CHAPTER 5 : LEOPARD TRANSLOCATIONS

INTRODUCTION

Translocation of mammalian species has received increasing attention over the last few decades. First because the natural areas where these predators occur are shrinking and they therefore come into direct or indirect conflict with human interests. Removing such problem carnivores is often the only choice. Secondly, many populations were and are being depleted due to different human actions. Therefore, in an attempt to re-establish viable populations, individuals are being introduced from elsewhere.

The objectives of these various research or management actions are represented by the following approaches :

1) Captive breeding and re-establishing a species in areas within it's historic range, where it has been exterminated (Henshaw & Stephenson 1974; Carley 1981; Pettifer 1980; Van Aarde & Skinner 1986). This is especially relevant in the case of endangered or rare species.

2) Locally abundant species captured in the wild have been moved to areas where they were exterminated or to stimulate existing non viable populations (Penzhorn 1971).

3) Wildlife biologists are frequently requested to resolve conflicts between e.g predators and man. Translocating such

individuals away from the area of conflict has been conducted to determine the feasibility of re-establishing these species elsewhere, where no conflict would exist (Craighead 1976; Miller & Ballard 1982; Meagher & Phillips 1983; Skinner & Van Aarde 1987).

Studies have also been carried out to investigate primarily from an academic point of view, which mechanisms are involved in orientation during homing behaviour, following a successful relocation. In all these cases animals were not enclosed and could disperse as they wished (Griffo 1961; Murie 1963; Robinson & Falls 1965; Sheppe 1965; Mackintosh 1973; Cooke & Terman 1977).

Although predators have been and are being translocated on a regular basis all over the world as a management and conservation strategy, there is relatively little information available on the fate of these carnivores after release. Hamilton (1981), mentioned that almost without exception, failures were described, with few accounts of success. The lack of well monitored post release movements is evident. Only studies on wolves (Mech 1970; Weise, Robinson, Hook & Mech 1975; Fritts, Paul & Mech 1984), brown bears, Ursus arctos (Harger 1970; Alt, Matula, Alt & Lindzey 1977; Mc Arthur 1981; Miller & Ballard 1982), and to a lesser extent on brown hyaenas (Skinner & Van Aarde 1987), can be considered as representative findings. In the Felidae only studies on relocation of leopards (Hamilton 1981), captive bred cheetahs (Pettifer 1980) and servals (Van

Aarde & Skinner 1986) have been published.

In many parts of their range in the Transvaal, leopards come into conflict with human interests by taking domestic livestock and wild ungulates. Large numbers are being caught in the process and speculation still occurs as what to do with these animals, other than to kill them.

OBJECTIVES

With this background it was decided to investigate different aspects of leopard translocations, namely :

a. Post release movement patterns.

b. Minimum distances and other factors involved in preventing homing behaviour.

c. Which factors negatively influence the possibility that a leopard may settle in a released area.

d. To speculate about possible mechanisms of orientation involved in homing behaviour.

e. The feasability of translocating leopards to areas where they were partly or totally exterminated due to reasons which don't prevail any more.

METHODS

All five translocated leopards in the present study were culprits or suspected culprits involved in stock losses, and were provided by the Problem Animal Unit of the Transvaal Division of Nature and Environmental Conservation. They were either caught by farmers and handed over to the Problem Unit, or captured by the Unit itself using fall-door traps.

During immobilization (8 mg/kg Ketamine hydrochloride, Parke Davis, Pty Ltd R.S.A) leopards were fitted with radio-collars (Leopard A - CSIR Pretoria, RSA; Leopard B - Telonics, Arizona USA; Leopard C - AVM Instrument Company California, USA; Leopard D - Potchefstroom University RSA; Leopard E - Potchefstroom University RSA), and directly transferred by road to the release site. All leopards were allowed to recover fully before release. Full recovery was considered when the animal could make a charge from the rear of the cage, without losing his balance.

Transportation cages were tightly covered with canvas and no additional drug dosages were administered during transport. In two cases leopards were kept for three (Leopard B) and four days (Leopard C) respectively, at the Problem Animal Unit prior to their release. This was necessary as they had to be drugged to move them to another cage for transfer purposes to the Unit at De Wagensdrift, while radio-collars were prepared. It was not ethical to administer a second dosage within three days to fit a radio-collar.

A lot of consideration was given to the sites for release. First the distances from capture sites to release sites were carefully selected. Thought was also given to the status quo of the release site leopard population as well as the prey situation. Translocated leopards were released by raising the drop door of the cage (still on the vehicle), by means of a pulley operated from the safety of the vehicle.

Released leopards were continuously monitored for the first five to seven days by vehicle, after which they were followed on a weekly basis from a fixed wing aircraft (Cessna 185). Radio tracking by vehicle only was impractical because of the unpredictability of their movements, large overnight distances sometimes traversed by released leopards, as well as lack of access roads. Movements were plotted on a 1:50 000 map, by means of trangulation and the aid of topographic features.

RESULTS

Leopard A

This female was caught by a farmer on the farm Doornfontein (Koedoeskop) (24° 51'S, 27° 33'E) in November 1984. Due to legal complications, the Chief Directorate of Nature and Environmental Conservation confiscated the animal. After the investigation, which lasted several months, permission was given to fit it with a radio-collar. She was released on the farm Kwarriehoek (24° 45 'S, 27° 53'E), 60km east of her capture site on July 6 1985.

The first night she walked 300m (Fig.17), where she remained inactive until the following night when she covered an additional 500m. Night three was spent on the same spot.During night four she moved from the farm Kwarriehoek and was tracked six km further, moving in a westerly direction (4).

