

NOTES ON SOME SMALLER CARNIVORES FROM THE KALAHARI GEMSBOK NATIONAL PARK

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Abstract – Notes on relative densities, habitat choice, food and foraging, social organisation and anti-predatory behaviour of certain small and medium-sized carnivores are presented. Possible mechanisms of niche separation and the evolution of different anti-predatory behaviours are briefly discussed.

Introduction

This paper discusses aspects of the ecology and behaviour of 11 species from four families of small to medium-sized carnivores in the Kalahari Gemsbok National Park, Republic of South Africa. The canids are excluded as they are discussed in a separate paper in this volume (Nel 1984). Included are “small” species *e.g.* the viverrids and the striped polecat *Ictonyx striatus*, as well as some larger ones which otherwise would have been excluded from this volume: the ratel or honey badger

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Mellivora capensis, the caracal *Felis caracal* and the aardwolf *Proteles cristatus*.

With the exception of the ratel which has received some attention from Kruuk & Mills (1983) and the suricate *Suricata suricatta* which is being studied by Macdonald (*in prep.*), no published information on these carnivores is available from the southern Kalahari. We here present some incidental observations on relative densities and habitat choice, food and foraging, social organisation and anti-predatory behaviour.

Methods

Visual observations, made from vehicles, were recorded on magnetic tape and later transcribed, or entered directly on prepared data sheets. Observations were made in the course of regular game censuses, or while following particular species being intensively studied, e.g. brown hyaenas *Hyaena brunnea*, spotted hyaenas *Crocuta crocuta*, and bat-eared foxes *Otocyon megalotis*.

To monitor relative densities and habitat choice 100 randomly chosen strips (20 on the side of the riverbeds and 80 in the dunes), each $200 \times 1,5$ m, were cleared, the sand smoothed, and approximately 15 hours later examined. The spoor of each species which had crossed the strips was identified with the aid of a Bushman tracker and noted. As it proved impossible to accurately assess the number of animals of each species which had crossed the strip, species were merely noted on a presence or absence basis. Social species, therefore, in this case particularly the suricate, will be under-represented.

Results and discussion

Relative density and habitat choice

The results are presented in Table 1. The yellow mongoose *Cynictis penicillata* is clearly a common carnivore in the southern Kalahari, showing a clear preference for the dunes ($\chi^2 = 12,14$; $df = 1$; $P < 0,01$). The next most common species to cross the strips was the African wild cat *Felis lybica*, which showed no preference for either river or dunes ($\chi^2 = 1,50$; $df = 1$; $P > 0,05$), followed by the striped polecat, which also showed no preference as to habitat ($\chi^2 = 1,29$; $df = 1$; $P > 0,05$). The only other species which showed an indication of habitat preference was the suricate for river habitat, but the sample size was too small for a statistical comparison. Direct observations strongly support this tendency. As mentioned above the data are biased against suricates because of their social nature and they are more common than is indicated in Table 1; probably the second most abundant of the carnivores listed.

The data for the other carnivores listed in Table 1 do not indicate a habitat preference, which was also our impression from direct observations. The small number of observations for the last three species in the table also probably mask differences in density between them. Ratels are certainly more often seen than aardwolves, which in turn are more often seen than small spotted cats *Felis nigripes*, which are extremely rare. The figures in the table, however, probably reflect the relative densities of these three species compared to the other species more accurately.

Table 1
Frequency of occurrence of spoor of different carnivores in 100 strips of 200 × 1,5 m located in river and dunes habitat

Species	River n = 20		Dunes n = 80	
	Frequency	Percent	Frequency	Percent
Yellow mongoose	5	25,0	52	65,0
African wild cat	5	25,0	9	11,3
Striped polecat	1	5,0	8	10,0
Caracal	0	0,0	3	3,8
Suricate	2	10,0	0	0,0
Small spotted genet	0	0,0	2	2,5
Ratel	0	0,0	1	1,3
Aardwolf	0	0,0	1	1,3
Small spotted cat	0	0,0	1	1,3

Two other small carnivore species which are known to occur in the Kalahari Gemsbok National Park (KGNP) are not represented in Table 1. The slender mongoose *Galerella sanguinea* is occasionally encountered along the riverbeds and is particularly associated with large fallen trees (*Acacia erioloba*) and rock outcrops. The banded mongoose *Mungos mungo* has recently been recorded from the KGNP. A band of five was seen twice early in 1983 along the Nossob riverbed at an interval of five weeks. The sightings were approximately 15 km apart (R. Goss pers. comm.).

