

CHAPTER 3

areas where they have exterminated or to augment depleted wild populations. However, Pettifer (1981 b) further adds that when cheetahs are released to an area where cheetahs already occur, the problem of clashes between Smuts (1982) records that there is an increase in the volume of wild animal traffic throughout the world. Animals from overstocked areas are being captured and being sold to zoos, private nature reserves, commercial game farms or are being moved to understocked areas. Endangered animals are being moved to new areas where their numbers can increase and, once the threat to their survival has passed, re-introduced into their original range (Smuts 1982).

On the conservation of rare large African mammal species, Eltringham (1979) writes that one of three options is to translocate the animals from where they are in danger to a place of safety. Eltringham (1979) further writes that translocation works well where there are secure sanctions whose ecological conditions are suitable for the rare animal in question but that territorial animals, e.g. lions, are notoriously difficult to move to areas already containing a resident population as there could be problems of intra-specific aggression.

Summarizing the relatively little published conclusions on the translocation of wild African carnivores is a debatable topic. Pettifer (1981 b) suggests that it would be of an advantage to possibly relocate captive-bred cheetahs to

areas where they have been exterminated or to augment depleted wild populations. However, Pettifer (1981 b) further adds that when relocating cheetahs to an area where cheetahs already occur, the problem of clashes between resident cheetahs and introduced cheetahs is likely.

Writing on the translocation of problem lions from one area to another or removing lions that threatened stock or human lives, Smuts (1982) felt that capture and translocation was a more acceptable alternative to killing.

In Kenya (Hamilton 1981) it is management policy to move trapped stock-raiding carnivores to other areas instead of shooting them and by so doing aim to achieve a conservation policy of helping to restock populations that have been depleted.

Wrogemann (1975) is clearly against the translocation and release of wild cheetahs into game reserves where resident cheetahs already occur writing that this action could lead to an artificially high density of cheetahs, disease and the jeopardy of the entire resident population.

Summarizing the relatively little published conclusions on carnivore translocations, Hamilton (1981) found that few translocations were successful and that most reported failure after failure. Most translocated animals moved

large distances from the release site, often moving towards their point of origin, and often turned to stock-raiding or otherwise were destroyed by man. The conclusion drawn is that the translocation of carnivores is seldom successful (Hamilton 1981).

This part of the study deals with the translocation of wild cheetahs to an area already containing resident cheetahs and, while aiming to obtain more information on cheetah biology, to supplement the published conclusions of carnivore translocations.

MATERIALS AND METHODS

After the marking operation, the cheetahs were transported. On arrival from South West Africa, six adult cheetahs, four males and two females, were held under observation at Hartbeeshoek, Pretoria, for six weeks. Here they were treated for mange and infectious feline enteritis. Thereafter they were moved to the Timbavati Private Nature Reserve where they were held in quarantine for nine weeks. The cheetahs were held in Timbavati as the Klaserie Private Nature Reserve did not have a suitable quarantine enclosure.

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Prior to release, while in the quarantine enclosure, each cheetah was anaesthetized and marked with an ear tag and either fitted just with a coloured collar or with a coloured

radio-collar (Table 2). Each animal was anaesthetized using 700mg of ketamine hydrochloride (250mg/ml Ketamine, Parke Davis) together with 20mg 4 per cent xylazine hydrochloride (Rompun, Bayer).

Table 2: Ear position, colour of ear tag and colour and

The cheetahs were darted in quick succession and due to the amount and the haste of marking neither times to anaesthesia nor times to recover were recorded.

Transvaal Lowveld, February 1979

The largest male and the two females were fitted with radio-collars as it was expected that the females, once released, would move alone and that the males would stay together (Pettifer pers. comm.).

After the marking operation, the cheetahs were transported to their release site in the Klaserie Private Nature Reserve (Fig. 3) where they were held overnight to ensure complete recovery from the effects of the drugs. The following morning they were released.

The project was initiated with the cheetah release on 18

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Table 2: Ear position, colour of ear tag and colour and type of collar fitted to each of the six translocated cheetahs prior to their release in the Klaserie Private Nature Reserve, Eastern Transvaal Lowveld, February 1979.

CHEETAH NUMBER	SEX	EAR TAG		COLLAR	
		Ear	Colour	Colour	Type
1	Female	Right	Green	Red	With radio
2	Female	Right	Orange	Green	With radio
3	Male	Left	Orange	Orange	With radio
4	Male	Left	White	Blue	Without radio
5	Male	Left	Yellow	Black	Without radio
6	Male	Left	Green	Purple	Without radio

Release site
 Date and location of female 1
 Accompanied by male 3
 Date and location of dead female 2

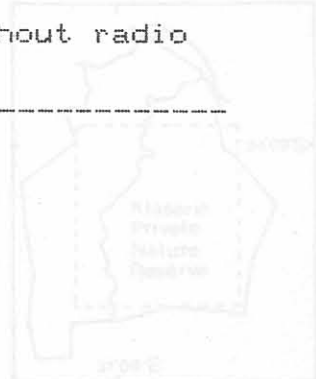


Figure 31: Dates and locations of female cheetah 1 and the date and location where female cheetah 2 was located dead in the Klaserie Private Nature Reserve, Eastern Transvaal Lowveld, after their release in the Klaserie Private Nature Reserve, February until June 1979. The insert shows the portion of the Klaserie Private Nature

