot even be considered, because their leopard populations are so depleted that sport hunting would be either fruitless or undesirable or both at the present time. The mere sixth of Kenya eligible for consideration comprises Narok and Kajiado districts, the forested controlled area blocks on the Aberdares (80, 81, 82) and Mount Kenya (74, 75, 76, 77, 78, 79), Nyanza Province, and Laikipia District. In addition I believe that Block 51 (i.e. 51, 51A & 51B), which includes the Leroghi Forest and Karisia Hills near Maralal, could be included on an experimental basis. However, leopard hunting should not be permitted in any other part of northern Kenya at the present time.

Masailand, the Aberdares and Mount Kenya forests, and Block 51 are eligible because their leopard populations are probably now adequate to withstand limited controlled hunting and because those areas provide the best leopard trophies and would be important to any future hunting industry. Laikipia is eligible because it still contains a reasonable leopard population which forms a reservoir of actual and potential stock-raiders and because the control of hunting

would be greatly facilitated there by the existence of generally well-run commercial ranches; the control of stock-raiders will be discussed later in this chapter. Nyanza Province is eligible because although it contains relatively small remnant leopard populations, it is presently the scene of serious conflict with man, particularly in Siaya and Kisumu districts. These remnants have no long term future whatsoever, and it would be better if they could be eliminated sooner rather than later. Whether visiting sportsmen would wish to hunt in such densely populated areas is another matter, for hunting clients come to Africa as much to enjoy life in the bush, away from people and the pressures of the Twentieth Century, as to shoot game animals. But some might accept the challenge and it should be open to them to do so. If, however, this proves impracticable, the Government should either undertake elimination itself or invite professional hunters in to do it and make it worthwhile for them to do so.

6.7.3. When?

At the present time (mid-1981) it appears that the Kenya Government is not yet ready to reopen sport hunting as it has not promulgated the revised rules, regulations, and systems which would be a prerequisite to any reopening of hunting. Nor is the hunting industry ready for immediate resumption although the basic infrastructure still exists. As it would take several months after any Government announcement for the industry to re-establish itself in full working order and to attract the foreign clients upon which it depends, there is little prospect of hunting reopening in Kenya before 1982, even if the Government does decide to take this course.

I suggest, however, that even if hunting is reopened in 1982 the leopard should not be made immediately available to sport hunters except in Laikipia and Nyanza. There should preferably be a probationary period of one year after the formal reopening of hunting, whenever this might be, to give the species further respite in Masailand, Block 51, and the montane forests and in order to give an opportunity for determining (i) whether the new system of controlled hunting was working properly, and (ii) whether or not the leopard populations of those areas are sufficiently in evidence to justify the resumption of hunting. Such an assessment would need to come from the persons best qualified to judge leopard populations: the professional hunters and other experienced field men. But the Government must be prepared to listen to people who know what they are talking about. Without co-operation between the Wildlife Department and the professional hunters no system of controlled hunting can be made to work.

6.7.4. How many?

This question is difficult to answer and has always been one of the major problems of operating any system of controlled hunting. In the past, quotas were not set on a block by block basis. But in well regulated areas the warden kept a continuous record of hunting offtakes and could amend the controlled area conditions if he felt that too many animals had been taken in one place or if there were signs of any shortage. This meant, however, that the effectiveness of game management depended almost entirely on the competence and experience of the warden, whose 'guesstimates' were unavoidably based on subjective impressions. This was especially true for a secretive

carnivore, such as the leopard, which was impossible to census. Nevertheless wardens could get a useful idea of relative abundance and population trends by listening to professional hunters who had been seeking the animal. Although in the 1980s the aerial surveys of the Kenya Rangeland Ecological Monitoring Unit should provide a rough basis for setting quotas for the larger herbivores, the leopard will continue to remain a problem.

I believe it is worthwhile to examine this problem in relation to possible leopard populations and past hunting offtakes in an attempt to arrive at rational quotas for the future. These I suggest should be set on a block basis that takes the area of the block into account as well as some idea of relative abundance. This inevitably involves considerable speculation, not least because our knowledge of the exact composition of leopard populations in the wild is still incomplete. However, by drawing upon data from leopard populations in the Tsavo and Kruger national parks and population data from other large cats, particularly the basically solitary cheetah, it is possible to indulge in some informed speculation. The resulting figures may be wide open to criticism. But that is why I present them, and I believe the attempt to do so represents a step forward.

The following assumptions about wild leopard populations have been made:

1. The sex ratio of adult leopards, including transients, is approximately 0.9 males to 1 female, even though resident adult females probably outnumber resident adult males by 1.8 : 1 (Bailey, pers.comm. in Chapter 2). I have assumed that mortality in adult males is slightly greater than in adult females (i) because of fighting between males, and (ii) because of their greater boldness which tends to expose them to trouble.

2. At any one time about 55% of the adult females are accompanied by dependent young. These may be small cubs or larger subadults.

3. The ratio of immature leopards (cubs and subadults, whether dependent or not) to adult females is 1.3 : 1, and the ratio of immature leopards to all adults is 0.71 : 1. This assumes a reasonable rate of increase in response to depletion.

4. In a hypothetical population of 29 leopards the sexes and ages might be distributed as follows:

8	adult males (5 residents, 3 transients)	
9	adult females, of which:	
	4 have no dependent cubs	= 0
	2 have litters of 3 & 2	= 5 small cubs
	3 have large dependent cubs (2+1+1)	= 4 large cubs
3	independent subadults	= 3 subadults
17	adults + 12 immature : total of 29 leopards.	

5. I have assumed that in the days of controlled hunting all leopards shot were adult males. This is probably not quite true but near enough.

6. I have assumed that a 10% annual offtake of the adult male population is a reasonable compromise between reduction and conservation of the population.

