

BEHAVIOURAL ECOLOGY OF CANIDS IN THE SOUTH-WESTERN KALAHARI

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Abstract – Aspects of the behavioural ecology of three medium-sized canids *Canis mesomelas*, *Otocyon megalotis* and *Vulpes chama*, occurring in the Kalahari Gemsbok National Park, are discussed. The good visibility in the study area facilitates visual observation of these mammals and studies on their socioecology are continuing.

Introduction

Three species of canids commonly occur in the southwestern Kalahari: the black-backed jackal *Canis mesomelas*, the bat-eared fox *Otocyon megalotis*, and the Cape fox *Vulpes chama*. All three species have a wide distribution in southern Africa (Smithers 1983), especially in the more arid western and southwestern regions, while both *C. mesomelas* and *O. megalotis* also occur in East Africa.

Considering the widespread occurrence of the three species, surprisingly little is known about their ecology and behaviour. Previous studies have focused mainly on diet (Grafton 1965; Bothma 1971; Rowe-Rowe 1976; Stuart 1976; Nel 1978; Rowe-Rowe 1983; Nel & Loutit *in press*), with less attention focused on foraging and hunting (Lamprecht 1978), behaviour patterns and communication (Ferguson 1978; Lamprecht 1979; Nel & Bester 1983), socioecology (Moehlman 1979, 1983) and coexistence (Bothma, Nel & Macdonald 1984). In South Africa different aspects of the ecology of *C. mesomelas* have been studied in the Drakensberg (Rowe-Rowe 1982, 1983) and western Transvaal and the Kalahari (Ferguson 1978, 1980) while *V. chama* has been studied by Bester (1982) in the Orange Free State. This paper summarizes aspects of the behavioural ecology of the three common canids of the southwestern Kalahari. The African wild dog *Lycaon pictus* is transient in this region and will not be discussed here.

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Materials and methods

Observations made from February 1976 to February 1984 on the three canid species by day or night, from a vehicle, were put on magnetic tape and later transcribed, or entered directly on previously prepared data sheets. As attention was focused mainly on foraging and feeding behaviour of *O. megalotis* observations on the other species were of a more incidental nature; logistic and other implications resulted in short observation periods of *ca* 10 days to 2 weeks, usually in January–February and June–July.

Results and discussion

Mating systems

Both black-backed jackals and bat-eared foxes exhibit monogamous pair bonding; in both cases this may persist for several years (Moehlman 1983; *pers. obs.*). However, the percentage or duration of pair bonding in both species in the southwestern Kalahari is unknown, and may vary from year to year due to environmental fluctuations in the case of bat-eared foxes (Nel, Mills & Van Aarde 1984) and perhaps also in the case of black-backed jackals (see group size below). The situation in *Vulpes chama* is unknown, but the few observations suggest that pair bonding also occurs in this species, although its duration is unknown and may not persist from year to year.

Pair bonding as evidenced by marking behaviour (especially double marking) has been noted in the Kalahari only during July and August in both black-backed jackals and bat-eared foxes. When this happens in Cape foxes in the Kalahari is unknown, but presumably also during the winter months (Bester 1982). All three species have their young in late spring to early summer, from September to November, with, in the case of bat-eared and Cape foxes, the possibility of litters being born as late as December. According to Kleiman & Brady (1978) canids have a single litter per year.

The time that the young remain in the parental group varies. In bat-eared foxes, family groups remain intact from the time the cubs start foraging, first with one, then later both parents, till May–June when groups split up, and re-affiliation of pair bonding between parents may ensue. Sibling groups can remain intact for several more months. Young therefore remain with the parents for 5–6 months. Black-backed jackal family groups remain together for a shorter period, from birth of cubs till up to March–April. The position with Cape foxes is unknown. Certainly male parental care, as in the other two species, is evident, but for how long the male remains with the group is unknown.

Division of labour between the sexes in degree of parental care in the three species is also largely unresolved. Certainly, in the case of bat-eared foxes at dens with cubs present, the male guards the young while the female forages, only returning to suckle. In this species food provisioning of the female by the male seems rare, and has only been observed once (*pers. obs.*). In both Cape foxes (Bester 1982; Ribbink *pers. comm.*) and black-backed jackal the male provisions the female at least for the first week or two *postpartum*. This difference in provisioning of the female, and later the cubs, no doubt is correlated with the diet of the three species — in the case of the bat-eared foxes mainly insects (predominantly termites, ants and beetles in the Kalahari — Nel 1978) and larger prey, *e.g.* small mammals,

reptiles etc. in the other two species (Ferguson 1980; Bester 1982; *pers. obs.*). Certainly no provisioning of food to the young by one or both parents in the case of bat-eared foxes has been observed. "Helpers" at dens of black-backed jackals have been reported by Moehlman (1979) and Ferguson (1980). Evidence for the occurrence of helpers at dens of bat-eared foxes is equivocal, while Bester (1982) reports den "parasitism" by Cape fox subadults, who do not provision the young, but in fact steal food brought to dens by parents.

