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Abstract: Cheetahs (*Acinomyx jubatus*) and African wild dogs (*Lycaon pictus*) are being studied in the Serengeti National Park and adjacent areas. The purpose of the research is to determine the size and trend of their populations, and to describe the extent of their movements and their ecological requirements. The ultimate objective is to formulate management recommendations for preserving cheetahs and wild dogs within the artificial confines of the park's boundaries. The cheetah population within the Serengeti ecosystem is probably in excess of 250. The high recruitment of young cheetahs into the population indicates either an expanding population or a stable population with high adult mortality. Individual cheetahs are identified by means of a photographic recognition file, which is based on the unique spot pattern on the face of every cheetah. Movements are being studied with respect to season and the availability of prey, water and cover. The maximum known migration distance for adult male and female cheetahs is 40 km. for each. The minimum dry season density of cheetahs around Seronera is about one cheetah per 3 sq. km. Wild dogs within the Serengeti ecosystem probably number about 300 individuals or 30 packs. In spite of a high pup mortality, the recruitment is high. Either the population is expanding, or there must be extensive adult mortality. individual dogs are identified by means of a photographic recognition file which is based on the unique pattern of white and yellow marks on the body and legs. Movements are being investigated with regard, to season, and the availability of prey, water, and cover. The maximum known range of a pack of wild dogs is a straight line distance of at Ieast 55 km. There is less certainty about the status of the wild doe population compared to that of cheetahs, so wild dogs are especially in need of more intensive and detailed studies.

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BANDED MONGOOSE

The principal banded mongoose study site comprises an area of approximately 80km² at the Gol Kopjes in the short grass plains. At present the study area contains 46 mongooses in four packs (a density of about ·6/km²), nearly identical to the 45 mongooses inhabiting the area one year ago. Recruitment exceeded mortality during the year but the increment was balanced by the emigration of a group of 31 mongooses from the study area following a pack split.

On the short grass plains banded mongooses feed mainly on dung beetles throughout the year. Packs occupy overlapping home ranges of about 20km² and use up to ten dens consisting of springhare holes and rock crevices in kopjes. During the dry season when food resources are more sparsely dispersed the mongooses move up to 10km/day and spend about 60% of their time foraging. In comparison with the dwarf mongoose in the woodlands, banded mongooses on the plains occupy ranges approximately 100 times as large, move considerably greater distance per day and spend a larger proportion of the activity cycle in search of food. The anti-predator behavior of the two genera also differs markedly. The frequent visual scanning and loud repetitive alarm call of the dwarf mongoose appears adaptive to a small woodland form which forages in widely dispersed groups. The larger banded mongoose forages in cohesive groups which respond aggressively to predators up to the size of a jackal by bunching and chasing them, behavior of importance is adapting this mongoose for life in open habitats.

Present data indicate that pack splits are an important mechanism regulating group size in the banded mongoose. Two occurred on the study area during the year. In October the V pack split into groups of 10 and 7. The smaller group moved to the northern part of the previous range extending it into an area used by the J pack. In November two mongooses rejoined the group of 10 but in January they returned to the 5 and have remained with them up to the present. The J pack split occurred in January — when the pack consisted of 24 mongooses — and was likewise followed by a period of group instability lasting for several weeks. The groups of 13 and 11 both continued to use the original range and both split temporarily into groups of 8 and 5, and 8 and 3 respectively. In addition one mongoose from the 11 temporarily joined the 13. During this period of instability frequent aggressive interactions occurred between the groups — often when two groups attempted to use the same den — and several individuals had most of the hair pulled from their tails. The situation was resolved in late February when the larger of the two groups emigrated. After a great deal of searching I eventually located them

at the southern edge of the Barafu Kopjes, 10 miles north of their original range.

The two observed pack splits suggest that in *Mungos* splits are followed by a period of instability — probably regulated by differences in the strength of social bonds between individuals — in which both groups attempt to remain in the original home range. If the resources within the range are not sufficient to support both groups and the range cannot be extended because of aggression from surrounding packs, concentration of the groups around scarce resources (in this case den sites) results in aggressive interactions and eventually the expulsion of one of the groups.