Let us start with an examination of 1965 hunting data from Narok District (Game Dept. 1965). In that year 52 leopards were shot by licensed hunters in blocks 57, 58, 59, and 60, as shown below:

BLOCK	AREA	LEOPARDS SHOT	km^2/LEOPARD SHOT
57	2250 km^2	21	107 km^2
58	2650 km^2	11	241 km^2
59	5100 km^2	10	510 km^2
60	2250 km^2	10	225 km^2
TOTALS	12,250 km^2	52	236 km^2

Note: All areas are approximate only.

At that time the leopard population of Narok District appeared to be able to withstand an annual offtake of this order, though that in Block 57 may have been excessive. If, however, it is assumed that all the 52 leopards shot were adult males and represented 10% of the adult male population, then:

The adult male population would have been 52 X 10 = 520 adult males;
The total population would have been 520 X 3.625* = 1885 leopards.

These figures represent densities of 1 adult male/24 km^2 or 1 leopard/6.5 km^2 which seem reasonably likely at that time.

In 1976, however, when the Game Department introduced a system of concessions in Narok District it approved the following quotas for leopards:

CONCESSION	AREA	APPROVED QUOTA	km^2/LEOPARD
N.1.	916 km^2	10	92 km^2
N.2.	1058 km^2	10	106 km^2
N.3.	1725 km^2	10	172 km^2
N.4.	1560 km^2	10	156 km^2
N.5.	1037 km^2	10	104 km^2
N.6.	880 km^2	12	73 km^2
N.7.	1206 km^2	10	121 km^2
TOTALS	8382 km^2	72	116 km^2

If the Narok leopard population had still been at the 1965 level, which is unlikely because heavy poaching had by then intervened, there might have been about 350 adult male leopards present in the 8,382 km^2 covered by the concessions (i.e. 1 adult male to 24 km^2). If this was so, an offtake of 72 would have represented no less than 21% of the adult male population and would have been excessive if implemented. I suggest that double the density (i.e. 1 adult male/12 km^2) would have been required for the leopard population to withstand a 10% annual offtake of adult males without

*Conversion factor = $\frac{29 \text{ leopards}}{8 \text{ adult males}}$ = 3.625

ill effect: In other words a population of about 700 adult males or 2,538 leopards (700 X 3.625 = 2,538 = 1 leopard/3.3 km^2). I doubt if leopards were that numerous in 1976 when there was already evidence of heavy poaching and marked depletion. Fortunately the approved quota of 72 leopards/annum was suspended after protests from the East African Wildlife Society, and the hunting ban came into effect in 1977.

That heavy offtakes from certain exceptional areas may be possible is suggested by figures from Akira Ranch (280 km^2) where between 1968 and 1973 inclusive about five leopards were shot every year by licensed hunters, apparently without ill effect. This represents an offtake of 1 adult male/56 km^2/annum. The leopard population was estimated then at 34-51 on the basis of baiting (Field, pers.comm.) but must have been appreciably higher because an offtake of five leopards per annum could have represented 21-31% of the adult males and this would have been excessive. But there was no noticeable decline in the population. If it is assumed that this offtake represented 15% of the adult male population, because it does seem large for such a small area, the adult males would have numbered at least 33 (1 adult male/8.5 km^2/3.3 sq.mi.) and the total leopard population, including small cubs, 120 (1 leopard/2.3 km^2/0.9 sq.mi.). These densities are very high but within the realm of possibility. However, Akira, with its deep rocky gorges, plentiful prey, and protection from poaching, provided, like Solio, an exceptional habitat with exceptionally high local densities of leopard probably maintained by the immigration of leopards from Mount Longonot to replace those shot. But similar high densities are almost certainly never found over extensive areas and should not form the basis for any estimates for setting hunting quotas.

From the foregoing I believe that the annual offtake of leopards should not exceed a maximum of 1 adult male/75 km^2/annum in even the most favourable places such as Akira. The 1965 data suggest that for Narok District an offtake of 1 adult male/236 km^2/annum was a reasonable maximum at that time, and that exceeding it, which happened later with the advent of uncontrolled sport hunting and poaching, would result in decline. Block 57 was one of those that showed severe signs of overshooting by 1975, and I suggest that a sustained offtake of 1 adult male/107 km^2/annum (the 1965 rate) is probably excessive. At the present time the leopard population of Narok District as a whole is probably about half of what it was in 1965, and I believe that leopard quotas set for the 1980s should not initially exceed 1 adult male/500 km^2/annum. Whether the Government reinstates the old hunting blocks or the concessions or devises a new system is irrelevant as this formula is equally applicable to all. For the sake of example, however, I have used it to derive quotas for the hunting blocks and concession areas listed below:

HUNTING BLOCK	AREA	QUOTA (adult males/annum)
BLOCK 57	2250 km^2	5
BLOCK 58	2650 km^2	5
BLOCK 59	5100 km^2	10
BLOCK 60	2250 km^2	5
TOTALS	12,250 km^2	25

CONCESSION	AREA	QUOTA (adult males/annum)
N.1.	916 km^2	2
N.2.	1058 km^2	2
N.3.	1725 km^2	3
N.4.	1560 km^2	3
N.5.	1037 km^2	2
N.6.	880 km^2	4 @ 1/250 km^2
N.7.	1206 km^2	2
TOTALS	8382 km^2	18

All the quotas given above are rounded off to the nearest whole number, and the only exception to the suggested quota of 1 adult male/500 km^2 is the concession N.6. which includes the Nkuruman Forest. That is an area where there seems to be a good leopard population that has been little affected by poaching. It is sensible therefore to take this into account by setting a higher quota. In other words, although quotas should as a rule be based on a chosen density, such as 1 adult male/500 km^2, good game management requires a flexible approach that makes use of knowledge of the country and common sense. Nevertheless exceptions should only be made when there are sufficient grounds for so doing. N.6. and Block 62, which includes it, are special cases. To raise quotas for any other reason, such as short term profit, would be short-sighted and irresponsible.