Diet and foraging

Table 2 summarises certain aspects of the ecology and behaviour of the carnivores under discussion, including diet. Two, the banded mongoose and the small spotted cat, are so rare that they cannot play any significant role in the ecology of the area. The wide range of prey items, from insects to small bovids, utilized by the others suggests that they form an important link in the Kalahari ecosystem.

In Table 2 the main diet of all, except three, of the species is taken as those food items which were found to have a percentage occurrence of more than 20% in the stomachs of specimens, collected in Botswana (Smithers 1971). The three exceptions are the ratel and the aardwolf, where main diet is taken as those food items with a percentage occurrence of more than 20% in faeces collected in the southern Kalahari (Kruuk & Mills 1983; Bothma & Nel *in prep.*), and the caracal, where the main diet is taken from direct observations in the southern Kalahari, using data from Smithers (1971) and Grobler (1981) as a guide.

It appears (Table 2) that the greatest overlap in diet occurs between the yellow mongoose and the slender mongoose, and between the slender mongoose and the striped polecat. Each of these species pairs have four food items in common. However, several factors tend to lessen the amount of interference (and exploitative)

Table 2

Summary of some ecological and behavioural attributes of certain small and medium-sized carnivores in the Kalahari Gemsbok National Park

Family and Species	Mass* kg	Preferred habitat	Main diet	Activity	Foraging group size
Viverridae					
<i>Suricata suricatta</i>	0,725	Riverbeds and adjoining dune slopes, pans.	* Coleoptera larvae, scorpions	Diurnal	\bar{x} = 8,6 n = 27
<i>Cynictis penicillata</i>	0,571	Dunes	* Coleoptera adults and larvae, Isoptera, Orthoptera, Insecta	Diurnal	\bar{x} = 1,6 n = 13
<i>Galerella sanguinea</i> ♂ (<i>Herpestes sanguineus</i>) ♀	0,493 0,384	Riverbeds; amongst dead trees and rock outcrops	* Isoptera, Reptilia, Muridae, Orthoptera, Insecta, Coleoptera adults	Diurnal	\bar{x} = 1,1 n = 11
<i>Mungos mungo</i>	0,794	?	* Coleoptera	Diurnal	?
<i>Genetta genetta</i>	1,900	Wherever large trees, especially <i>Acacia erioloba</i> are found	* Muridae, Orthoptera, scorpions, Solifugae	Nocturnal	\bar{x} = 1,5 n = 18
Mustelidae					
<i>Mellivora capensis</i>	7,700	Throughout	† Rodents, scorpions, lizards, insects and spiders	Diurnal/ Nocturnal	\bar{x} = 1,3 n = 57
<i>Ictonyx striatus</i> ♂ ♀	0,900 0,624	Throughout	* Coleoptera adults, Reptilia, Orthoptera, Muridae	Nocturnal	\bar{x} = 1,1 n = 10
Felidae					
<i>Felis nigripes</i>	?	?	?	Nocturnal	?
<i>Felis lybica</i> ♂ ♀	5,100 4,300	Throughout	* Muridae	Nocturnal	\bar{x} = 1,1 n = 23
<i>Felis caracal</i> ♂ ♀	13,400 9,700	Throughout	** Rodentia and Bovidae	Nocturnal	\bar{x} = 1,0 n = 13
Hyaenidae					
<i>Proteles cristatus</i>	9,100	Dunes	†† Isoptera (<i>Trinervitermes</i> sp.)	Nocturnal	\bar{x} = 1,0 n = 10

* From Smithers (1971) † From Kruuk & Mills (1983) ** Personal observations †† Bothma & Nel in prep.