SOLITARY MONGOOSES

A radio-collar was fitted on a white-tailed mongoose at the Gol Kopjes in August enabling me to locate her den on most days and obtain data on range, movements and den usage. Unfortunately, however, in October the collar was found in open grassland, still transmitting, but minus the mongoose. Probably she had been caught by a predator. Black-tipped mongooses are occassionally observed on the woodland study area but are not common enough there to make a study feasible. A study site where black-tipped mongooses are abundant has been selected at Kirawira and I plan to begin work there in near future. The short grassland at Kirawira facilitates mongoose field observations and the selected area should be a good one for a study of niche overlap in sympatric groups of *Helogale* and *Mungos*.

M. POPULATION STUDY OF CHEETAHS AND WILD DOGS—

George W. Frame and Lory Herbison Frame.

ABSTRACT

Cheetahs *(Acinonyx jubatus)* and African wild dogs *(Lycaon pictus)* are being studied in the Serengeti National Park and adjacent areas. The purpose of the research is to determine the size and trend of their populations, and to describe the extent of their movements and their ecological requirements. The ultimate objective is to formulate management recommendations for preserving cheetahs and wild dogs within the artificial confines of the park's boundaries.

The cheetah population within the Serengeti ecosystem is probably in excess of 250. The high recruitment of young cheetahs into the population indicates either an expanding population or a stable

population with high adult mortality. Individual cheetahs are identified by means of a photographic recognition file, which is based on the unique spot pattern on the face of every cheetah. Movements are being studied with respect to season and the availability of prey, water and cover. The maximum known migration distance for adult male and female cheetahs is 40 km. for each. The minimum dry season density of cheetahs around Seronera is about one cheetah per 3 sq. km.

Wild dogs within the Serengeti ecosystem probably number about 300 individuals or 30 packs. In spite of a high pup mortality, the recruitment is high. Either the population is expanding, or there must be extensive adult mortality. Individual dogs are identified by means of a photographic recognition file which is based on the unique pattern of white and yellow marks on the body and legs. Movements are being investigated with regard to season, and the availability of prey, water, and cover. The maximum known range of a pack of wild dogs is a straight line distance of at least 55 km. There is less certainty about the status of the wild dog population compared to that of cheetahs, so wild dogs are especially in need of more intensive and detailed studies.

INTRODUCTION

Cheetahs *(Acinonyx jubatus)* and African wild dogs *(Lycaon pictus)* are approaching extinction throughout Africa outside of National Parks and nature reserves. The primary threat to their survival is the loss of habitat, caused by development of farms and ranches and the expansion of cities, all a result of growth of human populations. A second major threat is the killing of cheetahs for their skins and the extermination of wild dogs because they are considered vermin. The numerous areas now designated for wildlife conservation offer hope that both these species will be preserved from extinction. However, because many park and reserve boundaries are established with inadequate knowledge of the habitat requirements or the movements of the wildlife, there is no guarantee that an individual species will survive indefinitely without the assistance of management techniques. Effective management can be applied only when long-term, detailed research provides abundant data on which to develop concepts and base decisions.

PART 1 — CHEETAHS

STATUS

Historically, cheetahs are known to have existed throughout most of Africa and southwestern Asia, and far enough eastward to include

central and southern India (Sterndale, 1884; Flower and Lydekker, 1891) However, the most recent sighting in India was in 1951, and this species is now believed to be extinct in that country. The last sighting in Iraq was in 1928, and it is not known whether any still survive in Saudi Arabia, Oman, or Asian Russia (Eaton, 1974).

Iran is the last stronghold of the Asian cheetah. Cheetahs have been legally protected in Iran since 1959, and with the assistance of the wildlife conservation department, it appears that in many remote areas of the country the cheetahs may actually be increasing in numbers (Firouz, 1974). The upward trend is due not only to effective protection of cheetahs, but to the successful management of prey species, such as the gazelle.

In Africa in the early 1930's, cheetahs were considered rare in Southern Rhodesia and Malawi, and sparse in Zambia (Shortridge, 1934; Roberts, 1951). Shortridge (1934) believed that cheetahs were increasing in Botswana at that time. Cheetahs are now extinct throughout much of South Africa, and their numbers are decreasing very rapidly in Somalia because of lack of protection (Eaton, 1974). N. Meyers (pers. comm., 1974) believes that the largest extant cheetah population is in South West Africa, and the second largest is in East Africa. Cheetahs are still widespread in East Africa (Graham and Parker, 1965), but are known to have disappeared entirely from some extensive areas in Kenya in recent decades (Stewart and Stewart, 1963).

