CHAPTER 8

PREY SELECTION BY CARACAL IN THE KGALAGADI TRANSFRONTIER PARK

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ABSTRACT

In the Kgalagadi Transfrontier Park, 116 caracal *Caracal caracal* scat samples were collected and 327 attempted hunts were reconstructed from spoor-tracking. The data were analysed to establish the prey-use of caracals in the Kgalagadi Transfrontier Park, and to study the extent to which caracals use small stock by moving into the adjacent farming land in Namibia. It was found that the primary prey resource was small mammals, the vast majority of which were rodents, including springhare *Pedetes capensis*. Larger prey animals included steenbok *Raphicerus campestris* and smaller carnivores up to the size of a black-backed jackal *Canis mesomelas*. Birds were an abundant prey resource, especially the larger ground-roosting species. Invertebrate remains were found in a large proportion of the scats, indicating that they are commonly used as a source of food. Domestic livestock remains were identified in eight of the scat samples and the temporal distribution of these indicates an increased use of domestic livestock by caracals in the cold season.

Keywords: Caracal, Felidae, scat analysis, spoor-tracking, small mammals, livestock

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INTRODUCTION

The survival of any predator is directly related to the quality and quantity of its diet. Predatory strategies have evolved to maximise the nutrient intake within a certain habitat. For this reason prey selection determines the spacing patterns and structure of predator social patterns (Sunquist & Sunquist 1989). Of the terrestrial carnivore families, the Felidae are the least dependent on vegetable and invertebrate food sources. Felids also tend to feed on prey species commensurate with their own body size. Despite being highly specialised predators, felids display certain levels of intra-specific prey preference that could include the habitual depredation on domestic livestock (Kruuk 1982).

The caracal *Caracal caracal* is known to be a predator of small domestic livestock throughout southern Africa (Pringle & Pringle 1978, Grobler 1981, Roberts 1986, Stuart 1986, Palmer & Fairall 1988, Stuart & Wilson 1988, Stuart & Hickman 1991). Responses to questionnaires conducted during this study indicate that this is the case in the Kalahari region, especially in areas where domestic livestock is farmed on the border of proclaimed conservation areas. One such area of conflict is the South African border with Namibia, where stock farms border on the Kgalagadi Transfrontier Park. Although widely condemned as a problem animal, caracals contribute to controlling populations of small mammals that eat natural forage upon which domestic livestock depend (Grobler 1981, Stuart 1982, Moolman 1986, Palmer & Fairall 1988, Stuart & Hickman 1991).

Most studies indicate that mammals contribute the primary component of the diet of caracals (Grobler 1981, Stuart 1982, Moolman 1986). In terms of absolute numbers, rodents contribute the largest percentage to this diet, but in terms of biomass domestic livestock and antelope make the greatest contribution towards the diet (Stuart 1982). In the Karoo National Park, Palmer and Fairall (1988) found that caracals killed large mammalian prey such as springbok *Antidorcas marsupialis*, grey rhebok *Pelea capreolus,* klipspringer *Oreotragus oreotragus* and mountain reedbuck *Redunca fulvorufula*. They hypothesised that this was due to a decrease in hyrax *Procavia capensis* and rodent populations as a result of drought conditions.

Aspects of caracal hunting behaviour have been discussed elsewhere (Melville unpublished data). The caracal fills the top predator niche in many areas of its range in South Africa (Estes 1991, Avenant & Nel 1998). In the Kgalagadi Transfrontier Park, however, it falls lower down the predator hierarchy. This study investigates what prey resources the caracals use, and whether they prey on small livestock that occur on farms outside the park in the vicinity of the Namibian border.

STUDY AREA

This study was conducted along the Namibian border near Mata-Mata in the southwestern portion of the Kgalagadi Transfrontier Park, in an area that extended 60 km north from the Mata-Mata rest camp to O'Kuip windmill and approximately 20 km into the interior of the Park.

The Mata-Mata area lies in the Shrubby Kalahari Dune Bushveld of the Savanna Biome (Low & Rebelo 1996). This is an arid savanna with temperatures varying from –10° C to 45° C in the shade with an annual mean rainfall of 182 mm that occurs

mainly in the summer. The landscape is one of undulating dunes with sparse vegetation, and altitudes varying from 1000 to 1100 m above sea level (Low & Rebelo 1996).