competition between these species pairs. The two mongoose species are diurnal whereas the striped polecat is nocturnal. The two mongoose species tend to use different habitats (Table 1), and the slender mongoose takes a greater proportion of larger food items such as murids and reptiles than the yellow mongoose (Table 2). Moreover, the slender mongoose is far less common than the other two competitors. Competition for food may also be severe between the small-spotted genet *Genetta genetta*, the African wild cat and the ratel, as murids are an important food source for all three species. However, the foraging behaviours of the three species tend to differ. Genets are arboreal to a far greater extent than the other two species are, ratels tend to dig out much of their prey and wild cats often employ a "sit-and-wait" hunting strategy. This may imply that each species selects different species of rodents. For example, the tree rat *Thallomys paedulus* may be taken by the small-spotted genet and not by the other two species.

Caracals, which are known to kill animals as large as adult springbok *Antidorcas marsupialis* probably compete more with the larger carnivores than with the smaller ones mentioned here. Mills (1981) recorded eight occasions where a brown hyaena was observed to appropriate a kill from a caracal, and agonistic interactions between black-backed jackals *Canis mesomelas* and caracals at or away from food have been observed. Once a caracal was observed to drive three black-backed jackals from their springhare *Pedetes capensis* kill. On one occasion only was a caracal observed up a tree with its springhare kill. In the light of the apparently high loss of kills to brown hyaenas, it is puzzling that they do not do this more often.

Foraging ratels are frequently accompanied by chanting goshawks *Melierax canorus* which come down onto low bushes, or onto the ground, when the ratels start digging, and snap up any small animals which may escape them. Sometimes black-backed jackals also follow foraging ratels, snapping up missed prey in a similar manner. These "satellites" do not appear to deprive the ratels of any food as they catch those prey which escape the ratels, nor do the ratels appear to derive any benefit from their presence. The ratels for the most part ignore the presence of these other species.

The aardwolf is a highly specialised carnivore feeding almost exclusively on termites of the genus *Trinervitermes* (Kruuk & Sands 1972; Cooper & Skinner 1979; Bothma & Nel 1980). This is corroborated by analysis of scats from the KGNP where *Trinervitermes* sp. were found to constitute $93,7 \pm 9,6\%$ ($n = 7$) of the food (Bothma & Nel *in prep.*).

The limited data, therefore, suggest that there are definite differences in diet, habitat preferences and activity budgets between many of these carnivores which affect niche separation.

Social grouping and anti-predatory behaviour

Viverridae

Of the four common viverrids the suricate is the most social (Table 2), the members of a social group always foraging together. When foraging, one of the group members often guards, usually from an elevated position such as a *Rhigozum tri-*

chotomum bush, termite mound or fallen tree, as the others search for food. Suricates inhabit open habitats, not usually used by the solitary mongooses, and are strictly diurnal. The yellow mongoose is more common in the dunes (Table 1) where cover is more abundant and forages singly or in pairs, while the solitary slender mongoose is usually associated with fallen trees and rocky outcrops. Both species are diurnal. The small-spotted genet forages solitarily, or as a female with young, often in trees and at night. It may be that the social nature of the suricate and its highly organised guard system allow this species to exploit an open habitat during the day to a far greater extent than do the other viverrids. All species of viverrids are subject to predation, particularly by large raptors (Steyn 1982).

Suricates live in communal burrows, often sharing them with ground squirrels *Xerus inauris*, but thus far they have not been observed to share burrows with yellow mongooses as, for example, in the Orange Free State (Lynch 1983). Once a group spent the night at a burrow with a group of breeding Cape foxes *Vulpes chama*. Apparently only one female in the group breeds, the other members of the group helping to feed the young.

Yellow mongooses also den communally (up to four per den) in the southern Kalahari, although the sex and age composition of the groups have not been determined. Slender mongoose dens have been found in hollow tree trunks and in calcrete outcrops, where on one occasion two adult animals were observed.

Mustelidae

The striped polecat is a solitary forager whereas the ratel may be solitary or paired, believed to be a female and her offspring (Kruuk & Mills 1983). Once three ratels, believed to be male, female and young, were tracked while moving together for two days. Both these species appear to exhibit the typical mustelid social organisation where males and females inhabit separate but overlapping territories.