In the early morning of night five she found refuge in the Elandsberg, another 4,1 km away (5). The next few days she couldn't be tracked. Her signal was however again received two weeks later on 24 July (A). This time against the northern aspect of the Boshoffsberge, 19,6 km in a straight line from point 5. On 11 August she was again detected on the southern

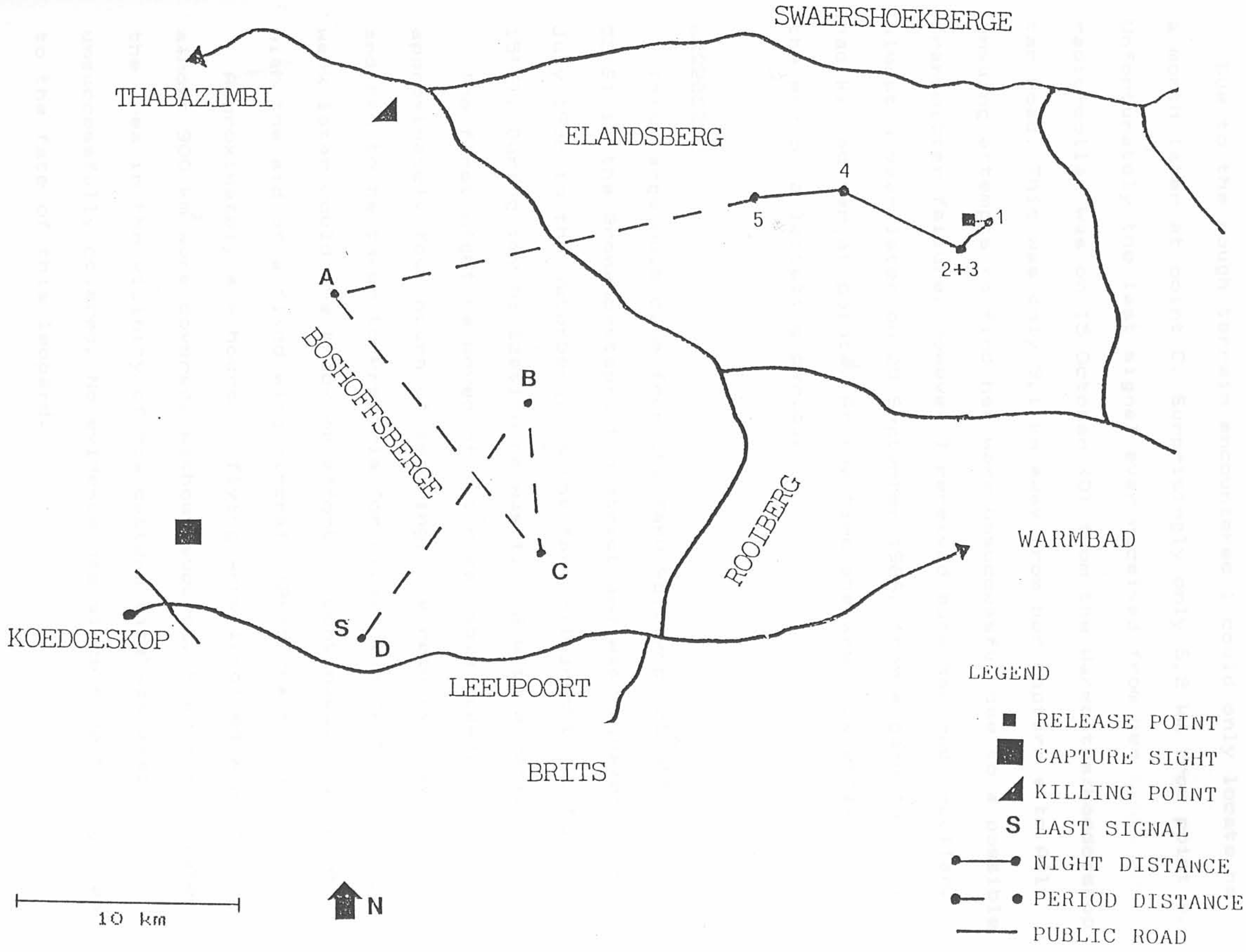

Figure 17 : Post release movements of translocated leopard A.

aspect of the same mountain range (B), 15 km from the previous locality.

Due to the rough terrain encountered I could only locate her a month later at point C. Surprisingly only 6,2 km from point B. Unfortunately the last signal ever received from her radio-collar was on 15 October (D) from the Warmbaths/Koedoeskop tar road. This was only 9,1 km away from her capture site. All ensuing attempts to find her were unsuccessful due to a possible transmitter failure. However I received back her radio-collar, almost a year later on 25 September 1986, from a game farmer who had killed her at point ▲. At the time she was apparently near the end of a lactating period.

Leopard B

This large male came from the farm Spitskop (25°46'S, 28°52'E) in the Bronkhorstspruit district and was released on 9 July 1986 in the Waterberg, on the farm Sliedrecht (23°58'S, 28°15'E). During immobilization he was fitted with a radio-collar.

The first night he moved off at remarkable speed. After approximately four hours of tracking, the receiver gave problems and had to be taken to Pretoria for repair the next day. Only a week later could the tracking effort be continued. This time with the aid of a fixed wing aircraft (Beechcraft Z10).

Approximately six hours of flying were involved whereby almost 900 km^2 were covered, without success. Four months later the area in the vicinity of his capture site was also unsuccessfully covered. No evidence has since come to light as to the fate of this leopard.