The vegetation is characterised by *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca* trees, with a shrub layer of *Grewia retinervis* and *Rhus tenuinervis* and a well-developed grass layer consisting mainly of *Stipagrostis amabilis*, *Eragrostis lehmanniana*, *Aristida meridionalis, Schmidtia kalihariensis* and *Centropodia glauca* (Low & Rebelo 1996). There is little variation in the soil forms because the area is predominantly covered by aeolian sand overlying calcrete (Low & Rebelo 1996).

METHODS

Two methods were used to assess the diet of caracals. One hundred and sixteen fresh scats were collected whilst spoor-tracking caracals. Scats were placed in paper bags, labelled and air-dried. Each scat was then sewn into a separate nylon sachet, numbered for future identification and washed until only insoluble, macroscopically identifiable material remained in each sachet (Merriwether & Johnson 1980). The individual sachets were then oven-dried (Bowland & Perrin 1993). Teeth and jaw fragments were compared with available keys or references (De Graaff 1981, Bowland & Bowland 1989). Hair was examined microscopically, including hair cuticle scale patterns and cross-section patterns (Dreyer 1966, Perrin & Campbell 1979, Keogh 1983, Keogh 1985). To ensure that no prey items were missed, imprints of a minimum of 20 hairs from each scat were made (Mukherjee *et al.* 1994).

Gelatine imprints of hair cuticle patterns were made according to the method of Dreyer (1966). The resultant impressions were compared with existing reference

keys (Keogh 1985, Keogh 1983, Perrin & Campbell 1979; Dreyer 1966). Additionally imprints of reference cuticle scale patterns, of known prey, were made according to the same method. The benefit of this was that the reference samples could be viewed under the same conditions and at the same magnification as the hair samples from the scats. The prey identified in each scat, according to the cuticle patterns, were then recorded.

Cross sections of hair were made by adapting the method of Douglas (1989) for both the reference samples of hair and hair from the scats. The method involved embedding bundles of hair in a molten mixture of 25 % depilatory wax and 75 % paraffin wax (Kaunda 1998). Identification of prey was based on the appearance of a combination of hairs of various cross-sectional structures, sizes and colours rather than on the identification of single hairs (Henschel & Skinner 1990).

Results obtained through scat analysis are prone to certain biases due to the variable digestion rates and travel time of certain food items through the gut (Putman 1984, Hiscocks & Bowland 1989, Bothma & Le Riche 1994). In absence of baseline data relating faecal volume to food intake, it was decided to concentrate on the analysis of the prey diversity that caracals used (Bothma & Le Riche 1994; Putman 1984). Diagnostic parts of an individual prey might be present in more than one scat, and as a scat is seen as a sampling unit, the number of individual prey detected might exceed the number consumed (Weaver & Hoffman 1978).

Where caracal hair was found in a scat, it was assumed that its inclusion was due to grooming behaviour (Bowland & Perrin 1993) and not due to cannibalism (Stuart & Hickman 1991). As such, the occurrence of caracal hair was not regarded as food for analytical purposes, but as further substantiation of the origin of a scat (Avenant &

Nel 1997; Bowland & Perrin 1993).

The contribution of various components in the scats are presented in Table 1 where the following guidelines of Avenant & Nel (1997) were used;

1. Percentage occurrence in the scat sample:

(Number of scats containing a particular prey item ÷ total number of scats) X 100

2. Percentage of the total number of prey units;

{Number of incidences of a prey type ÷ (incidence of all ingesta – plant material)} X 100

3. Percentage occurrence of the total number of ingesta;

(Number of incidences of a particular prey type ÷ incidence of all ingesta) X 100

A large proportion of the study comprised the investigation of caracal predation by tracking spoor. Experienced Kalahari San trackers assisted in following and interpreting fresh caracal tracks, over a distance of 537 km, as has been done in a number of studies in the Kalahari (Bothma & Le Riche 1984, Eloff 1984, Mills 1990, Stander *et al.* 1997). All hunting attempts interpreted as such by the tracker were recorded whether successful or not and where possible the type of prey targeted was identified. The pre-requisite for hunting success was the discovery of prey remains. This might underestimate the number of successful hunts because caracals are known to consume smaller prey entirely (Stuart & Hickman 1991). In many instances the target prey could therefore not be identified from spoor and were recorded as unknown prey. To investigate prey selection, only the data relating to identified prey that caracal targeted during hunts has been included here.