An African continent-wide cheetah survey was recently completed by N. Myers under the direction of the International Union for the Conservation of Nature and Natural Resources (I.U.C.N., Morges, Switzerland) and the World Wildlife Fund. Myers (pers. comm., 1974) concluded that there may be no more than 10,000 cheetahs surviving today. More important, Myers emphasized that the rate of decline of cheetahs is so rapid that by the end of this decade the number will be halved. It is clear that cheetahs have a future only within the relative safety of the artificial confines of national parks and reserves; but it is essential to understand the cheetah's ecological requirements if these protected areas are to be adequate.

Study of the cheetahs within the Serengeti National Park is prudent because, although the park's boundaries do not enclose the entire ecosystem, cheetahs and other large mammals are still able to migrate across boundaries and live in a relatively unhindered way. In the future, development of farms to the northwest and southwest, and possibly cattle ranches to the east, will cut off the routes of migration and dispersal. This will confine cheetahs and other animals to hardly more than half of the former extent of the ecosystem. The effects on

the animal populations will be profound. But study of cheetahs in the present, relatively natural conditions will provide a background of information essential for their survival.

STUDY AREA

The area of interest is the entire Serengeti ecosystem which consists of the Serengeti National Park (13,250 sq.km.), the woodlands to the northwest and southwest, the Masai Mara Game Reserve to the north and the grasslands and *Acacia* woodlands of the Ngorongoro Conservation Area to the east — all in all a total area of more than 30,000 sq. km. Obviously it is not possible to give adequate attention to the entire area, so a study area of about 3,000 sq. km. was chosen for intensive fieldwork. This study area surrounds Seronera, and includes a small portion of woodland, the woodland-grassland ecotone, and the large area of grassland as far east at Oldupai Gorge. The study area includes the Serengeti's major habitat types, so extrapolations can be made for other portions of the ecosystem. Boundaries of the study area were adjusted to include the total movements of several cheetahs for which the best and longest life history data were known.

A second study area, for comparative purposes, is the caldera of Ngorongoro. This area was selected because cheetahs are uncommon, although there is a high density of other carnivores and food is abundant. Information about what is happening to the cheetah population in Ngorongoro Crater will provide useful insights into competition between predators, both in Ngorongoro Crater and in the Serengeti.

METHODS

A photographic recognition file includes all cheetahs encountered in the field. This is being expanded from the photographic file system begun by G. Schaller and B. Bertram. Recognition is based mainly on the spot patterns on both sides of the face. Many cheetahs in the Serengeti National Park are sufficiently tame to permit good photographs within range of a 300 mm lens. Less tame cheetahs also are photographed, and, when the face spots are indistinct, attempts at identification are made using the pattern of spots on the chest and inner sides of the legs. Spots elsewhere on the body and rings on the end of the tail are subject to too much distortion to be reliable.

Cheetahs are common on the Serengeti Plains when the gazelles migrate there during the wet season, and at that time cheetahs are especially easy to observe because of the paucity of cover. In the dry season, when these cheetahs return to the woodlands, they are more difficult to locate.

Each time a cheetah is found it is photographed and later compared to the photographic recognition file. Repeated identifications, and following individuals for prolonged periods, provide information on movements, and these are correlated to season and availability of prey, water and cover. Detailed records are being compiled on hunting success and competition with other predators. Preferences are being noted for the prey species, sex, and size selected by the cheetah.

Radio-tracking is of only limited value for making spot checks of cheetah locations, because of the short transmitting range when the cheetah is lying — which is most of the time. So far only one cheetah is radio collared. However, radio-tracking is effective and essential for following selected individuals day and night for many consecutive days. Following selected cheetahs for long periods is the only feasible way of determining the total movements, because some cheetahs disappear for many months. They may migrate far out of park, and outside of the normal seach area.

Observations of cheetah behaviour are necessary for understanding the nature of their spacing system and for determining whether they are territorial. Several adult wild cheetahs of each sex are being studied in detail, and their movements are being compared. Particular attention is being devoted to several litters of cubs to learn about their dispersal.

The cheetah population size will be estimated for the entire Serengeti ecosystem. This will be accomplished by estimating the size of the cheetah population within the study area by means of the three methods described below, and adding this to the estimates derived independently from other areas outside of the study area:

The minimum count method involves summing all the cheetahs identified as individuals in the study area during an arbitary time period. The time period must be short enough to discount mortality. The count will be repeated yearly during the early part of the rainy season when visibility is best because most cheetahs are on the plains: the exact time will be determined by the arrival of the migratory gazelles.