In Narok District as a whole there are some 16,600 km^2 potentially available for hunting, subject to permission from the landowners as well as the Government. I believe that even at the present time the district's leopard populations could support an annual offtake of 1 adult male/500 km^2, i.e. a total of 33 leopards a year. At the rates I have suggested in Section 6.7.5. this could represent an income to the Masai of 297,000/- a year.

For Kajiado District, which was I believe more heavily poached and overshot than Narok, I suggest an initial offtake of 1 adult male/1,000 km^2/annum. This would give, as an example, the following quotas for the following (1970) blocks:

HUNTING BLOCK	AREA	QUOTA (adult males/annum)
BLOCK 84	1025 km^2	1
BLOCK 84A	1525 km^2	2
BLOCK 62*	2250 km^2	2*
BLOCK 63	2925 km^2	3
BLOCK 64	1475 km^2	1
BLOCK 65	1925 km^2	2
BLOCK 65A	950 km^2	1
BLOCK 66	2050 km^2	2
BLOCK 66A	875 km^2	1
TOTALS	15,000 km^2	15

* Excluding Nkuruman Forest portion in Narok District.

If during the first two years of hunting at this level it became evident that leopards are more plentiful than I suspect and could withstand a higher offtake, the quota could be raised to the same level as that for Narok: 1 adult male/500 km^2/annum. But it should not be allowed to exceed 1/250 km^2.

In the forest blocks on Mount Kenya and the Aberdares I suggest that a quota of 1 adult male/250 km^2/annum would be reasonable initially. This assumes a density of 1 adult male/25 km^2 or 1 leopard/7 km^2. These quotas should be maintained for the first

HUNTING BLOCK	AREA	QUOTA (adult males/annum)
BLOCK 80	175 km^2	1
BLOCK 81	650 km^2	3
BLOCK 82	700 km^2	3
BLOCK 74	400 km^2	2
BLOCK 75	250 km^2	1
BLOCK 76	550 km^2	2
BLOCK 77	375 km^2	1
BLOCK 78	425 km^2	2
BLOCK 79	250 km^2	1
TOTALS	3,775 km^2	16

two years. They could be raised later if the leopard populations prove large enough but the offtake should not exceed 1 adult male /150 km^2/annum.

For Samburu District I suggest an initial quota of 1 adult male/500 km^2/annum confined to Block 51 (i.e. 51, 51A, 51B) and excluding an area of about 700 km^2 within a 15 km radius of Maralal. This circle would include the Maralal Game Sanctuary and protect the leopards living in the vicinity of the Safari Lodge, where they are baited for photographic tourism. Block 51 covers approximately 4,575 km^2 or 3,875 km^2 excluding the sanctuary zone and at the suggested quota should be able to withstand an offtake of 8 leopards a year. This could be increased if after two years of offtake at this rate it becomes obvious that leopards are sufficiently numerous to justify an increase. In time leopard hunting could possibly be extended to adjacent blocks in Samburu, but I doubt if this could be contemplated much before 1990.

For Laikipia, where most of the land is privately owned, I suggest that Block 67 (1075 km^2) could be reopened to leopard hunting on an experimental basis with an initial quota of 2 (1/500 km^2). What happens on the ranches is largely up to the owners because Section 31 of the Wildlife (Conservation and Management) Act (1976) gives them the right to kill any game animal causing material damage or loss to the land or to any crop or stock thereon. However, I suggest that a quota of 9 leopards a year for the whole of the rest of the district (8643 km^2 @ 1 adult male/1000 km^2) would be reasonable initially. Exactly how leopards on the quota would be distributed would depend upon the wishes of the landowners: not all would necessarily be in favour of allowing any leopard shooting on their land, while others would be delighted.

I hope these figures provide a useful guide for the possible resumption of leopard hunting in Kenya. They can be revised upwards (likely) or downwards (less likely) as experience dictates, but they provide a starting point for setting quotas. How realistic they actually are can only be determined by trying them out, for, as I have said earlier, there is no better way of assessing leopard populations than by baiting and hunting. But only if the resumption of hunting is initially restricted to professional hunters of proven experience and integrity will it be possible to obtain such assessments. The opinions of game wardens are, I believe, of less significance because nowadays most wardens devote more time to administration than to safari in the bush, particularly on foot, and are so often transferred and reshuffled that they do not have the time to get to know their districts properly; some of the replies received in the questionnaire survey showed how out of touch some of them are. Nevertheless I believe that the annual setting of quotas should be done by a joint committee of senior Wildlife Department officers and suitable representatives from a revived Professional Hunters Association. But it must be a genuinely co-operative exercise if it is to work.

6.7.5. For how much?

At the time of the hunting ban in 1977 the special licence and controlled area fees for a male leopard were 1,000/- and 2,000/- respectively. When the concession system was introduced, a fee of 5,000/- which went directly to the landowner replaced the controlled area fee. How do these figures compare with those charged in other African countries where leopard hunting is permitted?

In Zambia in 1980 the supplementary licence for a leopard cost U.S. $ 660 (equivalent to K.shs. 5,870/- at the rate of shs. 8.9 to the dollar) and in Botswana 300 Pula (about K.shs. 3,300/-). In Zimbabwe in 1981 Hunters Africa were charging their clients U.S. $ 1,200 (K.shs. 10,680/-) for shooting a leopard, although this included preparation of the trophy as well as Government licence fees.

Bearing these figures in mind and taking inflation into account too, I believe it would be reasonable for the Kenya Government to charge K.shs. 12,000/- per leopard, of which 25% or 3,000/- would be a special licence fee payable to Government before the safari and 75% or 9,000/- would be payable to the landowner (whether private or corporate or county council) after the leopard has been shot. There is, however, a case for allowing a refund of the special licence fee if no leopard is shot because this would remove any temptation to shoot an animal of poor trophy quality merely to fill a licence already paid for. K.shs. 12,000/- is roughly equivalent to U.S. $ 1,350 and would not, in my opinion, be excessive. The leopard is a prime trophy and it should have an appropriate price tag in keeping not only with this status but also the fact that the species is far less common in Kenya, and Africa, than it used to be.