Leopard_C

Also captured at Spitskop (25°46'S, 28°52'E), on 13 April 1987, the female leopard was released on the farm Baviaanskloof (24°15'S, 28°55'E) near Potgietersrus the following day (Fig. 18), after being fitted with a radio-collar. This was 165 km from her previous territory. The first night she took up residence 1,1 km higher up the mountain (1). Here she remained inactive intil the following night, after which she moved 22 km into a smaller ravine (2). During night three she did not show any directional movement and remained in the same small ravine (3).

The first directional movement took place on the fourth night when she covered 4,1 km (4). The fifth and sixth nights she moved 1,8 (5) and 7,8 km respectively. However she suddenly changed direction during night seven and headed back in the direction of point of release. Seven km later she became inactive at locality (7).

On 1 May 1987 she was found inactive 7,4 km (A) from her previous monitored locality (7). Ten days later her signal was received from the Doorndraai Dam Nature Reserve, 3,5 km further (B). A week later (17 May 1987), it seemed as if she had settled in the area because she was only 3,6 km (C) from point B. However another week later she moved 21,1 km (D) and on her way crossed the busy N1 Highway to the north. On 30 April 1987 she was located 3,6 km further (E), and on the fourth and sixth of May another 8,1 km (F) and 1 km (G) respectively in the direction of Zebedela.

The last signal to be received from her radio-collar was on

16 June 1987 (H), 12,3 km in the direction of her released site. After almost nine weeks she was therefore approximately 15 km from her initial site of release.

During this period she covered a minimum straight line distance of 81,1 km. Despite five hours of flying whereby vast areas were covered (3000 km^2), no signal could be detected. Her dissappearance could have resulted from a possible transmitter failure or that she had been caught by a farmer and the radio-collar destroyed.

Leopard D

Leopard D was a young male that was trapped on the farm Doornkloof (Assen) (24° 08'S, 27° 25'E) on 20 July 1987, radio-collared and released in the Doorndraai Dam Nature Reserve (24° 17'S, 28° 46'E) three days later, 143 km from Doornkloof (straight line distance). The first night he walked 1,4 km into mountain cover, where he remained inactive until the following day (1) (Fig.19).

Although locally active he only moved approximately 50 m the next two nights. During night four, five and six he covered 2,0 km, 3,1 km and 1,0 km respectively (3,4,5). On 8 August 1987 his signal was received on the opposite side of the Doorndraai Dam (Point A), 6,5 km in a line walking around the dam.

Ten days later on 18 August he still wandered in the same vicinity (B), only 1,2 km from the previous site (A). On 20 August we found him still (C) within the boundaries of the Reserve, 2,8 km from point B. On 9 September the first signs of possible settlement in the area were evident. He only moved 3,1