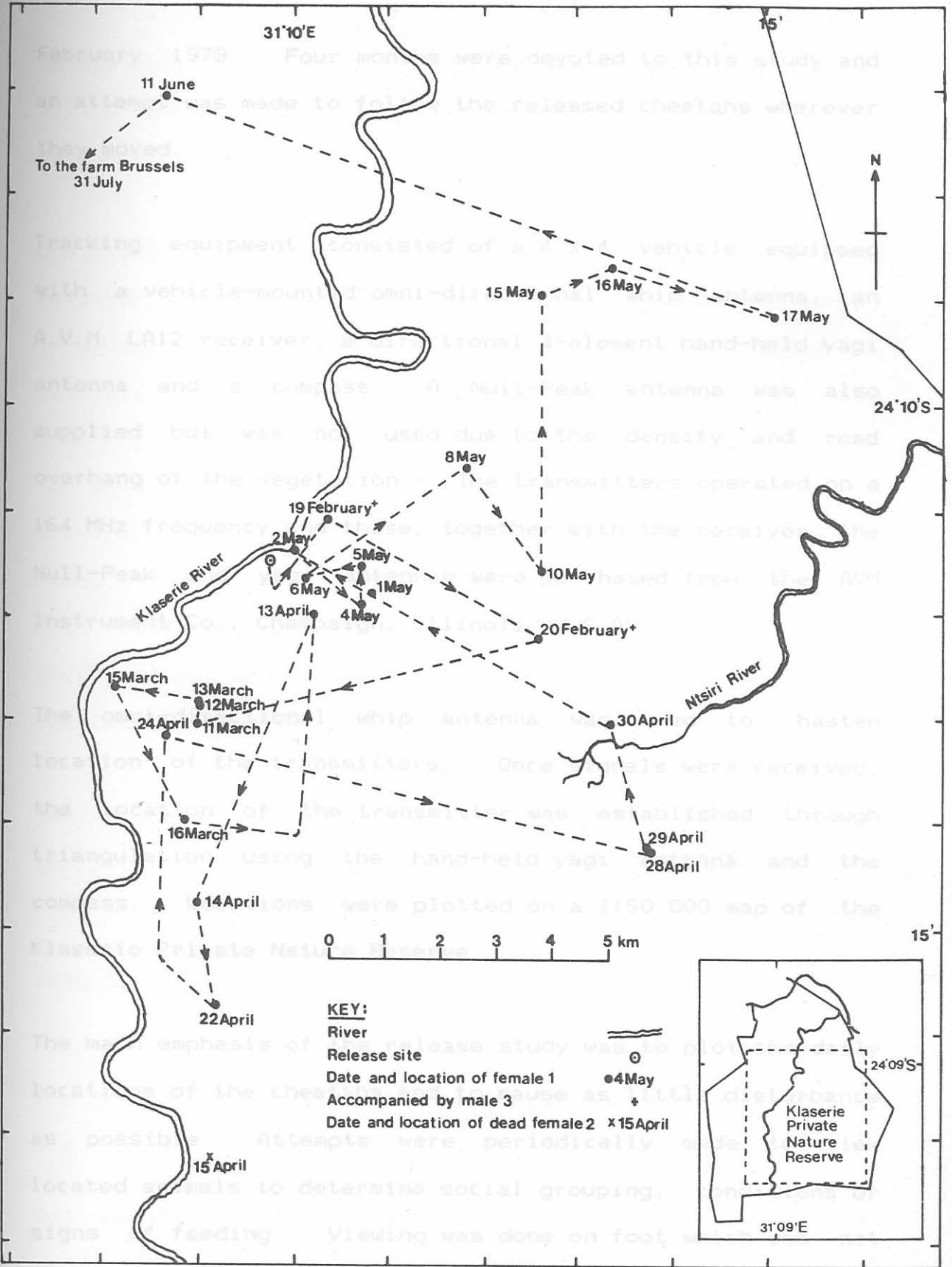


Figure 3: Dates and locations of female cheetah 1 and the date and location where female cheetah 2 was located dead in the Klaserie Private Nature Reserve, Eastern Transvaal Lowveld, after their release in the Klaserie Private Nature Reserve, February until June 1979. The insert shows the portion of the Klaserie Private Nature Reserve covered by the figure.

February 1979. Four months were devoted to this study and an attempt was made to follow the released cheetahs wherever they moved.

Tracking equipment consisted of a 4 X 4 vehicle equipped with a vehicle-mounted omni-directional whip antenna, an A.V.M. LA12 receiver, a directional 4-element hand-held yagi antenna and a compass. A Null-Peak antenna was also supplied but was not used due to the density and road overhang of the vegetation. The transmitters operated on a 164 MHz frequency and these, together with the receiver, the Null-Peak and yagi antennae were purchased from the AVM Instrument Co., Champaign, Illinois, U.S.A.

The omni-directional whip antenna was used to hasten location of the transmitters. Once signals were received, the location of the transmitter was established through triangulation using the hand-held yagi antenna and the compass. Locations were plotted on a 1:50 000 map of the Klaserie Private Nature Reserve.

RESULTS AND DISCUSSION

The main emphasis of the release study was to plot the daily locations of the cheetahs and to cause as little disturbance as possible. Attempts were periodically made to view located animals to determine social grouping, conditions or signs of feeding. Viewing was done on foot which was not always successful as the animal being approached at times

became aware of observers first and moved away. The nature of the terrain, density of the vegetation in places and the resulting noise prohibited the use of a vehicle for viewing.

As the carcass had already decomposed, the cause of her death was not determined. One drawback was that of having only one vehicle, driver and receiver. While attempting to track one animal, the others invariably moved around and days were often wasted in relocating the other cheetahs. When radio-tracking more than one recently relocated animal, which would be expected to move considerable distances, at least two vehicles, drivers and receivers should be used, depending on available funds. Aerial tracking could also be considered. During the release study, an assistant was not always available which slowed down the tracking and the viewing of released cheetahs on foot was not attempted alone.

The failure to locate her earlier, either alive, at the time of her death, was not due to faulty tracking equipment. The tracking equipment functioned well throughout the project and the collars were all properly fitted. Three weeks prior to the carcass being located, faulty tracking equipment is excluded as a possible cause as her transmitter was functioning well when she was finally located. It is assumed that she was elsewhere until shortly before her death.

RESULTS AND DISCUSSION

The respective cheetahs will be referred to numerically in the text as in Table 2.

Cheetah 1 (female) and cheetah 3 (male) were intermittently tracked for 118 and 55 days respectively. Two months after release, cheetah 2 (female) was located dead, 10,5 km south of the release site (Fig. 3). This was not located in either the Klaserie Private Nature

the first time that she had been located since the day of the release. death of cheetah 2, most data on the relocated cheetahs were obtained from cheetahs 1 and 3.

As the carcass had already decomposed, the cause of her death is unknown and it is also not known for how long she had been dead when located. She may have been killed by a leopard as a pile of cheetah hair was found close to the carcass. Leopards are known to occasionally lick or pluck hair from their prey before feeding (Smith 1978 and Bothma and Le Riche 1984). The cheetah hair may also have marked the original site of the carcass, the carcass having been later moved by another animal. No tooth marks were found on the only cheetah visible at the release site throughout the day of the release was cheetah 4 (male). Cheetah 2 was located by radio-location in the riparian vegetation

The failure to locate her earlier, either alive, at the time of her death or soon after her death, is inexplicable. The surrounding area was tracked six times until three weeks prior to the carcass being located. Faulty tracking equipment is excluded as a possible cause as her transmitter was lost. At 17h45 cheetah 4 (male) joined cheetah 2 at the release site and, after two minutes of rubbing and snuggling, they moved northward together. Cheetahs 1 and 3 were located together and moving south at 18h15. Cheetah 5 (male) was not located on the release day.