It is particularly important that the bulk of the revenue received from hunting a leopard should go to the landowner(s), for whom it provides handsome compensation for any losses of livestock he/they may have incurred and strong incentive to protect rather than eliminate all the leopards on that land. This especially applies to

the Masai group ranches, which are often extensive, varying in size from 35 to 1,000 km^2, and large private and commercial ranches. There is, of course, always a risk that a landowner, particularly a small one, may want all the leopards on his land eliminated by sport hunters in order to make an immediate short-term profit. But strict adherence to a block quota system should take care of this. If a stock-raiding leopard is killed on his land either by the Wildlife Department implementing control or by himself exercising his legal right to defend life and property, he would receive no 9,000/- fee and would also forfeit the trophy.

In conclusion an offtake of 48 leopards in Masailand could, at the fees suggested, bring in no less than 432,000/- p.a. to the people of Narok and Kajiado districts and 144,000/- to the Government in special licence fees. If the suggested quotas for Samburu, the mountains, and Laikipia are also fulfilled, the total amount of foreign exchange that could be brought into Kenya by the sport hunting of 83 leopards would be 996,000/- or U.S. $ 111,910 per annum. As 75% of this would go directly to the landowners (or in the case of the montane forests to the county councils) there would be a powerful financial incentive not to destroy all leopards for short term profit or predator extermination. Provided that illegal killing is kept firmly under control, some of the quotas could probably be raised after a few years, with consequent increase in revenue.

6.7.6. By whom and under what conditions?

I strongly recommend that if sport hunting reopens in Kenya it should, with the exception of bird shooting, be restricted to non-resident overseas visitors. The wildlife resource, and in particular the leopard, should be regarded primarily as an earner of foreign exchange, a commodity of which Kenya is in very short supply and great and increasing need. Foreign exchange is not gained by allowing resident hunters to kill relatively uncommon animals which could earn large amounts of dollars, pounds, francs, marks, or yen, though schemes for cropping herbivores for meat obviously form a separate and special case. Uncontrolled hunting by licensed residents, including members of the Diplomatic Corps, was one of the factors that led to the need for a hunting ban, and it should not be allowed to recur. Moreover the control of licensed sport hunting would be much easier if hunting was restricted to non-residents who would have to be accompanied by a professional hunter.

Since without the co-operation of professional hunters controlled hunting cannot work, it is essential that professional hunter's licences should be granted only to men of proven experience, integrity, and ability to attract overseas clients and who had also been members of the former E.A.P.H.A. of at least five years standing. A Kenya Professional Hunters Association should be formed and treated as a respectable professional body working in close consultation with Government. Training programmes for new hunters could be organised with its co-operation. However, the procedures for testing applicants for Assistant's Permits should be reinstated and rigorously adhered to, with no deviation whatsoever. No person should be granted a full Assistant's Permit unless he has first served an apprenticeship of at least one year and has been recommended by a joint panel of the Association, the Wildlife Department, and the Central Firearms

Bureau of the Kenya Police. It is vital that high standards are demanded and maintained. There should be no compromise on this, because the leopard, like other members of the Big Five, can be highly dangerous, and it would be irresponsible to commit foreign visitors to the care of persons not qualified to protect them in an emergency. Any professional hunter convicted of a serious offence against the Wildlife (Conservation and Management) Act should be expelled from the Association and automatically lose his hunting and firearms licences in addition to any fines or imprisonment imposed by the courts. In short, control must mean control, and the penalties must be such as to render no infraction worthwhile. In addition, control over the booking of hunting blocks should be restored, and no professional hunter should be allowed to escort more than two hunting clients at the same time. This would prevent package tour hunts of the type that started in the mid-1970s and led to disastrous overshooting.

Not more than four baits per client per hunting block should be allowed. If these fail to attract a suitable trophy male, it suggests that the area's leopard population is depleted or that the hunter does not know what he is doing. The practice before the hunting ban of putting up as many as 10-20 baits should be prohibited by law; apart from anything else it is very wasteful of the local herbivores. Furthermore no visiting hunter should be allowed to shoot more than one leopard in Kenya and no dispensation should be made for hunters allegedly collecting for 'museums'.

The shooting of female leopards should be prohibited, and in the event of a genuine mistake the trophy should be forfeited to Government, but the controlled area fee of 9,000/- would still have to be paid. Both the skull and the scrotum of any leopard shot should be preserved as evidence of age and sex and should be required to accompany the skin to the taxidermists and to the Wildlife Department for issue of an export permit.

The skin of any leopard shot by an overseas client should be required to leave the country whole and unmounted not later than 60 days after the end of the safari. Only processing for shipment, that is dipping and packing, should be allowed, and ideally this should be done by a single firm, such as the former Zimmermann's, under Government supervision. A special export permit, issued by the Wildlife Department and countersigned by the professional hunter, should be required, and sale of the trophy should be strictly forbidden in Kenya. The ban on any local dealing in leopard skins should remain in force, because there is little doubt that in the 1960s and 1970s, when there were over 400 dealers in leopard skins in Kenya ("Sunday Nation" 13/9/70), large numbers of leopards were poached specifically to supply the curio shops in the country as well as the overseas fur trade. Never again, if the leopard is to survive in Kenya in reasonable numbers, must local dealing in leopard skins be permitted.

The skins of leopards shot on control by Government officers or landowners or seized by or forfeited to Government should be disposed of in accordance with Resolution Com.3.24, on the Disposal of Confiscated or Accumulated Specimens of Appendix 1 Species. This was passed at the Third Meeting of the Parties to C.I.T.E.S. in New Delhi in March 1981 and recommends that Parties transfer specimens of Appendix 1 species to other countries only for bona fide scientific

or educational purposes and that they store or destroy excess specimens where transfer for these purposes is not practicable. Kenya is a signatory to the Convention. Whatever happens, leopard skins should not be exported for the international fur trade as this will only aggravate the leopard's status by helping to maintain demand.