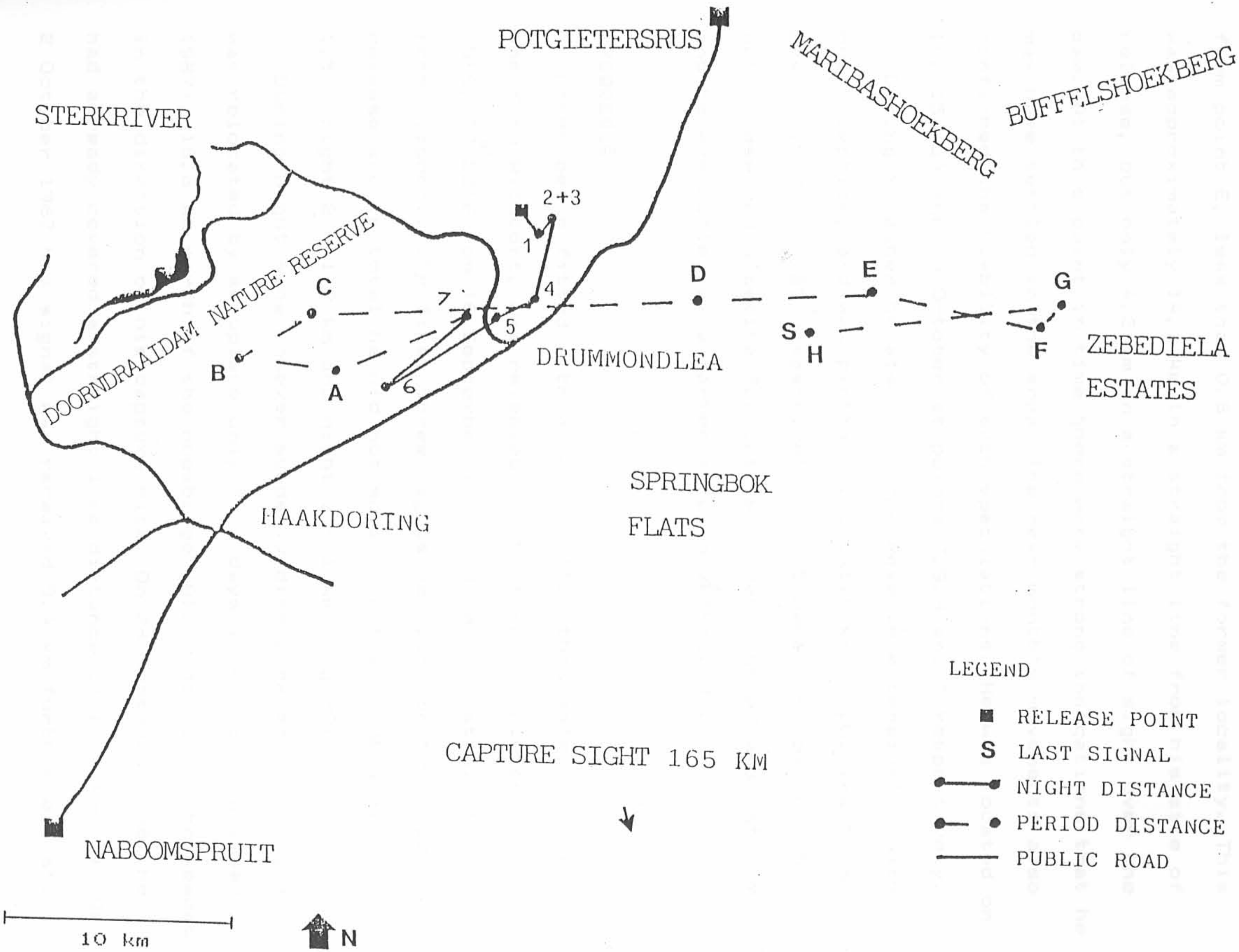

Figure 18 : Post release movements of translocated leopard C.

km (D) in the direction of point A.

Exactly two months after release a strong signal was received from point E, less than 0,8 km from the former locality. This was approximately 14,1 km in a straight line from his site of release, but only 4,2 km in a straight line of sight over the dam. At this point in time there were strong indications that he may have settled in the area. The next month's movements also confirmed the viability of such speculations. He was located on 10, 15, 24 and 29 October at points F,G,H and I respectively.

During November he also used the Reserve extensively, with one exception, and was plotted at localities J,K,L, and M on days 4,15,20 and 29 respectively. On 15 December however, his well preserved appetite for cattle calves counted against him and he was killed by a farmer at point ▲ (Fig. 19).

Leopard_E

After being fitted with a radio-collar this male, caught on the farm Witpoort, was released on the farm Kwarriehoek (24° 45'S, 27° 53'E) on 16 September 1987, 60 km in a straight line from Witpoort. The first three nights he spent on the koppie of release and in total he did not move more than 3 km (night 1 - 1,5 ; night 2 - 1,2 km and night 3 - 1 km)(Fig 20).

During night 4 he however suddenly dissappeared. His signal was relocated by aeroplane only four days later (24 September 1987), 18,8 km north of the Hoekberge (A). A day later he headed in the direction of his capture site. On 28 September 1987 he had already covered a straight line distance of 15,4 km (B). On 2 October 1987 his signal was received 9,4 km further and still