Cheetah 1 (female) and cheetah 3 (male) were intermittently tracked for 118 and 55 days respectively. Thereafter they were not located in either the Klaserie Private Nature

Reserve or the Timbavati Private Nature Reserve again. As a result of the death of cheetah 2, most data on the relocated cheetahs were obtained from cheetahs 1 and 3.

On the fifth day after the release, cheetah 3 was seen with Social Grouping After Release

Due to a disturbance immediately after release at 08h00 on 18 February 1979, the cheetahs, which were feeding on an impala carcass put out for them at the release site, dispersed in different directions.

The only cheetah visible at the release site throughout the day of the release was cheetah 4 (male). Cheetah 2 was located by radio-location in the riparian vegetation alongside the release site where she remained for most of the first day. No radio signals were received from cheetahs 1 and 3 throughout the day at the release site.

At 17h00 on the release day, radio contact with cheetah 2 was lost. At 17h45 cheetah 6 (male) joined cheetah 4 at the release site and, after two minutes of rubbing and smelling each other, they moved northward together. Cheetahs 1 and 3 were located together and moving south at 18h15. Cheetah 5 (male) was not located on the release day.

For at least two days after the release, cheetahs 1 and 3

moved together. By the fifth day after the release, they had parted and from this day on, cheetah 1 was always alone when located.

On the fifth day after the release, cheetah 3 was seen with cheetah 4. Cheetah 6, which had moved north with cheetah 4 on the day of the release, was absent. On a further two occasions, cheetah 3 was seen in the Timbavati Private Nature Reserve with an unidentified collared cheetah which was taken to be cheetah 4. Cheetahs 2, 5 and 6 were not positively sighted after the release day. Thirteen days after the release, five cheetahs were sighted by a ranger in the south of the Klaserie Private Nature Reserve; two of these animals were collared but the colours of the collars were not identified. No transmitters were located in the area following the sighting which would have indicated the presence of cheetahs 1, 2 or 3. Cheetahs 5 and 6 may thus have joined up, if only temporarily, with three resident cheetahs. The solitary habit of cheetah 1 after the release supports the findings of other authors (Schaller 1972, Pettifer 1981 and Smithers 1983) that adult female cheetahs are normally solitary, except when mating or accompanied by cubs. Eltringham (1979) lists the cheetah as solitary whereby both sexes live alone except when young accompany the mother.

Eltringham (1979) also states that adult cheetahs of the same sex tend to be more sociable than, for example, the strictly solitary leopard.

Wrogemann (1975) noted that adult male cheetahs may join up in the wild, although this grouping may not be permanent. Pettifer (1981 b) found that three 2,5 years-old captive-bred released male cheetahs which were litter mates, showed an extremely strong group cohesion. In the present study it is unknown whether any of the translocated cheetahs were related to each other, but, while not remaining together as a group, the released male cheetahs were more sociable than the one released female cheetah. No evidence was found of adult female cheetahs being sociable as Eltringham (1979) suggests.

From tracks or sightings of resident cheetahs in the Klaserie Private Nature Reserve, of those unaccompanied by small cubs, 52 per cent ($n = 48$) were solitary, 31 per cent were in pairs, 9 per cent were in a group of three animals, 4 per cent in a group of four animals and 4 per cent in a group of five animals.

Of the resident cheetahs occurring in pairs, two instances were of animals of roughly the same size, presumably litter mates, while three instances were of animals of different size indicating either a female with her subadult offspring

or an adult male and female. No satisfactory size estimate was obtained on the remaining 10 of the 15 occasions.

Of those resident cheetahs in groups of three animals, one instance was of animals of the same size. One animal was larger than the other two animals on a second occasion, indicating a female accompanied by her young. No size estimate of animals was obtained on the remaining two of the four occasions.

No size estimate of animals was obtained of those resident cheetahs occurring in groups of four or five.

The social grouping of cheetahs, not accompanied by cubs, in the Klaserie Private Nature Reserve is similar to the social grouping of cheetahs in the Serengeti National Park (Schaller 1972) but unlike the social grouping of cheetahs in the Kruger National Park where cheetahs are more often seen in pairs or in family groups of up to eight animals (Pienaar 1969). Where cubs were known to be present (n = 8), the female cheetahs were alone with their cubs on six of these occasions. Six cubs were noted in a group but no adult was present and on the remaining occasion, two adults and four young were seen together. These findings are again similar to those of Schaller (1972) for the Serengeti, except that

in the Serengeti, other adults were never seen to accompany a female with cubs.

On the release day, cheetah 4 became mobile at 17h45 after having rested all day until this time, while cheetahs 1 and 3 were active at 18h15. Cheetah 3 was active on a further

two occasions at 19h00 and 07h00 and cheetah 1 was found

Activity patterns were determined by locating an animal in the afternoon and again the following morning, from diurnal locations, and from direct observations. Following the definition of Pettifer, de Wet and Muller (1981), an animal was considered active when it was mobile. Resting was taken as when an animal was sleeping, lying down but awake or sitting. It was not known to spend more than one day in the same place.

Cheetahs 1 and 3 were monitored intermittently for 64 hours between 09h00 and 17h00 on 27 occasions. Ninety per cent of the warmer daylight time was spent resting under shady cover, either a tree or a bush. Cheetah 1 was active on two occasions during this time period (2 per cent). On a further two occasions, cheetahs 1 and 3 were resting at 17h30 and 19h00 respectively. Resting sites chosen by the released cheetahs rarely offered a clear view of the surrounding terrain, in contrast to what was to be expected based on Smithers (1983). On one occasion during the study period a cheetah was sighted during the dark phase. This Although the released cheetahs were never monitored during hours of darkness, activity took place mainly between 17h00

and were definitely active on two occasions at 15h30 and 09h00.

On the release day, cheetah 4 became mobile at 17h45 after having rested all day until this time, while cheetahs 1 and 3 were active at 18h15. Cheetah 3 was active on a further two occasions at 19h00 and 07h00 and cheetah 1 was found with a fresh kill at 08h30, indicating earlier activity that day.

Cheetah 1 rarely spent more than one day in the same place. On one occasion only, apart from time spent with a kill, cheetah 1 spent more than one day in the same place. Cheetah 3 was not known to spend more than one day in the same place.

These results are similar to those of Pettifer *et al.* (1981) and Pettifer (1981 b) who found their study cheetahs to be active predominantly diurnally, with a definite late afternoon and early morning peak.