6.7.7. U.S. legislation

So far as the United States Government is concerned, I recommend that it lifts its present ban on the importation of leopard trophies legitimately shot in Africa by American sport hunters. This could be achieved by declaring the leopard "threatened" rather than "endangered", while at the same time keeping it on Appendix 1 of C.I.T.E.S. This is what the U.S. Fish and Wildlife Service has proposed, and I support it. The ban on importing the legitimately acquired trophies of sport hunters has not, in my opinion, served any useful purpose. The number involved has been relatively small and the ban runs counter to the concept of giving the leopard monetary value that will help to justify its continued existence in Africa.

If the U.S. Fish and Wildlife Service wants safeguards to ensure that lifting of the ban does not open the door to abuse, the following measures could be considered to supplement any controls, or lack of them, in Africa.

1. The U.S. Government should insist on the production to U.S. Customs by the American sport hunter of a copy of the hunting licence and a valid export permit from the country in which his leopard was shot. No skin or trophy unaccompanied by such permits should be allowed into the United States.

2. The Fish and Wildlife Service should issue, either in Washington or through U.S. embassies in Africa, a non-reuseable seal to every American hunter proposing to shoot a leopard in Africa, as suggested in Teer & Swank (1977). The seal should be numbered, with no two seals bearing the same number, and an import permit endorsed with that number should be issued with it. These would be given to the hunter before his safari and would have to be returned to the Service if he failed to shoot his leopard. No seal or permit should be issued more than once; those returned unused should be destroyed. If, however, the hunter succeeded in obtaining his leopard, the seal should be attached to the skin before leaving Africa and its number should be endorsed on the export permit issued in Africa. No trophy unaccompanied by the correct seal and import permit should be allowed into the United States.

3. Seized skins and trophies should be disposed of by the Service in accordance with Resolution Com.3.24. of C.I.T.E.S. Destruction would be preferable to accumulation.

I believe these safeguards would be sufficient to prevent possible abuse by American sport hunters or other persons. Abuse by sport hunters is unlikely because a sportsman paying a large amount of money to go hunting in Africa almost invariably wants to keep his trophies as souvenirs; he is unlikely to sell his leopard skin to the fur trade as, apart from anything else, he would make a loss by so doing. Nevertheless there should be safeguards, if only to prevent other persons from taking advantage of relaxation of the ban. I believe few American hunting clients would object to their implementation

If the reasons are adequately explained and the measures are introduced tactfully and efficiently.

If other countries in Europe and Asia could be persuaded to adopt the same policy as the United States the leopard's future in Africa would be more secure.

6.7.8. The problem of stock-raiders

The time has finally come to deal with the vexatious problem of what to do with marauding leopards in Kenya. Total extermination may be the answer in Nyanza but it is not the solution elsewhere. Kenya's national parks cover only 4.5% of the country and if the leopard is to survive in any number it must co-exist with man in the other 95.5% inhabited and used by man. Most leopards probably never touch livestock or else do so only occasionally, but some become persistent stock-raiders and must be tackled dispassionately.

In view of the failure of translocation (Chapter 3) only one realistic solution remains: to kill them. This can be achieved either by poisoning or by shooting them. I am not in favour of poison or any form of snare or jawed gin trap because of the cruelty involved and because other, innocent, animals are likely to suffer. If a leopard has to be killed it should be killed quickly and cleanly with a single shot. It can either be shot over its kill or on a bait or it can be trapped in a box trap and shot in the trap. This recommendation may be controversial but it is rational; and wildlife conservation and management in the 1980s must rest on a rational basis if it is to work at all.

In theory the best solution if Kenya's hunting ban is lifted would be to allow visiting sportsmen accompanied by a competent professional hunter to shoot a stock-raider over a kill or bait; the sportsman would obtain his trophy and the landowner would benefit from the removal of the stock-raider and payment of the 9,000/- hunting fee. In practice there are several problems.

First, not all hunting clients are good shots and there would always be the risk of a farm ending up with a wounded and therefore dangerous leopard. The presence of a professional hunter would, however, be a safeguard and the heavy responsibility of finishing off a wounded leopard would remain with him.

Secondly it is not always possible to be sure exactly which leopards are stock-raiders and which are innocent. If stock-raiding leopards are declared 'open game' in any part of the country, many innocent leopards would be killed as the possibilities for abuse are enormous and the difficulties of exercising control are formidable. I therefore suggest that to start with only Laikipia District, apart from the other areas I have designated, should be made available for the hunting of stock-raiders. I also suggest that, unlike the other areas, the hunting of leopards in Laikipia should initially be restricted to known or strongly suspected stock-raiders. The landowners, however, would have the final say and it would be up to the Wildlife Department to consult them and the professional hunters in working out the details of a practicable scheme.

Thirdly, persistent stock-raiders can become remarkably cunning and unpredictable, and it would often be difficult to synchronize the presence of a non-resident hunter and professional with

the best opportunity for getting a particular leopard. Professional hunters plan their safaris months in advance and might find it difficult to disrupt an itinerary to take advantage of an opportunity suddenly offered elsewhere. In the days of controlled hunting, however, there used to operate a system in which game wardens notified professional hunters of the existence of problem animals, such as rogue elephant or rhino, in certain areas, and because of the close co-operation between hunters and the Department it worked reasonably well. If the system could be resusciated it would be easier to operate now as virtually all professional hunters are in radio contact with the outside world and there might be hunters and clients who could take advantage of it; Laikipia is, after all, in the very centre of Kenya and a good hunting area in its own right.