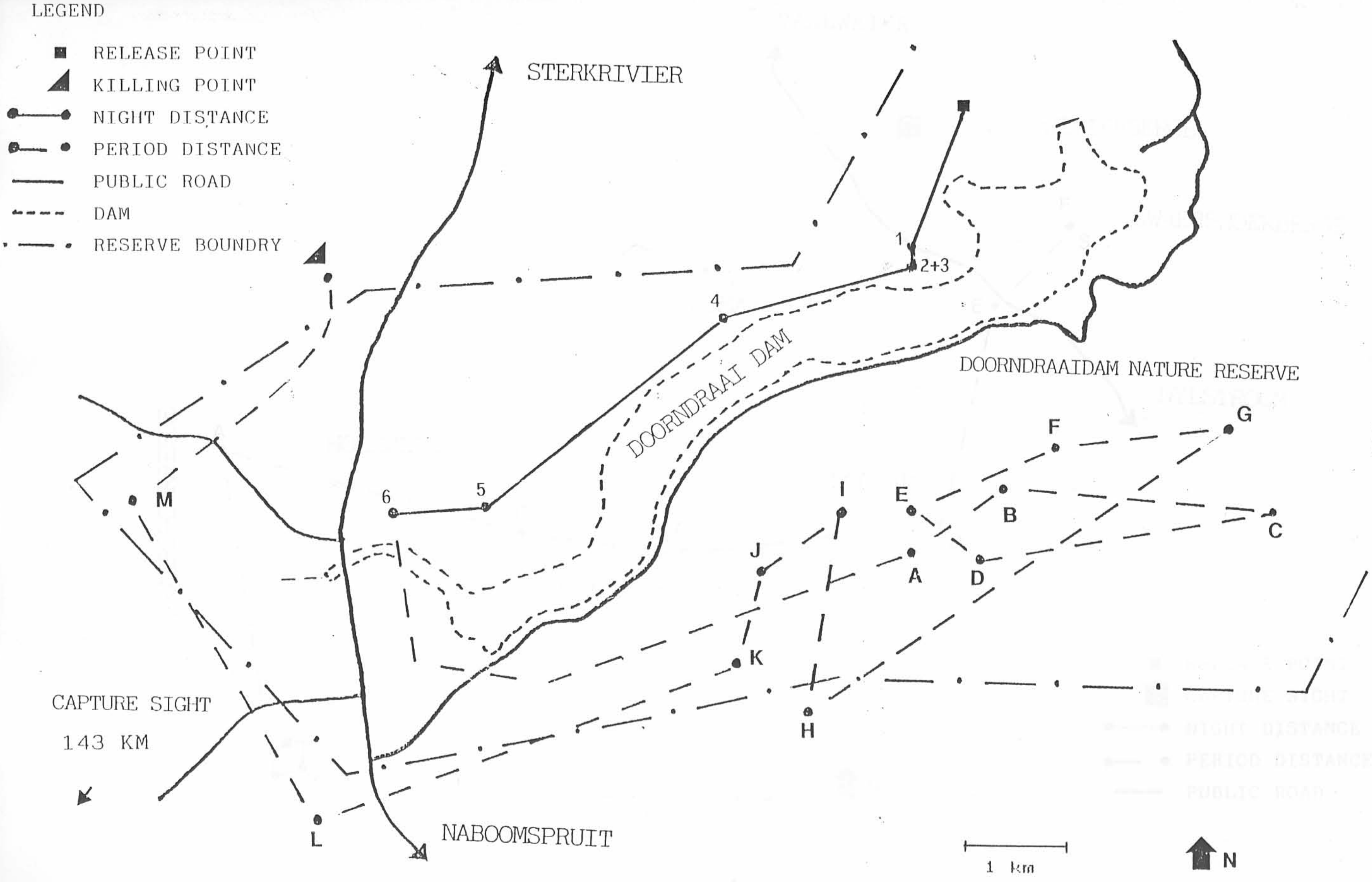

Figure 19 : Post release movements of translocated leopard D.

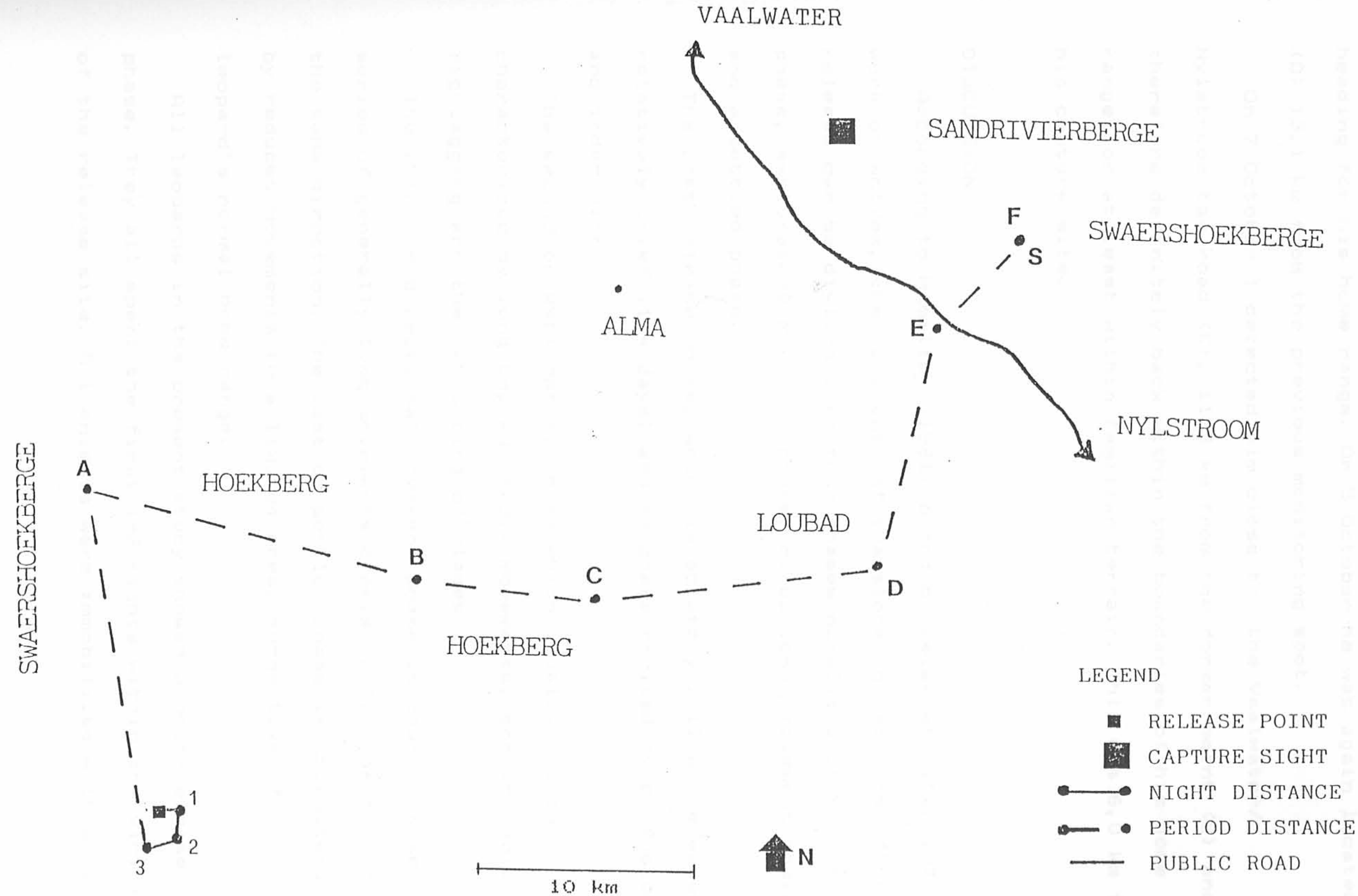

Figure 20 : Post release movements of translocated leopard E.

heading for his home range. On 5 October he was again located (D) 13,1 km from the previous monitoring spot.

On 7 October I detected him close to the Vaalwater/ Nylstroom tar road (E), 11,3 km from the former point (D) and therefore definitely back within the boundaries of his home range, or at least within familiar terrain. This was 6,0 km from his capture site.

DISCUSSION

According to Hamilton (1981) based on Weise _et_ _al_'s. (1975) work on wolves, the movements of translocated leopards after release can be divided into four phases namely: post release phase, exploratory movement phase, directional movement phase and a settled phase.

The post-release phase, which immediately follows release, is relatively brief (1-4 days) and is characterised by confusion and indecision.