The subjective estimate is based on several parameters: If male cheetahs are territorial, knowledge of the territory size will lead to an estimate of the number of territorial males. And an understanding of the social organization and the recruitment of male cheetahs provides a basis for estimating the number of non-territorial males. In the absence of territorial behaviour, estimates of the number of male cheetahs could be based on the knowledge of dominant/subordi-

nate relationships. The abundance of females can be estimated from an understanding of their spacing system. The number of immature cheetahs can be approximated by multiplying the percentage of adult females seen with cubs, times the estimated number of adult females, times the average litter size. This subjective approach is complicated by the fact that a large proportion of the cheetah population is migratory. Consideration must also be given to the distribution and availability of food, water and cover. The estimate will be based on cumulative knowledge and need not be done at any particular time of year.

The Petersen Index depends on the identification of known individuals. The method established by Petersen (1896), and later modified by Bailey (1951) is being followed. This method was successfully used by Clark (1972) for estimating the absolute density of coyotes. Kruuk (1972) used a similar approach for spotted hyenas in the Serengeti, except he earnotched individuals rather than use a photographic recognition file. During an initial two-week search period in the study area, all cheetah individuals identified by photographs are counted, and assigned to sex and age classes. About one week is allowed to pass, and then a second two-week search is done. This method is done simultaneously with other fieldwork during the wet season when migratory gazelles are on the plains. Otherwise, the expense would not be justified because the minimum count method is probably more accurate.

Approximations of the population trend will be obtained by examining the age and sex structure of the population, the number of young attaining adulthood each year, mortality factors, and the estimated density of cheetahs in the study area in successive years. Analytical methods to be used are similar to those described by Gross and Stoddart (1974).

Two reproductive parameters to monitor for possible changes are litter size and percentage of adult females with litters. The method of Gross (1974) analyzing reproductive performance of a population on a discrete litter basis is being followed as far as possible, but data collecting for cheetahs is necessarily limited because only live animals can be studied.

Mortality factors will be studied. Calculation of mortality rates for successive years will follow the approach used by Gross (1967).

RESULTS

Movements

Most Seronera cheetahs migrate onto the short grass plains during the rainy season to follow the migratory gazelles. And then in the

dry season they return to Seronera and other parts of the woodland and woodland-grassland ecotone. In the 1974 dry season, for example, 4 adult males, 10 adult females, and 16 cubs were resident around Seronera. An additional 2 adult males and 6 adult females appeared to be transient through the Seronera area.

Six cheetahs remained around Seronera during the 1974 wet season, but all were young and only recently separted from their mothers. A year later, during the 1975 wet season, these 6 cheetahs disappeared from Seronera, and one young female was seen among the migratory gazelles far out on the plains. Apparently by then they had all learned to follow the migrations of gazelles.

The one male and one female adult cheetah for which we have the best data have ranges from the woodlands to far on the plains, each with a known maximum diameter of 40 km.

Dense concentrations of prey are not necessary for good hunting success. In fact, we find that cheetahs are most successful when the prey is in small groups. Even the sparse numbers of gazelles remaining around the Gol Kopjes during the 1974 dry season were sufficient to sustain 13 resident cheetahs.

Spacing

Cheetahs space themselves visually and by scent marking, as was suggested by Schaller (1970) and Eaton (1970). The highest reported cheetah density was in Nairobi National Park (Eaton, 1974:28). However, the dry season 1974 cheetah density around Seronera was even greater, with 22 adults and 16 cubs in an area of about 120 sq. km. Occasionally as many as 10 cheetahs (including cubs) were seen in an area of 25 sq. km., and sometimes the adults were clearly visible to one another.

The area between the Seronera River and Mukoma Hill was occupied at various times during the 1974 dry season by 7 of the females and 8 of the cubs listed above. This contrasts with Schaller's (1970) report of only 2 females with cubs resident there in the dry season.

Adult males may be more intolerant of one another than are females, and thus more widely spaced. Eaton (1974) recorded aggressive interactions between males. Stevenson-Hamilton (1947) reported two incidents where a male cheetah apparently killed another male. The numerous fine facial scars and tattered ears of every adult male is suggestive of fighting. Females, by contrast, are remarkably unscarred regardless of age. But whether the males receive most of their scars from other males in fights, or from females during courting, remains unclear.