The results from spoor-tracking were compared with those compiled from scat analysis (Table 1). It was expected that the results from spoor-tracking would

Table 1: *The prey used by the caracal in the Kgalagadi Transfrontier Park from June 2000 to July 2002, based on scat analysis and evidence from hunts*

Prey	Scat analysis				Spoor tracking			
	Occurrences of prey in 116 scats	Percentage of scats in which prey occurs	Percentage contribution of prey to carcal diet relative to total number of prey	Percentage contribution of all ingesta compared with total number of ingesta	Occurrences in 327 hunts	Percentage of total hunts	Percentage of hunts with identifiable prey	Number of hunting successes
Lagomorpha								
Lepus saxatilis : scrub hare	11	9.5	4.9	3.9	14	4.3	18.9	1
Rodentia								
Pedetidae								
Pedetes capensis : springhare	43	37.1	19.1	15.2	23	7.0	31.0	2
Sciuridae								
Xerus inauris : ground squirrel	*	*	*	*	4	1.2	5.4	0
Muridae								
Parotomys brantsii : Brant's whistling rat	26	22.4	11.6	9.2	*	*	*	*
Rhabdomys pumilio : striped mouse	23	19.8	10.2	8.1	*	*	*	*
Aethomys namaquensis : Namaqua rock mouse	1	0.9	0.4	0.4	*	*	*	*
Desmodillus auricularis : short-tailed gerbil	3	2.6	1.3	1.1	*	*	*	*
Gerbillurus paeba : hairy-footed gerbil	4	3.5	1.8	1.4	*	*	*	*
Tatera brantsii : Highveld gerbil	37	31.9	16.4	13.1	*	*	*	*
Carnivora								
Felidae								
Felis silvestris : African wild cat	4	3.5	1.8	1.4	2	0.6	2.7	1
Canidae								
Canis mesomelas : black-backed jackal					1	0.3	1.4	0
Otocyon megalotis : bat-eared fox	6	5.2	2.7	2.1	8	2.4	10.8	2
Vulpes chama : Cape fox	5	4.3	2.2	1.8	10	3.1	13.5	2
Mustelidae								
Ictonyx striatus : striped polecat	3	2.6	1.3	1.1	2	0.6	2.7	1
Cynictis penicillata : yellow mongoose	6	5.2	2.7	2.1	1	0.3	1.4	1
Artiodactyla								
Raphicerus campestris : steenbok	3	2.6	1.3	1.1	7	2.1	9.5	
Ovis aries : dorper sheep	8	6.9	3.6	2.8	*	*	*	

Table 1: *Continued*

Prey	Scat analysis				Spoor tracking			
	Occurrences of prey in 116 scats	Percentage of scats in which prey occurs	Percentage contribution of prey to carcal diet relative to total number of prey	Percentage contribution of all ingesta compared with total number of ingesta	Occurrences in 327 hunts	Percentage of total hunts	Percentage of hunts with identifiable prey	Number of hunting successes
Aves								
Gruiformes								
Ardeotis kori : kori bustard	5	4.3	2.2	1.8	2	0.6	2.7	2
Eupodotis ruficrista : redcrested korhaan	3	2.6	1.3	1.1	*	*	*	*
*U*nidentified	7	6.0	3.1	2.5	*	*	*	*
Insecta								
Coleoptera : unidentified	27	23.3	12.0	9.5	*	*	*	*
Plants								
Mimosaceae								
Acacia erioloba : camel thorn	2	2.6	na	0.7	*	*	*	*
Acacia haematoxylon : grey camel thorn	1	0.9	na	0.4	*	*	*	*
Acacia meliferac : black thorn	1	0.9	na	0.4	*	*	*	*
Scrophulariaceae					*	*	*	*
Aptosimum elongatum	4	3.5	na	1.4	*	*	*	*
Cucurbitaceae					*	*	*	*
Citrullus lanatus : tsamma melon	3	2.6	na	1.1	*	*	*	*
Poaceae					*	*	*	*
Schmitia Kalihariensis	45	38.8	na	15.9	*	*	*	*
					*	*	*	*
Unidentifiable plant material	2	1.7	na	0.7	*	*	*	*
Unknown	*	*	*	*	253	77.5	na	15
Total	283	na	100	100	327	100	100	27

* no data for these categories

underestimate the contribution of small mammals to the diet of caracals (Grobler 1981).