If no hunting party is available at the crucial time and the offending leopard continues to take an unacceptable toll, the landowner would have no alternative but to exercise his legal right under Section 31 of the Wildlife (Conservation and Management) Act to kill the animal himself or to call upon assistance from the Wildlife Department. If the marauder is successfully killed by either the landowner or the Department the landowner would not receive any 9,000/- hunting fee but would be relieved of the cause of his problems, which is usually all he asks. The skins of leopards killed in this way should be surrendered to Government for the reasons given earlier and disposed of in accordance with C.I.T.E.S., preferably by destruction as experience has shown that not all members of the Department can be trusted with leopard skins. Indeed the landowner should be required to report the killing of any leopard on control on his land to the Director's Office in Nairobi and the warden to whom the skin is surrendered should be required to produce it at Wildlife Department Headquarters.

Finally, only in Nyanza Province, and to a lesser extent Laikipia, where leopard hunting should be regarded primarily as a control measure should the rules and conditions outlined earlier be relaxed. In Nyanza, for example, the taking of adult females could be permitted and the landowner's shooting fee could be reduced from 9,000/- to a nominal 1,000/-, because the policy there should be one of reduction and eventual elimination of the leopard population. Moreover there would need to be incentive to encourage sport hunters to go to the densely populated and relatively unappealing parts of western Kenya for their leopards. In Laikipia, which is more central and situated in attractive country where there is plenty of good hunting, such an incentive would not be necessary. The landowner should receive the full fee of 9,000/- for any leopard shot by a visiting hunter and the shooting of an adult female should be permitted if there are reasonable grounds for believing she has been stock-raiding. In the rest of the country the rule should remain: only adult males.

6.7.9. Conclusion

In conclusion my proposals for the reopening of leopard hunting could restore to the species real monetary value, at first just in certain areas but later, hopefully, throughout Kenya's rangelands. Private and corporate ranchers, including the owners of the group ranches that are rapidly coming into existence in pastoral areas, are

unlikely to try to eliminate all leopards from their land when the value to them of each adult male could be 9,000/-, beside which the occasional loss of a few sheep or goats pales into insignificance. In effect the leopard would become an honorary addition to their livestock and its future would then be more secure.

Finally, all the suggestions and recommendations made above on the subject of reopening leopard hunting hinge on one crucial condition. That is that if hunting reopens in Kenya it will be done properly, and not as in the 1970s. There must be an honest and effective system of controlled hunting in which professional hunters, landowners, and the Wildlife Department co-operate. The appalling abuses that took place before the hunting ban must not be allowed to recur. If they do recur, all the suggestions I have made above will be invalidated and I would recommend instead THAT THE HUNTING OF LEOPARDS IN KENYA REMAIN CLOSED.

This would be bad for the conservation and management of the leopard; bad for the status of the species; bad for the landowners and nomadic pastoralists who lose livestock to leopards; bad for Kenya's capacity to earn foreign exchange and to provide employment for her people; and last but not least bad for the reputation of the Wildlife Conservation and Management Department and the Kenya Government. It would signify a total failure of wildlife conservation and management and an indictment of the country's inability to manage its natural resources on anything other than a 'magendo' (corruption and racketeering) basis. We can only hope that events will prove otherwise.

But one thing is certain. The future of the leopard - and all wildlife - in Kenya will depend upon the outcome.

CHAPTER 7

CONSERVATION AND MANAGEMENT OF THE LEOPARD IN KENYA

A POLICY

The formulation of policy is the prerogative of Government and it is not my intention to usurp this. I believe, however, that constructive suggestions for a policy to conserve and manage the leopard in Kenya may be useful. I have in the preceding chapters discussed various aspects of this such as translocation, sport hunting, game-viewing tourism, and the problem of stock-raiding. The purpose of this chapter is to draw all these together into a coherent policy, with a few additional recommendations that have not yet been made.

The basic question that the Government must decide is what it wants. Does it want to eliminate all predators, including the leopard, as a menace to life and limb and a negative influence on livestock development? If it does, much of what follows in this chapter will be irrelevant. But two predictions can be made. One is that no matter how hard it tries, the Government would probably not be able to exterminate the leopard in Kenya; enough would always remain to cause problems somewhere at some time. Secondly, the near-annihilation of leopards would undoubtedly increase the problems arising from crop-raiding by herbivorous vermin. For although I said in Chapter 1 that I believe the leopard's role in controlling the numbers of baboon and pig has been exaggerated, leopards do prey upon them and do therefore reduce their numbers to some extent. I, for one, am not surprised that some of the shrillest complaints of crop-raiding by these animals currently come from Ukambani, where leopards have been so assiduously persecuted over the years. Leopards do have a role in the balance of nature and their removal from the equation can only be expected to unbalance it. But while conceding that leopards do sometimes kill livestock, I have shown in Chapter 4 that their depredations in Kenya as a whole are not of great importance; they certainly do not justify a country-wide campaign of attempted extermination. What we need to decide is whether or not the losses of livestock to leopards could be offset by the positive economic value of the species in Kenya. I suggest they could be and that a policy of attempted extermination would be short-sighted, counter-productive, and irresponsible.

I suggest that what we want instead is a policy to conserve the leopard to the maximum benefit to the people of Kenya while at the same time minimising its depredations on livestock. This will require some changes of attitude, both in and out of Government. First, it will require a greater appreciation of the potential value of the species to the country as a whole, especially to landowners, and much less tolerance of illegal killing and dealing in skins, both of which should be severely punished. Secondly, and perhaps paradoxically, it will require a more realistic approach to the management of stock-raiders. If we want to conserve the leopard we must accept that some leopards will abuse our forbearance by killing livestock. Those that do so persistently must be dealt with. And as translocation has been shown to be largely futile, this means killing them, preferably

by the bullet. This may be controversial, especially overseas amongst people who do not have the leopard as a predatory neighbour, but provided that the practice is not abused by becoming the basis for another leopard skin racket, it should be seen as rational and acceptable. With these points in mind I suggest the following as a policy for conserving and managing the leopard in Kenya; most of them apply equally well to the cheetah.