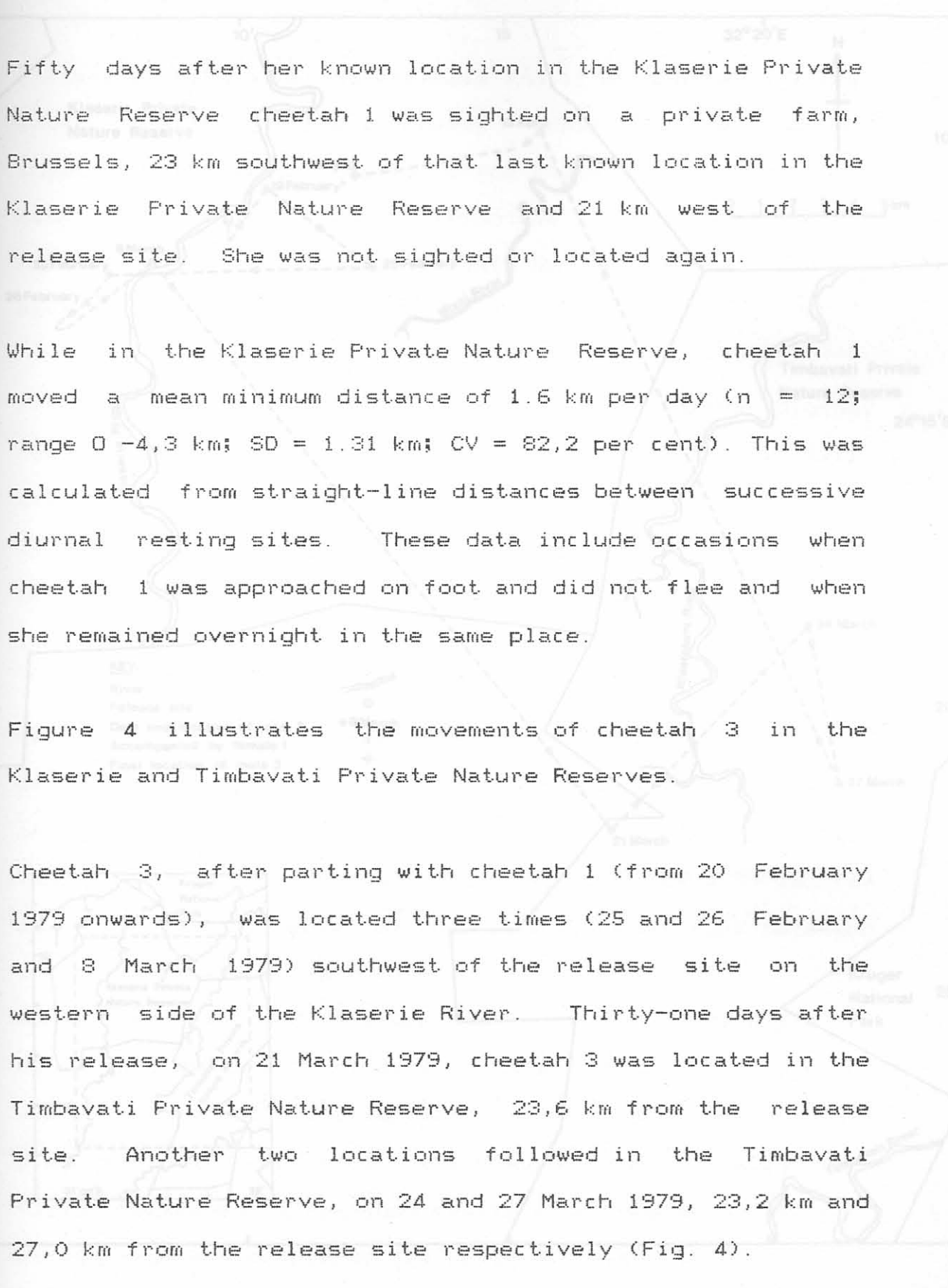
Little reliable data on the activity patterns of resident cheetahs in the Klaserie Private Nature Reserve were obtained as, when sighted, the animal concerned had normally already been disturbed. On one occasion during the study period a cheetah was sighted during the dark phase. This animal was mobile at 19h45. Resident cheetahs were definitely resting on eight occasions between 08h00 and

16h00 and were definitely active on two occasions at 15h30 and 16h00. Resident cheetahs were noted feeding at 10h30, 16h30, 10h00 and 14h30. of that last known location in the Klaserie Private Nature Reserve and 21 km west of the Pettifer *et al.* (1981) recorded relatively little cheetah activity during the dark phase and overall the results lend support to the general picture of cheetahs being largely diurnal animals (Wrogemann 1975, Myers 1976, Hamilton 1981, Pettifer 1981 b and Smithers 1983). 82,2 per cent) This was

calculated from straight-line distances between successive Movements After Release. These data include occasions when cheetah 1 was approached on foot and did not flee and when she remained overnight in the same place.

Figure 3 illustrates the movements of cheetah 1 after release in the Klaserie Private Nature Reserve. in the Klaserie and Timbavati Private Nature Reserves.

From 18 fixes in the first 77 days after the release day (until 6 May 1979), cheetah 1 was located within 8,6 km of the release site, predominantly to the south of the release site. The last six of these days (1-6 May 1979) were spent within 1,8 km of the release site. This was the longest time that cheetah 1 was recorded to spend in a relatively small area. Hereafter there is a definite northward movement away from the area previously utilized. Her last located position in the Klaserie Private Nature Reserve (11 June 1979) was 8,5 km roughly north of the release site.



Fifty days after her known location in the Klaserie Private Nature Reserve cheetah 1 was sighted on a private farm, Brussels, 23 km southwest of that last known location in the Klaserie Private Nature Reserve and 21 km west of the release site. She was not sighted or located again.

While in the Klaserie Private Nature Reserve, cheetah 1 moved a mean minimum distance of 1.6 km per day ($n = 12$; range 0 -4,3 km; SD = 1.31 km; CV = 82,2 per cent). This was calculated from straight-line distances between successive diurnal resting sites. These data include occasions when cheetah 1 was approached on foot and did not flee and when she remained overnight in the same place.

Figure 4 illustrates the movements of cheetah 3 in the Klaserie and Timbavati Private Nature Reserves.

Cheetah 3, after parting with cheetah 1 (from 20 February 1979 onwards), was located three times (25 and 26 February and 8 March 1979) southwest of the release site on the western side of the Klaserie River. Thirty-one days after his release, on 21 March 1979, cheetah 3 was located in the Timbavati Private Nature Reserve, 23,6 km from the release site. Another two locations followed in the Timbavati Private Nature Reserve, on 24 and 27 March 1979, 23,2 km and 27,0 km from the release site respectively (Fig. 4).