The second or exploratory phase which usually follows is characterised by long unpredictable movements, considerable zig-zagging and the revisiting of places.

The third or directional movement phase is characterised by a series of generally long movements consistantly made in about the same direction. The last or settled phase is characterised by reduced movements to a limited area, suggestive of a leopard's normal home range.

All leopards in the present study showed a post-release phase. They all spent the first 1-3 nights within the vicinity of the release site. All animals were immobilized with a single dose of ketamine hydrochloride for the fitting of radio-collars and relevant measurements to be taken. During transfer no drugs were administered and the animals had recovered completely on arrival at release sites.

Drug inducement was therefore not suspected as influencing this relatively inactive phase, but it was probably an orientation reaction towards a strange environment. My findings however did not show an exploratory phase succeeding the first phase. A directional phase was subsequently evident and lasted for different periods depending on circumstances (distance from capture site, motivation to home seeking, etc). Leopard A which was released 60 km in a direct line from her capture site started directly after the post-release phase to home in on her former locality by means of this directional phase, until she reached her destination.

Leopard C who was released 165 km from her capture site showed a directional phase of only three nights averaging 4,5 km straight line distance per night, after which she started zig-zagging and revisiting places.

Leopard D, a young male, was released 143 km from his capture site but did not show a strong motivation to walk back. He also showed a directional phase from night three until five weeks later, averaging 1,8 km per night.

Leopard E also showed directional movement after the initial post-release phase, which was followed through until he reached familiar terrain.

Leopard C which was released far from her capture site however showed a third phase namely an exploratory phase, when she started to zig-zag after night seven. This was followed again by a directional phase and shortly after another exploratory phase. The large home range sizes (300+ km) of free living leopards in the Waterberg (Chapter 3), as well as the long distances travelled each night (up to 20 km a night), made it difficult to determine whether an individual was in the exploratory or settled phase. The fact that Leopard D did settle in his released area after almost five months, gave me the opportunity to analyse his movement patterns.

Individual C on the other hand seemed motivated and in an attempt to find her way back, followed the exploratory phase up with more directional movement phases.

Pronunciations made regarding factors that could prevent or hamper animals in a homing attempt, or negatively influence them settling in an area, are in many cases derived from their general behaviour patterns and/or extrapolated from other species behaviour and/or human interpretation. It is however still of great importance to consider all such factors if representative information is lacking. Studies on white-footed mice, Peromyscus leucopus noveboracensis (Cook &Terman 1977), European woodmice, Apodemus sp. (Bovet 1982), wolves (Fritts et al. 1984) and black bears, Ursus americanus (Mc Arthur 1981), however, specifically addressed factors relevant to homing behaviour.

Homing limiting factors:

Cook & Terman (1977) showed that in the white-footed mouse, homing performance was inversely distance dependant. There also did not seem to be a linear relatioship between the two factors.

A threshold effect may however be involved after increasing distance to a limit. Furrer (1973) found in the mice _Peromyscus maniculatus_ that there was a gradual decline in homing success with increasing displacement distance, beyond which the homing percentage declined sharply.

Homing success was also found to be inversely related to distance in black bears (Mc Arthur 1981), brown bears (Miller & Ballard 1982) and wolves (Fritts _et al._ 1984). From a management point of view, defining a threshold distance is very relevant.

Findings in one region for a specific species can however not be extrapolated to another ecological region, without conducting an independant study.

Threshold distances were suggested to be greater than 258 km for brown bears in Alaska (Miller & Ballard 1982). It is suggested by Hamilton (1981), that a translocated leopard should not be released less than 100 km from the place of capture. The greater the distance the better.

Both leopards A and E walked back (homed) from a straight line distance of 60 km. The large homerange sizes of leopards in the Waterberg (> 300 km^2 in a resident radio-collared male) mean exposure to larger familiar habitat. Although the fate of leopards B and C is not known, where 336 km and 165 km straight line homing distances were involved, it is feasible to suggest that translocation distances greater than 150 km should be allowed in the Transvaal.

Furthermore, other factors like topographic barriers etc. are also expected to influence homing performance negatively. Topographic barriers had an effect in brown bears (Miller &

Ballard 1982), whereby a wide and braided river prevented homing. Mountains and lakes also influenced homing behaviour in wolves (Fritts et al. 1984).

Interestingly, Mc Arthur (1981), found the number of ridges and elevation gain, between the trapping and release sites were highly correlated with the success of translocating black bears. Differences in the importance of distance and elevation gain between males and females and between experienced bears were also identified. The influences of the above mentioned features in the present study could only be made applicable on leopard D. She had not homed, or surely settled at the time when I received her last signal. Although these influences could be ruled out, it seemed more likely that human settlement played a limiting role in her initial homing performance.

The town Naboomspruit and the adjacent Springbok flats are situated to the south of her release site, with small farms surrounding it. To the west she encountered Leboa with a lot of activity at the Zebediela Estates and townships (Mokerong). Although these could be regarded as obstacles which hampered her initial movements, at this stage there is no certainty that they prevented her reaching her destination, as she could only be monitored for two months.

In other studies, differences between adult and subadult individuals concerning homing success have also been described. Due to more erratic initial direction and movements, than those of adults, Fritts et al. (1984), suggested that subadults (inexperienced animals) showed less developed orientation ability.

This could also be linked to a lack of motivation to return to his capture site (Rogers 1977). Leopard D, a young male, although released more than 140 km from his captured site, did not even consider homing in on his former range, despite a lack of other limiting factors like topographic features and human activity. An absence in motivation was therefore a strong possibility.