1. I RECOMMEND THAT THE KENYA GOVERNMENT SHOULD EFFECTIVELY CONSERVE THE COUNTRY'S FORESTS AND WILDLIFE OUTSIDE AS WELL AS INSIDE THE NATIONAL PARKS AND RESERVES.

   This study has indicated that more than 80% of Kenya's leopards live outside the national parks and reserves and that their most important habitat is the indigenous forest which is disappearing so fast. If the species is to be conserved, its habitats must be preserved as well as the wildlife on which it feeds. This has important implications for management as well as for conservation, because if the leopard's natural habitats and prey are not conserved, the species will inevitably be forced into greater conflict with man, as is happening now in western Kenya. The same applies to the lion and cheetah. In fact data from a Masai ranch in Kajiado District have shown that whereas losses of livestock to predation amounted to only 1% each year with wild prey available, they rose to 12% with no wild prey available and, even after accounting for grassland resources taken by wild herbivores, the results still justified a joint wildlife/livestock operation (Myers, pers.comm.). In other words, if you want to avoid or minimise trouble from stock-raiding carnivores, don't kill all their natural prey!

2. I RECOMMEND THAT THE KENYA GOVERNMENT DISCONTINUES THE TRANSLOCATION OF LEOPARDS AND OTHER CARNIVORES AS A CONSERVATION AND MANAGEMENT POLICY FOR THE REASONS GIVEN IN CHAPTER 3.

   This needs no further elaboration.

3. I RECOMMEND THAT PERSISTENT STOCK-RAIDING LEOPARDS AND OTHER CARNIVORES BE SHOT, AS SUGGESTED IN CHAPTERS 3 & 6.

   Occasional stock-raiders should be left in peace if possible, with drastic measures taken only against persistent marauders. The number of persistent stock-raiders that would be shot each year under this policy should not be sufficient to affect the status of their species in the country as a whole, but careful records should be kept so that the situation can be monitored. In this regard it is disconcerting to find that some game stations (e.g. Nyahururu and Nanyuki) do not keep records and that even the Game Department/Wildlife Department Headquarters has not published an annual report for 16 years.

4. I RECOMMEND THAT THE KENYA GOVERNMENT REOPENS THE CONTROLLED SPORT HUNTING OF LEOPARDS TO NON-RESIDENT HUNTERS ALONG THE LINES SUGGESTED IN CHAPTER 6.

5. I RECOMMEND THAT THE KENYA GOVERNMENT REQUIRES THE MANUFACTURERS OF THE POISONOUS ACARICIDES USED TO KILL LEOPARDS TO INCORPORATE AN ADDITIVE THAT MAKES THE LIQUID DISTASTEFUL TO ANIMALS.

When the toxaphene poison 'Coopertox' was first introduced as a cattle dip, many dogs on farms died from drinking it. Since then it has been used extensively to poison predators, as Chapter 4 showed. As long ago as 1972 the East African Wildlife Society asked the manufacturers if they could incorporate a distasteful additive but was told that although it could be done it would add to the cost of the product. I believe the Kenya Government should request the inclusion of an additive despite the expense; if the manufacturers fail to comply they could easily be compelled to do so because 'Coopertox' and similar compounds are made in Kenya. Commercial firms should be required to operate responsibly as well as profitably.

6. I RECOMMEND THAT THE KENYA GOVERNMENT'S BAN ON THE EXPORT OF LEOPARD SKINS (LN 181 of 21/8/79) SHOULD BE REVISED:

   i) TO TOTALLY PROHIBIT THE EXPORT OF LEOPARD AND CHEETAH SKINS FOR ANY COMMERCIAL PURPOSE;
   ii) TO ALLOW A LEGITIMATELY LICENSED NON-RESIDENT SPORTSMAN TO EXPORT TO HIS COUNTRY OF ORIGIN THE SKIN OF A LEOPARD LEGALLY SHOT BY HIM IN KENYA.

7. I RECOMMEND THAT THE KENYA GOVERNMENT CONTINUES TO PROHIBIT INDEFINITELY ALL LOCAL DEALING IN LEOPARD AND CHEETAH SKINS ANYWHERE IN KENYA.

It should be illegal for any person to sell leopard or cheetah skins to any other person inside or outside the country, no matter when or how those skins were originally obtained. Transfer of the ownership of trophies in legal possession by way of gift should continue to be subject to the provisions of Section 44 of the Wildlife (Conservation and Management) Act of 1976. The skin of any leopard shot by a licensed non-resident hunter should leave the country whole and unmounted within 60 days of the end of the safari and should be dipped and packed by a single firm of taxidermists under Government supervision.

8. I RECOMMEND THAT THE KENYA GOVERNMENT DISPOSES OF THE SKINS OF LEOPARDS AND CHEETAH SHOT ON CONTROL OR SEIZED FROM POACHERS, IN ACCORDANCE WITH RESOLUTION COM.3.24, OF THE CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES, TO WHICH KENYA IS A SIGNATORY.

This would prohibit their onward transmission to the international fur trade, a trade that should not be given any encouragement by Kenya or other African countries. Ideally these skins should be destroyed.

9. I RECOMMEND THAT THE KENYA GOVERNMENT NOT ONLY ENFORCES THE LAWS THAT ALREADY EXIST BUT ALSO AMENDS SECTION 56 OF THE WILDLIFE (CONSERVATION AND MANAGEMENT) ACT (1976) AS FOLLOWS:

   1) TO SPECIFY A MINIMUM PENALTY FOR AN OFFENCE COMMITTED IN RESPECT OF A PROTECTED ANIMAL (e.g. the cheetah) OR AN ANIMAL MENTIONED IN PART 1 OF THE FIRST SCHEDULE TO THE ACT (e.g. the leopard), SUCH PENALTY TO BE NOT LESS THAN MANDATORY IMPRISONMENT FOR A TERM OF THREE YEARS WITHOUT THE OPTION OF A FINE. FORFEITURE OF ANY VEHICLE, WEAPON, OR THING USED IN CONNECTION WITH THE OFFENCE SHOULD BE MANDATORY, AND SECTION 56(2), WHICH EMPOWERS COURTS TO INFLICT ADDITIONAL PUNISHMENT IN RESPECT OF EACH ANIMAL OR TROPHY AFTER THE FIRST, SHOULD ALSO BE MADE MANDATORY.