Both mustelids use what appears to be chemical defence against predators. A ratel was observed to ward off an attack by three spotted hyaenas by three times stopping, facing the hyaenas with mouth open and emitting a fierce growl. At the same time it raised its tail and emitted a foul smell. This had the apparent effect of deterring the hyaenas. Twice a striped polecat was observed to behave in a similar manner towards a brown hyaena, although no smell was detected, upon which the hyaena left it, and once a spotted hyaena was observed to pick up in its mouth and then rapidly drop a striped polecat. On another occasion, however, a brown hyaena was observed to kill and eat a striped polecat (Mills 1978).

Felidae

The three felid species are solitary, nocturnal foragers. On the two occasions that two adult African wild cats were seen together they were male and female. On one of these occasions the male followed the female for several minutes and twice spray-urinated against a bush, African wild cats have been observed to be hunted by or preyed upon by cheetahs *Acinonyx jubatus*, leopards *Panthera pardus*, caracals and brown hyaenas. When pursued they have been observed to scramble into trees.

The occasional presence of feral domestic cats *Felis catus* in the KGNP is disturbing. At least one case of hybridization between *F. lybica* and *F. catus* has been found and destroyed.

Hyaenidae

The aardwolf is predominantly a solitary forager, although the social group may consist of male and female and grown-up young. They are preyed upon by leopards and spotted hyaenas and appear to rely on a series of burrows in their home ranges in which to take refuge when chased by a predator.

Conclusions

The smaller carnivores discussed here have evolved differences in main diet, habitat choice, activity periods and social organisation, all of which aid in total niche separation. Differences in social organisation have also led to the emphasis on different mechanisms of anti-predatory behaviour. The social species use a guard system, some of the solitary species employ chemical defence, whereas others rely on speed to reach refuges such as holes or trees.

The paucity of information available on many of these small carnivores is unfortunate. The KGNP with its open habitat, good visibility, and sand substrate making spoor tracking possible, is an ideal study area for many of these species.

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REFERENCES

- BOTHMA, J. DU P. and J. A. J. NEL. 1980. Winter food and foraging of the aardwolf *Proteles cristatus* in the Namib – Naukluft Park. *Madoqua* 12: 141-149.
- COOPER, R. L. and J. D. SKINNER. 1979. Importance of termites in the diet of the aardwolf *Proteles cristatus*. *S. Afr. J. Zool.* 14: 5-8.
- GROBLER, J. H. 1981. Feeding behaviour of the caracal *Felis caracal* Schreber 1776, in the Mountain Zebra National Park. *S. Afr. J. Zool.* 16: 259-262.
- LYNCH, C. D. 1983. The mammals of the Orange Free State. *Mem. Natl. Mus.* 18: 1-218.
- KRUUK, H. and M. G. L. MILLS. 1983. Notes on food and foraging of the honey badger *Mellivora capensis* in the Kalahari Gemsbok National Park. *Koedoe* 26: 153-158.
- KRUUK, H. and W. A. SANDS. 1972. The aardwolf (*Proteles cristatus* Sparrman, 1783) as predator of termites. *E. Afr. Wildl. J.* 10: 211-227.
- MILLS, M. G. L. 1978. Foraging behaviour of the brown hyaena (*Hyaena brunnea* Thunberg, 1820) in the southern Kalahari. *Z. Tierpsychol.* 48: 113-141.
- MILLS, M. G. L. 1981. *The socio-ecology and social behaviour of the brown hyaena Hyaena brunnea, Thunberg, 1820, in the southern Kalahari*. D.Sc. thesis. University of Pretoria, Pretoria.
- NEL, J. A. J. 1984. Behavioural ecology of canids in the south western Kalahari. *Koedoe* (Supplement) 27: 229-235.
- SMITHERS, R. H. N. 1971. The mammals of Botswana. *Mem. natn. Mus. Rhodesia.* 4: 1-340.
- STEYN, P. 1982. *Birds of prey of southern Africa*. Cape Town: David Philip.