RESULTS

Of the 37 suitable mammalian prey species available to caracals in the study area, 16 were used by them. Rodents, including the springhare *Pedetes capensis,* comprised 60.9 % of the total number of individual prey items identified. Springhares alone contributing 31.4 % of the total number of rodents identified. Carnivora constituted 10,7 % of total prey identified, whereas larger artiodactyls such as the steenbok *Raphicerus campestris* featured infrequently in the scats (Table 1).

Wool from sheep *Ovis aries* was found in eight (6.9 %) of the scats. The scats that contained wool were not limited to regions of the Kgalagadi Transfrontier Park that border directly with Namibia. Three of these scats were found in the vicinity of the border, the others were found further than 13 km from the Namibian border in the interior of the Kgalagadi Transfrontier Park. One was found approximately 23 km away from the border.

Remains of avian prey occurred in 13.0 % of the scats, the identified ones being kori bustard *Ardeotis kori* and redcrested korhaan *Eupodotis ruficrista* (Table 1). As a group, birds contributed 6.7 % to the total number of prey identified in the scats.

Of the invertebrates carapaces were found in 23.3 % of the scats (Table 1). No reptilian remains were found in any of the scat samples, neither were hunting attempts on reptiles recorded while spoor tracking.

Plant material formed 20.5 % of total number of ingested items that were identified,

but probably only seeds from the tsama melon were taken in as food. Once a caracal being tracked also apparently ate a tsama. Kalahari sour grass *Schmidtia kalihariensis* leaves or seeds were found in 38.8 % of the scats (Table 1).

Tracking

During the study 327 hunts were recorded from spoor (Table 1) but in only 74 (22.6 %) of the cases could the target prey be identified. According to spoor tracking, caracals achieved a 10.1 % hunting success. Hunting attempts on two prey species not found with scat analysis, black-backed jackal *Canis mesomelas* and the ground squirrel *Xerus inauris,* were recorded while tracking, although none were successful.

From spoor-tracking, the most frequently recorded prey were springhare Cape fox *Vulpes chama* and a *Lepus* species. These animals were hunted on 23, 11 and 15 occassions respectively with two of the springhare hunts, three of the fox hunts and one of the *Lepus* species hunts being successful. Twenty-three of the 74 (31.1 %) recorded hunts, involved attempts to catch other carnivores of which seven were successful involving six species (Table 1). Although the relative importance of small rodents in the diet could not be determined from spoor tracking, it is likely that most of the unidentified hunts were on rodents.

DISCUSSION

Many studies have been conducted into the minimum sample size required to estimate the diet of predators (Bothma *et al.* 1976, Windberg and Mitchell 1990, Mukherjee *et al.* 1994). Based on a comparison with the sample sizes in these studies, it is likely that the sample (116 scats) used here should give a reliable first order indication of the diet of caracals in the Kgalagadi Transfrontier Park and this is augmented with data from tracking spoor. The sample size is still too small,

however, to give an accurate estimation of the seasonal prey use by caracals. Scat analysis shows that the remains of more than one prey is often included in a single scat (Mukherjee *et al.* 1994). Therefore a large enough hair sample should be taken from each scat to include all prey that may occur in that scat.

General mammalian prey

The most abundant prey for caracals during this study were rodents which were found in 60.9% of scats. This is likely to be due to increased rodent recruitment in response to two seasons of good rain in the study area (Nel *et al.* 1984). Like other predators, the caracal is an opportunist (Bothma & Walker 1999; Bothma 1998) and uses suitable prey that is most abundant and consequently most frequently encountered while hunting. When compared with other studies in southern Africa, the only study that found a higher percentage of rodent use than that of the Kgalagadi Transfrontier Park, was in the arid West Coast National Park, where rodent remains were found in 89.1 % of the scats (Avenant and Nel 1997). Other studies revealed rodents to vary in percentage occurrence from 5.3 % to 50.0 % (Table 2).