Young cheetahs, after separating from their mother, may emigrate to areas outside of their former range. Of 19 cubs whose history was first recorded by B. Bertram and continued by us, 15 (79 percent) disappeared within a year of separating from the mother. Most of the disappearances occurred within the first several months. Several litters are now under observation, with the intention of keeping close watch on them when they separate.

Population Size

Schaller (1973) estimated a population of 200 to 250 cheetahs in the entire Serengeti ecosystem. Although we have not yet analyzed our 1975, census data, it appears that Schaller's estimate is an understimate.

Sex Ratio

The cheetah cub sex ratio shows a slight preponderance of females (8:7). With adults, nearly three times as many females as males are seen in the Seronera area; but on the short grass plains the adult sex ratio is about even. Whether this difference in the sex ratios reflects a real difference in the distribution of males, or whether males are normally more secretive than females but less successful at hiding on the short grass plains, cannot be determined yet.

Reproduction

Cheetahs first successfully conceive at 20—22 months of age (Schaller, 1972). At that time they are solitary, having separated from or been abandoned by their mother at 14 to 18 months of age, and then separating from their siblings a few months later. A tame cheetah at Gol Kopjes was sexually attractive to males for a ten day period when she was 20 months old. A vaginal discharge was noted one day, midway through this period. Males seem to have discovered her through olfaction, and they gave much attention to her urine and places where she had been lying. Giving continuous vocatizations (yelps and staccato purrs) one male tried by degrees to approach the female and habituate her to himself.

Many females seem to need experience before they can successfully raise cubs. The average age of five Serengeti cheetahs, when they gave birth to the first litter they were subsequently able to rear, was 44 months. One female did not rear any cubs until she was over five years old. Yet she was known to have conceived her first litter when she was 21 months old, and she lost three more litters in the following years (B. Bertram, pers. comm., 1975). Figuring an average litter size of 3·5, we estimate this female has lost at least 16 cubs in her lifetime, 11 of which were never seen. She has successfully raised only 7 cubs to adulthood. Thus she had a cub mortality rate of about 70 percent.

From long term records begun by B. Bertram it is known that female cheetahs may conceive within two weeks of losing a litter. J. Adamson (1969) noted that her tame but free living cheetah conceived again within a week of losing a litter. Thus it is possible that female cheetahs in the Serengeti which are repeatedly seen without cubs may in fact have two or three litters per year, but either miscarry them or lose them soon after birth.

Litter Size

Among all litters recorded by B. Bertram and us, only nine were seen before one month old. The average litter size at this time was slightly less than four cubs.

Mortality

Nearly two-thirds of the cubs in the above mentioned nine litters died before reaching three months of age. However, almost no cub mortality occurred between three months of age and the time at which the cubs separted from their mother as young adults.

The causes of cub mortality are numerous. One young female was seen in an area of sparse cover during heavy rain and flooding; her cubs were already dead — either stillborn or the victims of exposure (B. Bertram, pers. comm., 1975). Adamson (1969) noted that her cheetah's first litter was born during heavy rains and did not survive. Also, grass fires sometimes kill cubs (Schaller, 1972).

Other carnivores sometimes kill cheetahs. J. Adamson (1969) reported a lion killing a cheetah cub, and Schaller (1972) and Bertram (pers. comm., 1975) saw the same in the Serengeti. Adamson (1969) suspected spotted hyenas of killing a litter of cheetah cubs. And M. Turner (pers. comm., in Schaller, 1972:301—302) found a cheetah that had been killed and hung in a tree by a Serengeti leopard. Eaton (1974) believes that lions, hyenas, and leopards are the main causes of cub mortality in Nairobi National Park, although it is unclear whether he witnessed any predation.

Maternal neglect or abandonment, especially in inexperienced mothers, is a possibility. Females with cubs must kill nearly every day, although solitary hunters can survive on one kill every two or three days (Schaller, 1972). For young females, cubs may well be a burden. But females 2½ years or older seem capable of capturing as much prey as they and their cubs require.