Figure 4: Dates and locations of male cheetah 3 in the Klaserie and Timbavati Private Nature Reserves, Eastern Transvaal, Lowveld, after his release in the Klaserie Private Nature Reserve, February until April 1979. The insert shows the portions of the Klaserie and Timbavati Private Nature Reserves covered by the figure.

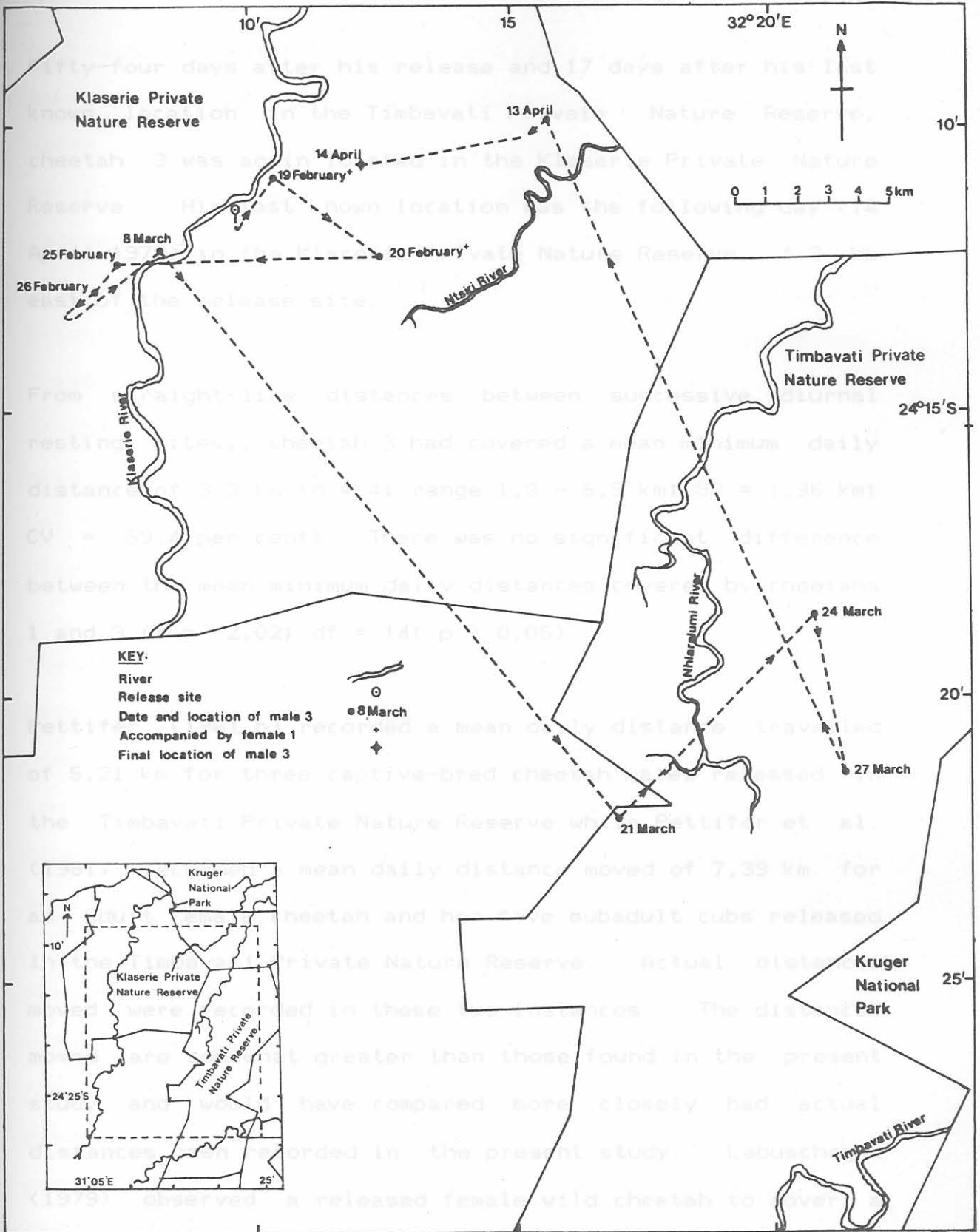


Figure 4: Dates and locations of male cheetah 3 in the Klaserie and Timbavati Private Nature Reserves, Eastern Transvaal Lowveld, after his release in the Klaserie Private Nature Reserve, February until April 1979. The insert shows the portions of the Klaserie and Timbavati Private Nature Reserves covered by the figure.

Fifty-four days after his release and 17 days after his last known location in the Timbavati Private Nature Reserve, cheetah 3 was again located in the Klaserie Private Nature Reserve. His last known location was the following day (14 April 1979) in the Klaserie Private Nature Reserve, 4,3 km east of the release site.

From straight-line distances between successive diurnal resting sites, cheetah 3 had covered a mean minimum daily distance of 3,3 km ($n = 4$; range 1,3 - 5,5 km; $SD = 1,96$ km; $CV = 59,4$ per cent). There was no significant difference between the mean minimum daily distances covered by cheetahs 1 and 3 ($t = -2,02$; $df = 14$; $p > 0,05$).

Pettifer (1981 b) recorded a mean daily distance travelled of 5,21 km for three captive-bred cheetah males released in the Timbavati Private Nature Reserve while Pettifer et al. (1981) recorded a mean daily distance moved of 7,39 km for an adult female cheetah and her five subadult cubs released in the Timbavati Private Nature Reserve. Actual distances moved were recorded in these two instances. The distances moved are somewhat greater than those found in the present study and would have compared more closely had actual distances been recorded in the present study. Labuschagne (1979) observed a released female wild cheetah to cover a straight-line distance of 174 km in 97 days.

On resident cheetahs, Wrogemann (1975) wrote that cheetahs move 3 - 5 km per day. On the Suikerbosrand Nature Reserve, South Africa, Pettifer (1981 a) recorded that the greatest straight-line distances moved by two female cheetahs between diurnal resting sites were 12,5 km and 13,8 km respectively. Tracks of resident cheetahs in the Klaserie Private Nature Reserve were followed on eight occasions. These revealed a mean minimum distance of 2,12 km per day (range 1,0 - 3,4 km; SD = 0,86 km; CV = 40,6 per cent). A mean minimum distance was calculated as the tracks could not be followed to the full and can not be compared with distances recorded by Pettifer (1981 a).