2) TO MANDATORILY DOUBLE THE MINIMUM PENALTY FOR OFFENCES IN RESPECT OF THESE SPECIES COMMITTED IN A NATIONAL PARK OR NATIONAL RESERVE OR IF THE OFFENDER HAS PREVIOUS CONVICTIONS UNDER THE WILDLIFE (CONSERVATION AND MANAGEMENT) ACT WITHIN THE PRECEDING FIVE YEARS.

3) TO MANDATORILY TREBLE THE MINIMUM PENALTY FOR RECIDIVIST OFFENCES IN RESPECT OF THESE SPECIES COMMITTED IN NATIONAL PARKS OR NATIONAL RESERVES OR IF THE OFFENDER IS A GOVERNMENT OFFICIAL OR EMPLOYEE.

There is a great need not only for enforcement of the law but also for the introduction of new provisions, as the unprecedented commercial poaching of elephant and rhino since the introduction of the Act in 1976 has demonstrated. Like the leopard these were Schedule 1 Part 1 species but the law has provided them with negligible protection (i) because it has not been enforced properly, and (ii) because the courts have often imposed derisory penalties. To give but one example, a man convicted of illegally killing a rhinoceros in Meru District in 1979 was fined the awesome sum of 10/- (ten shillings) or U.S. $ 1.10. Sentences such as this, although the Act provides for maximum penalties of a fine of 40,000/- or imprisonment for up to ten years or both such fine and imprisonment, bring the Government and the law into disrepute and thoroughly demoralise the Anti-Poaching Units. If the courts are not willing to impose sensible penalties for serious game offences, they must be made to do so by amendment of the law, as suggested in Proposal 1. There should be no option of a fine because commercial poachers and trophy dealers are usually so wealthy that they can pay even the largest of fines without any difficulty.

Proposals (2) and (3) are, I believe, equally important. They are not creations of my own but are drawn directly from the law of the Central African Republic, a country which has also been badly afflicted by poaching in the national parks and poaching by government officials. The Central African Government has recognised that special offences require special punishment and has set an example which other African countries might do well to emulate.

The greatest need in Kenya, however, is for impartial enforcement of the law. For no matter how draconian the penalties are, unless offenders can be brought to court in the first place and convicted without the case being dropped, all is futile. If Kenya is serious about conserving and managing its wildlife for the benefit of the country as a whole, the Government must demonstrate this by enforcing its own laws.

In conclusion I believe that if these recommendations are implemented there will continue to be a future in Kenya for both the leopard and the cheetah: as part of the country's natural and cultural heritage, as contributors to the balance of nature, and as economic assets to the people of Kenya. It will be greatly to the country's credit if Kenya can successfully conserve and manage these spectacular animals for posterity. I wish her success.

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APPENDIX 1

KENYA LEOPARD SURVEY

QUESTIONNAIRE FOR WILDLIFE DEPARTMENT WARDENS

1. DO STOCK-RAIDING LEOPARDS PRESENT ANY PROBLEM IN YOUR AREA?

☐ YES ☐ NO (Please tick)

IF 'YES' DO THEY PRESENT:

☐ A MINOR PROBLEM?

☐ A MAJOR PROBLEM?

IF 'MAJOR', PLEASE ELABORATE (For example, what type of livestock are they killing and in what numbers?):

2. DO ☐ LIONS PRESENT PROBLEMS IN YOUR AREA?

☐ HYAENAS

☐ CHEETAHS

☐ WILD DOGS

☐ JACKALS

IF 'YES', DO THEY DO ☐ MORE DAMAGE THAN STOCK-RAIDING LEOPARDS?

☐ LESS DAMAGE THAN STOCK-RAIDING LEOPARDS?

3. HAVE YOU HAD ANY CONFIRMED REPORTS OF MAN-EATING LEOPARDS (OR ANY ATTACKS BY LEOPARDS ON HUMANS) IN YOUR AREA DURING THE LAST THREE YEARS?

☐ YES ☐ NO

IF 'YES', PLEASE GIVE DETAILS:

4. HAVE ANY LEOPARDS HAD TO BE KILLED ON CONTROL OR TRAPPED ALIVE IN YOUR AREA IN THE LAST THREE YEARS?

☐ YES ☐ NO

IF 'YES', PLEASE GIVE NUMBERS BELOW:

YEAR	KILLED			TRAPPED		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL

5. HAVE ANY LEOPARDS TRAPPED ALIVE IN YOUR AREA IN THE LAST THREE YEARS BEEN SENT TO OTHER AREAS (SUCH AS NATIONAL PARKS AND GAME RESERVES) FOR TRANSLOCATION AND RELEASE OR TO THE ANIMAL ORPHANAGE IN NAIROBI?

☐ YES ☐ NO

IF 'YES', PLEASE GIVE DETAILS BELOW:

SEX*	DATE CAUGHT**	PLACE CAUGHT***	DISPOSAL****

Notes:
* It is assumed that all animals are adult unless otherwise stated,
** Month and year are sufficient,
*** Please give name of farm or ranch if known,
**** Please say where leopard was sent for release (which national park or game reserve) or if it was sent to the Orphanage in Nairobi.

6. WHAT DO YOU BELIEVE IS THE PRESENT STATUS OF LEOPARDS IN YOUR AREA?

☐ NONE
☐ RARE
☐ MODERATE NUMBERS
☐ PLENTIFUL
☐ VERY PLENTIFUL

SIGNED: _____ (NAME)

_____ (GAME WARDEN/DISTRICT)

_____ (DATE)