Most caracal diets elsewhere include a larger proportion of artiodactyls with a body mass of ≥10 kg than in the Kagalagadi Transfrontier Park (Tables 2 and 3). Only the study of one male caracal in the desert of Saudi Arabia recorded a lower incidence of large mammals in the diet of a caracal than the present study. The collared male caracal in Saudi Arabia was observed feeding on the carcasses of dead camels *Camelus dromedarius* and sand gazelles *Gazella subgutturosa* (Van Heezik & Seddon 1998). Although these are large prey it is likely that the caracal was scavenging on the carcasses of these animals. In an arid area such as the northern

Table 2: *Synopsis of the relative percentage contributions of major prey sources from the Kgalagadi Transfrontier Park compared with those from previous studies, based on scat analysis.*

Prey	Region and source of data						
	Kgalagadi Transfrontier Park: current study	West Coast National Park Avenant & Nel (1997)	Southwestern and eastern Cape: Stuart & Hickman (1991)	Karoo National Park: Palmer & Fairall (1988)	Mountain Zebra National Park: Moolman (1986)	Farm land in the eastern Cape: Moolman (1986)	Mountain Zebra National Park: Grobler (1981)
Mammals	81.3	69.8	94.8	85.2	94.9	96.9	93.7
Lagomorpha	4.9	1.3	5.2	14.7	15.3	9.4	10.6
Rodentia	60.9	57.4	50	30.2	8.5	24	5.3
Hyracoidea	na	1.2	9	17.1	52.5	30.3	53.3
Carnivora	10.7	1.2	2.9	1.6	5.1	na	0.9
Artiodactyla	1.3	4.2	10.9	21.7	13.5	10.3	23.6
Insectivora	na	4.5	na	na	na	na	na
Domestic stock	3.6	na	16.8	na	na	22.9	na
Birds	6.7	11.5	5.2	1.6	4.3	2.1	5.3
Reptiles	na	7.9	na	na	0.8	1	0.9
Invertebrates	12.0	10.8	na	13.2	na	na	na

Table 3: *Mean body mass of various animals that caracals preyed on in the Kgalagadi Transfrontier Park from June 2000 to July 2002 (Skinner Smithers 1990)*

Prey	Scientific name	Body mass	
		Males	Females
African wild cat	*Felis sylvestris*	4.9	3.7
Bat-eared fox	*Otocyon megalotis*	4.0	4.1
Black-backed jackal	*Canis mesomelas*	7.9	6.6
Brant's whistling rat	*Parotomys brantsii*	0.1	0.1
Caracal	*Caracal caracal*	11.8 *	8.6 *
Cape fox	*Vulpes chama*	3.0	2.9
Ground squirrel	*Xerus inauris*	0.7	0.6
Kori bustard	*Ardeotis kori*	13.5 to 19.0	13.5 to 19.0
Scrub hare	*Lepus saxatilis*	2.2	2.6
Springhare	*Pedetes capensis*	3.1	2.8
Steenbok	*Raphicerus campestris*	10.9	11.3
Striped polecat	*Ictonyx striatus*	1.0	0.7
Yellow mongoose	*Cynictis penicillata*	0.6	0.6
Unidentifiable	~	~	~

* Based on the body masses of caracals captured in the Kgalagadi Transfrontier Park

steppe desert of Saudi Arabia, where prey are not abundant, opportunistic feeding behaviour dictates that caracals use whatever food resources are available.

The most important prey animal in the diet of caracals in the Kgalagadi Transfrontier Park is the springhare. Springhare remains were found in 37.1 % of the scats collected and made up 6.1 % of kills recorded (Table 1). The importance of the springhare in the diet of caracals is due to its abundance and large size relative to other prey. In the Kgalagadi Transfrontier Park the springhare probably fills the same prey niche, in terms of degree of use (Table 2) and mean body mass (Table 3), as the rock dassie *Procavia capensis* does in other areas (Skinner & Smithers 1990).

Carnivore prey

Although the use of carnivores as prey is not uncommon (Bothma & Walker 1999, Mills 1990), a prominent feature of the diet of caracals in the Kgalagadi Transfrontier Park is the high proportion and diversity of carnivores used as prey. In the present study five species of carnivore contributed 10.7 % of the total number of prey identified in the scats. This is more than twice the number of carnivores recorded by Moolman (1986), in the Mountain Zebra National Park (Table 2). Other studies recorded a variation in contribution of carnivores to caracal diets (Table 2). Of the prey that could be positively identified from spoor-tracking, 32.4% were carnivores and 22.5 % were killed.