The home range size of cheetahs in the Klaserie Private Nature Reserve was not estimated as sightings and tracks of resident cheetahs were relatively few and no individual could be recognized, either by sight or by the tracks. In other areas, cheetah ranges are large (McLaughlin 1970, from Schaller 1972, Pettifer 1981 a and Smithers 1983).

Pettifer et al. (1981) further observed that the cheetah group they studied spent most of their time 5-15 km from their release site and that on only one occasion was the group further than 20 km from their release site. In the present study, from the day of the release until 14 April 1979, cheetah 3 was located, on an average, at no significantly greater distance from the release site

compared with the average distance from the release site of cheetah 1 ($t = -2,030$; $df = 16$; $p > 0,05$). Cheetah 3 was located an average of 10,8 km from the release site ($n = 10$; range 1,2 - 27 km; $SD = 9,92$ km; $CV = 92,3$ per cent) while over the same time period, cheetah 1 was located an average of 3,5 km from the release site ($n = 8$; range 1,2 - 6,1 km; $SD = 1,77$ km; $CV = 50,6$ per cent). On three occasions cheetah 3 was further than 20 km from the release site, i.e. 23,6 km, 23,2 km and 27 km away.

The study cheetahs of Pettifer *et al.* (1981) were released from their quarantine enclosure after 31 days. As explained before, the present study cheetahs were quarantined for 63 days in the Timbavati Private Nature Reserve prior to their immediate release in the Klaserie Private Nature Reserve, 16 km northwest from the quarantine enclosure. From the day of release until 14 April 1979 cheetah 1 was located an average of 15,4 km from the quarantine enclosure ($n = 8$; range 11,5 - 16,2 km; $SD = 1,72$ km; $CV = 11,2$ per cent) and cheetah 3, 13,8 km from the quarantine enclosure ($n = 10$; range 7,5 - 18,8 km; $SD = 3,82$ km; $CV = 27,6$ per cent). During the stated time period, cheetah 3 and cheetah 1 were never further than 20 km from the quarantine enclosure but neither of them were ever known to be closer than 7,5 km to the quarantine enclosure.

Hamilton (1981) describes four phases of movement of

translocated animals after release, based on a study of relocated leopards in the Meru National Park: a post-release phase, an exploratory movement phase, an optional directional movement phase and a settled phase. The phase sequence may not be rigidly followed and all phases may not occur in any specific case.

The post-release phase is a brief period occurring immediately after release. Animals remain relatively close to the release site for up to four days. This appears to be an orientation phase.

The exploratory phase follows the post-release phase and is identified by long, zig-zagging, unpredictable movements, and the re-visiting of earlier visited places. During this phase a leopard in Hamilton's (1981) study overnight often moved linear distances of more than 10 km and up to 20,7 km.

The directional movement phase is identified by long movements in the same direction. These movements can take animals back to the place of capture or in different directions. During this phase and the exploratory phase, relocated leopards moved greater mean daily distances than resident leopards (Hamilton 1981).

The last phase, the settled phase, showed reduced movement in a certain area, the area being similar to a leopard's

normal home range.

In the present study on the relocated cheetahs, cheetah 1 followed two of the phases described above. Phase one, the post-release phase, appears to have been omitted and movement began with the exploratory phase. This phase ended after her re-visiting the release site. Then followed the directional movement phase which took her away from the release site to outside the boundaries of the Klaserie Private Nature Reserve. Whether phase four, the settled phase, then took place is unknown.

Similarly, cheetah 3 began its post-release movement with the exploratory phase and due to the relatively short period that he was tracked before being lost, this was the only phase recorded. When last located moving to, and in the vicinity of the release site, this may have been the conclusion of the exploratory phase. It remains unknown whether the directional movement phase or the settled phase then took place.

Thus, while the complete fate of the cheetahs tracked were unknown, they did follow some of the phases described by Hamilton (1981) for relocated leopards.

Response To Observers On Foot

During the cheetah study period, cheetah 1 was approached on foot 11 times. On five of these occasions she fled from observers soon after she had been sighted. On two occasions she moved away from observers before she was sighted and on four occasions, she did not flee. On the four occasions when she did not flee includes one occasion when she was sighted at a kill and on the remaining three occasions when she did not flee, cheetah 1 showed no signs of restlessness. These three occasions were towards the end of this study period (i.e. on 1, 2 and 17 May 1979). Of the five occasions when cheetah 1 fled soon after she had been sighted, one occasion was when she fled from the kill the following day.

On two occasions of the initial five occasions noted above, but prior to 1 May 1979, cheetah 1 moved straight-line distances of 5,0 km and 5,3 km between resting sites after fleeing from observers. Although a small sample, these distances are significantly greater than her mean straight-line distance between resting sites of 1,6 km after no human disturbance ($t = -3,701$; $df = 12$; $p \leq 0,05$). It was therefore assumed that during the study, until 1 May 1979, observers on foot affected her normal behaviour. After 1 May, the human factor was considered not to influence her behaviour. Her sudden movement northwards after 6 May 1979, was initially thought to be due to human disturbance but is

natural behaviour after relocation (Hamilton 1981). Fairall (pers. comm.) found that human disturbance directly after release adversely affected the successful re-introduction of a group of elephants into the Sabi Sand Game Reserve from the Kruger National Park.

Cheetah 1 was found once with a kill. A juvenile kudu, 22 days after her release. She had already fed on the carcass. Cheetah 3 was approached on foot six times during this study when located at 08h30 and at 11h45 the following day. He fled from observers on four occasions and was briefly sighted on two of the four occasions. Cheetah 3 kept moving ahead of observers on the remaining two occasions. No records were made of distances moved on successive days after a sudden disturbance by humans as he could not be located on the day following a disturbance. It is unknown to what extent humans on foot affected his behaviour.

Hamilton (1981) also radio-tracked on foot but investigated resting sites after leopards had left while Pettifer (1981) concluded that no undue disturbance was caused by following relatively tame relocated cheetahs in a vehicle. Scott (1985) observed that resident Meru leopards were wary

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of people on foot and avoided contact on such occasions. She was located on the following day in the same locality. She was not approached on this occasion and a brief inspection of the area after she had left revealed no carcass.

Cheetah 1 was found once with a kill, a juvenile kudu, 22 days after her release. She had already fed on the carcass feeding once on an impala carcass in the Timbavati Private Nature Reserve. The kill was not personally seen and still at the kill site. She thus spent at least 27 hours at the carcass.

When observed, all the study-cheetahs were in good condition. This behaviour is unlike resident cheetahs of Klaserie which do not remain at a carcass for any length of time and after feeding, leave the kill site.