Disease may be another important cause of cub deaths. Schaller (1973) noted illness in one young cub shortly before it disappeared. Adamson (1969) and Murray (1967) have recorded feline enteritis in cheetahs. Also, Adamson (1969) reported canine tick fever; Adamson (1972) reported *Babesia felis;* and Murray (1967) reported homelytic

anemia brought about by *Eperythrozoon felis*. Anthrax was recorded by Pienaar (1969) in Kruger National Park. Schaller (1972) reported severe tick infection by *Rhipicephalus carnivoralis*. Cheetahs are also known to be infected with cestodes (Adamson, 1972) and nematodes (Murray, Campbell, and Jarrett, 1968), but the significance of these parasites as a mortality factor remains unclear. Captive cheetahs often suffer from rickets (Young, 1967; Adamson, 1969) and toxic dystrophy of the liver (Eaton, 1974), but these ailments may not be serious in wild cheetahs although they normally have heavy loads of Hippoboscid flies and ticks.

Lack of skill in hunting does not seem to be a significant problem for Serengeti cheetahs. Although young adults are not skillful hunters, we have seen no instance of an individual starving after separating from its mother. Hunting skills are rapidly perfected, and in every case a successful adjustment was made in a few months.

The light build and fast pace of cheetahs make them especially prone to injury during hunts, either from the prey itself or accidents during the chase. Adamson (1973) found her cheetah seriously disabled and hypothesized the cause was a kick from a large ungulate. The horns of the prey are serious hazards, and several local cheetahs show scars indicating they were very nearly blinded. Also, a tame cheetah at Oldupai Gorge somehow got a thorn in her eye, and she was subsequently unable to hunt.

CONCLUSIONS

In spite of a cub mortality rate of about 70 percent, the Serengeti cheetahs raise a large number of cubs to maturity. Fully one-third of the 90 cataloged individuals are between 3 and 14 months of age, an age interval during which very little mortality occurs. Given such a large recruitment of cheetahs into the adult population, it appears that either cheetahs are increasing in numbers, or more likely there is some adult mortality factor that keeps the cheetah population at its present level.

All the above cheetah data are presented as a progress report for the purpose of promoting discussion. In many cases the tentative conclusions may be based on inadequate sample sizes. Continuing fieldwork will produce information which may necessitate revision of the above discussion and conclusions.

PART II — WILD DOGS

STATUS

Wild dogs are distributed throughout most of Africa south of the Sahara. They occur in a variety of habitats; but not deserts or moist evergreen forests (Schaller, 1972:321). Wild dogs have even climbed

to the summit of Mt. Kilimanjaro (Thesiger, 1970). They are sparse in numbers throughout their range, but whether this is a normal condition brought about by natural causes, such as disease, or the result of extensive shooting by man remains unknown.

Shooting of entire packs has been common in many parks and reserves until relatively recently. In the Kruger National Park, for example, shooting continued until 1960 (Pienaar, 1969), and it is believed to have continued until perhaps 1973 in the Serengeti National Park. When the Ngorongoro Conservation Area achieved temporary national park status in 1951, a game warden shot 45 wild dogs in one day in Ngorongoro Crater (Maasai Elder in Engoitokitok village in Ngorongoro Crater, pers. comm., 4 March, 1974).

STUDY AREAS

The wild dog study area is essentially the same as that described for cheetahs, in order to minimize travel expenses. The dogs, however, are farther-ranging than cheetahs, so occasional special effort is needed to follow the full extent of the movements of several select packs.

METHODS

Wild dogs are photographed whenever encountered in the field. Individuals are cataloged to amass data on life histories, range, and associations with other individuals. Recognition is based mainly on the pattern of white and yellow marks on the body and legs. Most dogs are tame and can be approached closely enough for good photographs with a 150 mm lens. H. van Lawick made available his recognition photos from 1969 to 1971, and we are currently updating and expanding this file.

Wild dog movements are being studied with regard to season and the availability of prey, cover, and water. The motivation for their movements appears to be very different from that of cheetah, and we are looking closely at the individuals in a pack who most often initiate pack movements.

Radio-tracking has proven useful for following wild dogs in darkness and for relocating them after long periods. Wild dogs are so far-ranging that following a pack for long periods is the only way to obtain adequate data on their total movements.

The behaviour of wild dogs is being studied only in the context of understanding why packs split and join together. This entails elucidation of the social heirarchy. If James Malcolm's proposed project on behavioural ecology of wild dogs is approved, he will concentrate on this aspect as well as provide information on the movements of several packs in the Ndutu-Endulen area. This will enable us to work more on the wild dogs nearer to Seronera and in the woodlands.