Previous studies have shown that the carnivores preyed upon by the caracal weigh <1 kg (Skinner & Smithers 1990), with the exception of water mongooses *Atilax paludinosus,* that weigh 3.4 kg, in the southwestern Cape (Stuart & Hickman 1991). Four of the six carnivore species preyed upon by caracals in the Kgalagadi Transfrontier Park weigh from 2.5 to 8.0 kg (Table 3). In most areas the risk of

preying on larger carnivores is probably not ameliorated by the energetic benefits gained from utilising them. In the southern Kalahari the energetic benefit provided by larger prey may outweigh the risks involved in preying upon larger carnivores (Sunquist & Sunquist 1989). The low density of smaller artiodactyls, except for steenbok, in the Kgalagadi Transfrontier Park, creates the opportunity for smaller carnivores to fill this medium to large prey category for caracals. The low density of leopards *Panthera pardus* and cheetahs *Acinonyx jubatus* in this area may increase the availability of such small predators to caracal. This is further evidence of the opportunism and adaptation displayed by the caracal in its predatory behaviour.

Diurnal prey

Predation on diurnal animals including Brant's whistling rat *Parotomys brantsii*, ground squirrels, and yellow mongooses indicates that caracals in the Kgalagadi Transfrontier Park display some diurnal behaviour. This is supported by observations in the present study of caracal activity during daylight hours, especially in the cooler winter months, as well as by observations of Avenant & Nel (1988) in West Coast National Park.

Domestic livestock

It is clear that caracals living in the vicinity of the border of the park with Namibia do occassionally feed on small livestock. Four of the six scats that contained wool were found during the cold season (April to September) when the livestock lamb. This is supported by the observations of Namibian farmers who indicate that the majority of sheep losses occur in the cold period. The furthest distance from the park border that small livestock remains were found in a caracal scat was 23.3 km. This suggests that caracals with a good proportion of their foraging range within the park, do transgress into the neighbouring farming areas.

Avian prey

The occurrence of avian prey in the diet of caracal in the Kgalagadi Transfrontier Park is higher than recorded for most other areas, except in West Coast National Park (Table 2). It was surprising that birds did not contribute more to the diet of caracals in the Kgalagadi Transfrontier Park. Kori bustards and korhaans seem to be ideal prey because of their relatively large size and ground-nesting habits (Maclean 1985). On two occasions a caracal stalked and killed kori bustards that were roosting on the ground.

Invertebrate prey

Invertebrate prey, made up exclusively of Coleopterans, was found in 23.3 % of the caracal scats. Because of their low individual biomass, their contribution to the diet of the caracal is limited, but they probably supplement the diet when taken opportunistically. Coleopterans form an integral component of the insect fauna in the semi-arid regions of southern Africa (Palmer & Fairall 1988). Moolman (1986) found scorpion remains in a small percentage of the caracal scats that he analysed. Stuart and Hickman (1991) suggest that insects do not contribute to the diets of caracals, however, the current data supports the results of Palmer and Fairall (1988) that at least in some areas they do. Perhaps in the more arid areas where prey abundance is low, opportunism dictates that caracals use items not taken under other conditions.

Vegetable matter

The occurrence of plant material in caracal scats has also been recorded in other studies (Palmer & Fairall 1988, Stuart & Hickman 1991, Avenant & Nel 1997). Caracals probably usually ingest vegetable matter accidentally while grooming or while consuming other food. Tsamma melon seeds were found in three scats in the

present study. Caracals were also recorded to eat tsamma melons based on spoor evidence. This confirms that caracals, like other carnivores, use these plants in the Kgalagadi Transfrontier Park (Eloff 1984, Mills 1990, Bothma & Le Riche 1994). This habit probably supplements the moisture intake of carnivores in the southern Kalahari (Bothma 1998).

Comparison of methods

As discussed by Mills and Mills (1978) both methods have advantages and disadvantages that to an extent augment each other. Scat analysis reveals small items such as insects and small rodents not recorded when tracking spoor and tracking spoor gives an indication of hunting success and type of prey hunted.

CONCLUSIONS

The primary prey resource used by caracals in the Kgalagadi Transfrontier Park is rodents, of which the springhare is especially important. Smaller carnivores form an important component of the diet and seem to replace the artiodactyls as a larger prey resource for caracals as eaten in other areas. The use of small livestock seems to take place on an opportunistic basis when there is an increase in vulnerability due to the birth of lambs.

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