This unusual incidence of a cheetah remaining at a carcass for some length of time was also observed by Pettifer (1981 b). He recorded a mean time of 32 hours and 24 minutes that captive-bred male cheetahs spent at each carcass and attributed this to the fact that the captive-bred cheetahs had never experienced competition from scavengers or other predators. In the Kruger National Park to prefer "open or lightly wooded savanna." Hamilton (1961) suggests that It is unknown whether the present study-cheetahs came from an area where other predators or scavengers occurred. No experience from other predators or scavengers could be a factor and being unsettled in the new environment, cheetah 1 utilized as much food as possible while it was available.

Cheetah 1 possibly made another kill on 26 May 1979 as she was located on the following day in the same locality. She was not approached on this occasion and a brief inspection of the area after she had left revealed no carcass.

Male 4 and an unidentified collared cheetah were seen feeding once on an impala carcass in the Timbavati Private Nature Reserve. The kill was not personally seen and no further data are available.

When observed, all the study-cheetahs were in good condition and it is assumed that they were hunting successfully.

Habitat Use

Cheetahs can be found in a variety of habitats (Wrogemann 1975). In the Serengeti National Park, cheetahs preferred the plains to the woodland (Schaller 1972) while in the Kafue National Park, cheetahs do not select open plains (Mitchell, Shenton and Uys 1965). Pienaar (1969) records cheetahs in the Kruger National Park to prefer "open or lightly wooded savanna." Hamilton (1981) suggests that bushland is suitable cheetah habitat and that the cheetah is adapted to hunting and living in it.

The Klaserie Private Nature Reserve and the Timbavati Private Nature Reserve do not possess a variety of habitats

for cheetahs to select from. Hirst (1969) describes the vegetation of the Timbavati Private Nature Reserve as being heterogeneous "varying from open savanna with tall or short grass through moderately dense woodland to dense riparian woodland."

From the diurnal locations of cheetahs 1 and 3, 80 per cent were in the *Acacia nigrescens* - *Sclerocarya birrea* woodland, 8 per cent in the denser vegetation alongside small water-courses, 6 per cent in riparian vegetation and 6 per cent in a dry watercourse itself. Neither cheetah 1 nor cheetah 3 were recorded resting in the reed-covered beds of the Klaserie and Ntsiri Rivers, known resting places of lions, leopards and spotted hyaenas.

Resident cheetahs of the Klaserie Private Nature Reserve were also located predominantly in the *Acacia nigrescens* - *Sclerocarya birrea* woodland in the southern, flatter section of the reserve. Resident cheetahs were found once with a kill in an open section of the Ntsiri river-bed and a cheetah once took cover in the reed-bed of the Klaserie River after being disturbed on the river bank.

Cheetahs can and do survive in moderately dense woodland with cheetah 1 successfully chasing and killing a young kudu in the denser vegetation alongside a watercourse.

Narchoorn (1976) wrote that "relocation cannot be considered

Interactions Of Cheetahs With Resident Carnivores Of The Klaserie And Timbavati Private Nature Reserves

Besides the unknown cause of death of cheetah 2, no interactions between the released cheetahs and resident large carnivores of the Klaserie and Timbavati Private Nature Reserves were observed and, when sighted, no cheetah showed any signs of adverse interactions with other predators.

Pettifer (1981 b) recorded a serious fight between his relocated cheetahs and resident cheetahs, seriously injuring one relocated cheetah. Further, contacts with lions were few with the study cheetahs retreating. Contacts with spotted hyaenas were more frequent than with lions with the study cheetahs mostly defending their kills from spotted hyaenas (Pettifer 1981 b).

The released cheetahs used in the present study presumably either avoided contact with the larger carnivores of the Klaserie and Timbavati Private Nature Reserves or successfully overcame physical contacts.

CONCLUSIONS

One cheetah, a female, was known to have successfully established herself in the Kruger National Park. One cheetah was shot on adjoining private land while the fate of Harthoorn (1976) wrote that "relocation cannot be considered the remaining cheetahs was not known (Labuschagne 1979)

a success until the new animals have established themselves in their environment." The success of Hamilton's (1981) relocations depended on meeting two criteria: translocated animals must remain within the confines of an area where they are released and the translocated animals must not again revert to stock-raiding. If both criteria were not met, the translocations were regarded as a failure (Hamilton 1981).

After four months in the Klaserie Private Nature Reserve, cheetah 1 had not yet established herself in the reserve. Her ultimate fate, together with that of the four remaining cheetahs, remains unknown. The long-term success of many translocation programmes could not be evaluated due to the problem of relocating translocated animals (Eltringham 1979). This, together with the death of cheetah 2, leads to the conclusion that the current relocation of wild cheetahs to the Klaserie Private Nature Reserve was a failure.

Similar results on the movements of wild relocated cheetahs were obtained by Labuschagne (1979). In the study of Labuschagne (1979), 19 of 34 relocated wild cheetahs were collared (no radios) and released in the Kruger National Park. One cheetah, a female, was known to have successfully established herself in the Kruger National Park. One cheetah was shot on adjoining private land while the fate of the remaining cheetahs was not known (Labuschagne 1979).

During June 1981 a report was received of a collared cheetah, one of a group of four animals, 25 km south of the release site and west of the Timbavati Private Nature Reserve. During 1982, three reports were received from local inhabitants of a collared cheetah in the eastern section of the Klaserie Private Nature Reserve. Although these sightings were not confirmed as being any of the present study cheetahs, one released cheetah may have eventually settled in the eastern section of the Klaserie Private Nature Reserve, two with resident cheetahs, with the remaining cheetahs establishing themselves outside the reserve boundaries. Although the relocation to the Klaserie Private Nature Reserve itself thus was a failure and if the cheetahs have avoided being destroyed outside the reserves, a successful relocation to the Transvaal Lowveld may have occurred.

Hamilton (1981) considered the relocation of 10 leopards to the Meru National Park to be a failure with two leopards settling within or on the park boundary. Pettifer (1981 b) viewed his study results as "highly encouraging" and Pettifer *et al.* (1981) concluded a successful relocation of a female cheetah with her five subadult cubs to the Timbavati Private Nature Reserve.

Although of a suitable shape, the Klaserie Private Nature Reserve with its cheetah passable boundaries is considered

too small an area for a successful cheetah relocation. The length and breadth of the reserve can be covered by a released cheetah in a relatively short time period, increasing the risk of it being destroyed outside the reserve boundaries.