Settling limiting factors :

The importance of motivation as a factor in increasing homing success also received attention. Because a homerange not only satisfies an animal's physical needs, but also constitutes an area within which it can move with assurance, allowing it to efficiently use the resource there, translocated animals are highly motivated to return to their home ranges (Beeman & Pelton 1976).

The importance of an animal's social structure in this motivation process has also been described. Rogers (1977) observed a difference in motivation between black bear males and females, due to a difference in territoriality. Females defended a territory whereas male black bears defend only the personal space surrounding them as they travel through their home ranges. Because females returned more frequently, it follows that they are more highly motivated to return.

Leopard studies so far, however, showed that both males and females are territorial (Hamilton 1981; Bertram 1980.

The presence or absence of conspecifics in the capture area and/or release site may also play an important role as a motivation in homing behaviour.

If we first consider the presence of mates in the captive area, certain types of social structures, especially pair bonds (black backed jackal), but also others like matriarchal societies (lions) etc, will increase motivation to walk back depending on social status. A temporary bond between solitary species can also play a significant role.

The night when leopard E, an adult male, was captured, smaller leopard spoor were found in the vicinity of the trap. As the leopard is a solitary species, this may have been a female in oestrus which was temporarily associating with him. The movements this leopard showed after release in new habitat were of a highly motivated individual. He was back in familiar territory within 18 days, during which period he covered a straight line walking distance over rough mountains of almost 72 km.

The presence of conspecifics in the released area could have the reverse effect. Hamilton (1976) argued that the home ranges of resident adult leopard 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.

As translocated male leopards are strangers to any males resident in the released area, encounters will be hostile, resulting in avoidance. According to Hamilton (1981) such avoidance behaviour is unlikely to render translocation successful in any release area already occupied by a dense population of resident males.

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 released area unless there is room for her. According to Hamilton (1981), settlement of translocated leopards in the release area will succeed only if there are vacancies for leopards of the required sex or sexes.

Hamilton (1981) also used the situation in Meru National Park, Kenya as an example. According to his records this Park once had a substantial leopard population, which was heavily depleted by poaching. In theory. therefore, Meru should have had plenty of vacancies for translocated leopards of both sexes. The majority of translocated leopards however, failed to integrate after release. Hamilton (1981) believed the answer lies in the nature of the species. The leopard appears to him to be a species that does adapt well following translocation, bearing in mind that the area of release was human selected.

In the present study it was planned to relocate leopard A in an area with a low leopard density, a plentiful number of potential prey species and a habitat that should have satisfied her physical needs, yet this also did not succeed. Although the straight line distance from her release site to her former home range was apparently inadequate, other factors must have influenced her as well.

For example, in this case human activity like continuous game drives involving guests etc. had a negative influence, due to her inherent fear of humans, as she was captured in an area where leopards were not tolerated. The sanctuary area into which she was released was apparently too small and did not have enough secluded places.

Orientation mechanisms :

Many hypotheses have been proposed regarding orientation mechanisms in mammals. Studies in homing behaviour of the grey wolf led to the belief that their movements are in response to visual, olfactory and auditory cues, with the latter probably being the most important (Henshaw & Stephenson 1974).

They argued that the wolf seems driven to return to familiar territory, using the strongest acquired exogenous cues. It must however be mentioned that these wolves were hand reared and thereafter released into the wild. They would thus maintain their affinity for human habitation and could locate centres of human activity over long distances.

Studies on white-footed mice (Cooke & Terman 1977), suggest that something other than vision, possibly olfaction, may have been utilized for orientation on familiar terrain, while vision may have been used on an unfamiliar area. Visual cues such as landmarks were subsuquently found to be important in house mice, Mus musculus (MacKintosh 1973).

Henshaw & Stephenson (1974) also mentioned an inherent or calculated sense of orientation. Especially the latter aspect with reference to indices of time and direction. These were available in sun-arc, celestial and photoperiodic cues in combination with circadian biological rhythms.

Erickson & Petrides (1964) found that black bears released in unfamiliar surroundings evidently wander at random until they either find a familiar area or can establish new home ranges. In familiar terrain they utilize directed movements to reach their destination. However, Miller & Ballard (1982) found that brown bears homing was not dependent on random movements, until familiar terrain was encountered. Like polar bears (Ursus martimins) they seemed to navigate, without physical reference points to maintain their position.

It therefore seems that a variety of mechanisms are involved in the homing behaviour of terrestrial mammals, and no definite mechanisms are apparent. In leopards, one can at this stage only mention possible inherent or calculated senses of determining direction. However, it seems most likely that they do use auditory, visual and olfactory cues, as primary, or even secondary navigatory mechanisms, where an inherent sense of direction is relevant.

The fact that only two individuals homed in, over relatively short distances, makes speculation regarding the mechanisms involved more difficult. If one assumes the absence of an inherent sense of direction, as well as any visual, olfactory and auditory cues in a leopard that was released further than 150 km from his territory, he was left with one option, and that was to wander at random until he either found familiar indicators (cues) or terrain or a new acceptable vacant territory. These indicators could be visual like prominent mountain shapes (for example Hangklip in the Naboomspruit area), post office towers with red lights (Potgietersrus area) or even the lights of towns. All these cues are visible at night from a high point over vast distances.

Auditory cues also may assist in direction finding. Here, sounds familiar to the animal like locomotives, large trucks on the highway and even regular aeroplane flights (in the vicinity of an airport), could aid in the orientation of a leopard.