A study of the resident cheetahs in the Klaserie Private Nature Reserve is advised before any further relocations of cheetahs to the reserve are considered. In such a study emphasis should be placed on the resident cheetahs' population dynamics and the areas occupied by them.

If cheetahs already occur in an area proposed for relocation, it is advisable to first study the present population. Although the present cheetah population may be relatively low in numbers, it may be stable and adapted to existing ecological conditions, and an introduction of cheetahs to the area would be worthless. Concluding on the rarity of cheetahs in the Serengeti National Park, Schaller (1972) wrote that "little can be done to encourage their increase other than to protect them vigorously and to ensure that their principal prey, the Thomson's gazelle, continues to be an abundant source of food for them."

Prior to relocating cheetahs to areas where they once occurred or where their numbers have been reduced, the reason(s) for their decline or disappearance should be

investigated first and dealt with. Investigate whether translocated wild cheetahs could survive in an area. On release, animals should be continuously monitored and disturbance of released animals kept to a minimum. Released female cheetahs without cubs can be expected to move about alone whereas male cheetahs may remain together or form smaller groups. Released cheetahs are capable of moving great distances and if released in an area other than the quarantine site, may not return to the quarantine site. were radio-collared before release. The remaining three animals. Relocated wild cheetahs have the ability to survive in a woodland habitat as found in the Klaserie Private Nature Reserve where suitable prey and other larger carnivores exist. In such a habitat, radio-tracking is the only method by which shy, not often seen released animals can be continuously monitored. a predominantly solitary creature while male cheetahs are more sociable (Schaller 1972). The cheetah is an animal that has now disappeared from most of its former range, both on and outside the African Continent (Wrogemann 1975, Myers 1976 and Smithers 1983). one during the study period with the released male cheetahs. Proposals have been put forward to relocate cheetahs to areas where they once occurred or to areas where their numbers have been reduced (Skinner et al. 1977 and Pettifer 1981 b). However, most carnivore translocations have reported failures (Hamilton 1981).

Similar to the findings of Pettifer et al. (1981) and

The aim of this study was to investigate whether translocated wild cheetahs could survive in an area (the Klaserie Private Nature Reserve) where cheetahs and other larger carnivores, the lion, the wild dog, the spotted hyaena and the leopard, exist. Little is known about the cheetah population in the reserve.

Six cheetahs were released in the Klaserie Private Nature Reserve. Three cheetahs, two females and a male, were radio-collared before release. The remaining three animals, all males, were fitted with collars without radios prior to release. One female died soon after release and as a result, most data came from the remaining radio-collared female and the male. These daily distances were less than recorded elsewhere (Pettifer et al. 1981 and Pettifer 1981). The female cheetah is a predominantly solitary creature while male cheetahs are more sociable (Schaller 1972, Wrogemann 1975, Pettifer 1981 a and Smithers 1983). The results of this study support this conclusion. The released female cheetah in the present study moved mostly alone during the study period with the released male cheetahs forming various associations. Resident cheetahs in the Klaserie Private Nature Reserve are predominantly solitary creatures and a female cheetah is normally alone with her cubs.

Similar to the findings of Pettifer et al. (1981) and

The released cheetahs showed some of the phases of movement described by Pettifer (1981 b), the cheetah is an animal that is active after release as described by Pettifer (1981) mainly between late afternoon and early morning. Warmer daylight hours are spent resting under shade. The study showed the cheetahs to rarely spend more than one day in the same place; a kill held one released cheetah for more than a day in the same place. Indications are that resident cheetahs in the Klaserie Private Nature Reserve are predominantly diurnal, supporting the conclusions of Wrogemann (1975), Myers (1976), Hamilton (1981) and Smithers (1983).

The female cheetah moved a mean minimum daily distance of 1,6 km and the male 3,3 km with no significant difference between the two. These daily distances were less than recorded elsewhere (Pettifer et al. 1981 and Pettifer (1981 b) for released cheetahs as actual distances were recorded in the studies elsewhere. During the cheetah study period, the cheetahs were recorded at no greater distance than 27 km from the release site and never closer than 7,5 km to the quarantine enclosure.

In agreement with Pettifer et al. (1981) and Pettifer (1981 b), the movements of the male and female study cheetahs show that the boundaries of an area the size of the Klaserie Private Nature Reserve can be traversed by released cheetahs. Both released and resident cheetahs were found mainly in the

Acacia nigrescens - *Sclerocarya birrea* woodland. The reed-

The released cheetahs showed some of the phases of movement after release as described by Hamilton (1981).

Humans on foot were found to influence the movements of the released cheetah during part of the study. It is not known if the male cheetah was in any way influenced by observers on foot.

Little feeding data were obtained for the released cheetahs. The study did show the unusual occurrence of a cheetah spending considerable time at a carcass. In agreement with Pettifer (1981 b) this is ascribed to possible no previous interactions with other larger carnivores. It is concluded that the present study cheetahs were hunting successfully as, when observed, all were in good condition.

It has been written that cheetahs prefer plains to woodland if both habitats exist (Schaller 1972), but this may be a result of direct antagonism with other predators. In agreement with Hamilton (1981), woodland is a suitable habitat for cheetahs, as shown by the already present resident cheetahs in the Klaserie Private Nature Reserve and by the assumption that the released cheetahs hunted successfully in this type of habitat.

Both released and resident cheetahs were found mainly in the *Acacia nigrescens* - *Sclerocarya birrea* woodland. The need-

covered beds of the two rivers in the Klaserie Private Nature Reserve, known resting places of lions, leopards and spotted hyaenas, tended to be avoided by both resident and released cheetahs.

CHAPTER 4 THE KLASERIE LEOPARD

The death of one study female cheetah may have been due to a leopard. When sighted, the remaining study cheetahs showed no signs of any detrimental contacts with other carnivores. It is therefore concluded that the released cheetahs avoided contact with other larger carnivores or successfully overcame any contacts. Released cheetahs have been injured by resident cheetahs, have avoided contact with lions and have defended their kills from spotted hyaenas (Pettifer 1981 b). Recent work has been carried out in countries such as Tanzania (Bertram 1982), Nepal (Gungoliet 1983) and South Africa (Pettifer 1981 b). The conclusion of the relocation of cheetahs to the Klaserie Private Nature Reserve is that the project was a failure, although a successful relocation to the Transvaal Lowveld may have occurred. A study of resident cheetahs should first be undertaken prior to any further releases. When more than one leopard is encountered it is likely that the leopard will kill the cheetah. Careful consideration should be given to any carnivore relocation programme. Consideration should be given to the size of the proposed area, present populations and reasons for decline or disappearance. All future carnivore relocations should be documented.