Olfactory indicators are most likely to play a role in the final stages of homing behaviour. Individual recognition through the scent marks of conspicific neighbours may be an important mechanism in direction orientation in the leopard, especially where leopards roam over vast areas and have overlapping home ranges.

Feasibility of translocations:

The initial capturing of an individual is in most cases due to socio-economic reasons. In other words the impact this predator had on the stock-farmer and his subsequent preventative action. This resulted in removing the animal (translocation) or killing it. Due to the rare status of the leopard in South Africa, a long term conservation strategy for the species should also be taken into consideration in any decision making effort. Consideration should be given to stimulating or restocking populations in suitable habitats that have been depleted for reasons that do not exist anymore.

Contrary to the belief of Hamilton (1981), I am of the opinion that, apart from problem leopards, leopards could be considered for such a conservation strategy objective in the Transvaal. Depleted populations could be stimulated and vacant territories occupied wherever the potential for this exists. In the case of problem leopards (as defined in Chapter 2) they must however be killed immediately. The priority is therefore to solve the 'problem' rather than transferring such leopards, thereby prejudicing the longterm conservation strategy for the species.

Hamilton's (1981) situation dealt almost exclusively with problem leopards. In Kenya cattle farming procedures differ markedly from those practised in South Africa. In the Transvaal leopards almost exclusively (exception the Lowveld) inhabit mountainous areas, and only pose a threat to cattle calves (up to three months old) during calving periods.

Usually most farmers thus have the option when to use mountain grazing and when to protect vulnerable calves (anti-predator stock management). Not all of them unfortunately apply strict measures.

In Kenya, however, due to the wide distribution of natural areas, leopards are expected to be present at any time in most cattle farming areas. The fact that goats are also extensively utilized as stock by local farmers or herdsmen makes them vulnerable throughout the year. Natural prey species of the leopard are also being depleted in some of these regions. In Kenya problem leopards were transferred to National Parks and if a leopard moves out of this human selected area of release, the problem of stock raiding is only transferred. The value of a translocation is therefore questioned.

In evaluating the feasibility of translocations in the Transvaal, it is important to examine the different criteria being used to enable possible justification or dissaproval of the action. The two objectives of a translocation to be fulfilled before it can be considered a success are therefore first, a socio-economic commitment (forms part of responsive management) towards the landowner and secondly to assist with the conservation of the species, namely a conservation commitment.

Socio-economic factors such as the attitude of the people in control of the initial area concerned should be taken into consideration, in that their 'problem' must be solved. Translocation actions could be considered a success even though individuals had moved out of the area of release and settled elsewhere in the vicinity. As long as they could complement or strengthen a leopard population without being problem leopards.

A leopard captured on bait that has most likely been killed by him, can be considered as the culprit, but not necessarily as a problem leopard. Leopards may occasionally prey upon a calf when it is available without becoming a problem leopard. It all depends on the circumstances whereby the cattle calf was taken, for instance the locality of killing site (was it near human activity etc), precautionary measures taken (were cattle kraaled or protected), as well as recent frequency of stock killing incidences in the area.

If relevant stock protecting measures, as proposed (Chapter 6) were applied, could the incident be avoided? A first incident in three or more years, due to poor stock management, does not mean that a death sentence should be imposed on a captured leopard. The same applied to a leopard that was captured with bait, provided it was not killed by the leopard, after a series of stock losses. Many innocent leopards have been killed in this way, just for the culprit to return again.

To remove (translocate or kill) the captured leopard would be the only option (responsive management) in any situation where a leopard has been caught, as few farmers would allow a leopard captured on their property just to be released again in the same area. The whole occurrence must be used to enlighten the farmer that a potential threat exists to his livestock and that he should impose precautionary measures (preventative management).

This was the case with leopard A. This subadult female was captured using donkey meat. After she was removed from the farm, the farmer still had problems with a leopard killing calves near the farmhouse. This only ceased three months later when an adult male was killed. As mentioned in Results, Leopard A returned to her former locality after release but did not cause problems. When she was again captured on another farm, 12 months later, after she had killed a blesbok, she was in the final stage of lactation. This translocation was therefore from a conservation point of view, successful in that a litter was probably raised.

The human factor relevant in deciding where to locate an individual or set home range boundaries is often subject to bias and will in many instances not satisfy the needs of the animal. Subtle settling limiting factors could be overlooked.

Translocations where the transferred individual moves out of the selected area and settles in another area of his choice can be seen as making a positive contribution towards the future of the species. The condition that no problem animals should be involved, still prevails. Even when an animal returns to his former habitat, the whole action should not be considered as a failure, unless the individual starts causing damage. The translocation *per se* would however be seen as unsuccessful in such a case, even if it does not cause problems. A translocation action would therefore be considered unsuccessful when the initial status of the leopard is incorrectly evaluated i.e. when a problem leopard is relocated. Moreover, from a public opinion point of view, care should be taken to ensure that individuals do not home in on their original territory.

Leopard D's translocation *per se* could be considered as a proven success. The whole translocation action however is questionable due to the domestic calf that he apparently killed in the new area. However, the farmer concerned was also partially to blame in that newly born calves were kept in mountain veld.

The strongly motivated homing ability of leopard E, made this translocation *per se* unsuccessful. After almost two years since the last signal nothing further is known as to the whereabouts of this individual. This may just indicate that no problems arose due to his presence. It should be mentioned that he was initially captured on an impala carcass which he had killed. The whole translocation action did therefore meet the socio-economic function (public opinion) in that the animal was removed and sacondly, he did again integrate with the local leopard population (conservation function).