Multiple litters at dens of bat-eared foxes have been observed (*pers. obs.*; Mills *pers. comm.*) as well as at dens of Cape foxes (Mills *pers. comm.*), but not as yet in the case of black-backed jackals in the Kalahari.

What then is the social grouping in the three species? This will depend which part of the annual "cycle" is considered. For the first half of each year bat-eared fox social organization can be stated to consist predominantly of family groups; for the latter half of the year as mainly of pairs. A similar situation exists in the black-backed jackals, although family groups remain cohesive for much shorter periods before break-up. Predominantly therefore, they are observed as pairs, although, in the southwestern Kalahari, singles are also common. Cape foxes evidently forage singly, although whether in fact they are solitary or not remains in considerable doubt (Bester 1982). It may well be that their social organization is more complex than is known, as has been found *e.g.* in the red fox *Vulpes vulpes* (Macdonald 1981).

Table 1

Some ecological and behavioural parameters of Canis mesomelas, Otocyon megalotis and Vulpes chama in the southwestern Kalahari

	<i>Canis</i>	<i>Otocyon</i>	<i>Vulpes</i>
Mass (kg)	9-14	3-5	3,0
Group size	$\bar{x} = 1,7$ (n = 130)	$\bar{x} = 2,7$ (n = 623)	$\bar{x} = 1,2$ (n = 13)
Sociality	Pair	Family group	Solitary
Territorial	Yes	No	No
Home ranges overlap	No	Yes	Yes
Home range size (km ²)	2,6-8,8 $\bar{x} = 4,12^1$	0,5-3,0	?
Main prey items	springhares ¹ mice insects arachnids	termites ants beetles sunspiders crickets berries	rodents insects sunspiders
Hunt as	pair; single	group, pair	single
Food caching	Yes	No	Yes

¹From Ferguson 1980

Table 2

Variation in group size of C. mesomelas in the southwestern Kalahari

	\bar{x}	n
"Summer"		
Dec. – Jan. 1976–78	1,5	20
Feb. 1982	2,0	30
Feb. 1983	1,5	42
Feb. 1984	1,6	9
"Winter"		
Jul. 1976–78	1,9	13
Aug. 1981	1,3	13

Group size

Group sizes for the three species are given in Table 1. In bat-eared foxes mean group size tends to vary from year to year, apart from the seasonal fluctuations due to change in social grouping, probably due to changes in rainfall and/or food availability (Nel *et al.* 1984). To what extent food availability influences the persistence of family groups in this species is, however, unknown. Hunting group sizes are given in Table 1. Similar changes may occur in black-backed jackals as well (Table 2). The situation as regards the Cape fox is unknown.

Spacing

In the southwestern Kalahari black-backed jackals have discrete home ranges, which are marked by urination and defaecation, and actively defended against conspecifics (Ferguson 1980). They can, therefore, be regarded as being territorial in this part of their range. Observations on jackals inhabiting the riverbeds of the Kalahari Gemsbok National Park suggest that at least in this habitat, strict territoriality may, however, break down under two circumstances.

Free water is normally scarce and only available at boreholes for most of the year, except in summer when ephemeral pans develop after heavy downpours. The boreholes lie within the territories of pairs of jackals, and access to water is controlled by the resident pair or family group. Other jackals are permitted to approach waterholes, but only after exhibiting submissive behaviour (for details, see Ferguson 1978). This submissive behaviour is shown by "strange" adults even to very young cubs of the resident pair.

The second instance is when the carcass of a medium-sized or large ungulate becomes available in the territory of a resident pair. In this case large aggregations of jackals may collect around a carcass — up to 24 (Mills *pers. comm.*). Conceivably the resident pair feeds first; others lie in a large circle around the carcass, come up to feed either with others, or alone, and then move on.

In the Kalahari, in contrast to East Africa (Lamprecht 1979), bat-eared foxes show no signs of territorial behaviour. Boundaries of home ranges are fluid, and intermingling of different groups on profitable good feeding sites, *e.g.* harvester termite *Hodotermes mossambicus* colonies, occur. Home ranges of adjacent pairs or groups then overlap to a greater or lesser extent. Findings by Bester (1982) in the Orange Free State indicate that in the Cape fox overlap of home ranges may also occur, although the significance is not clear pending resolving their social organization.

Food

The main items in the diet of the three canid species present in the Kalahari are given in Table 1. Obviously particular prey categories utilized will differ according to the time of year, their availability, and the habitat sampled. Changes in prey taken exist, for bat-eared foxes, between summer and winter (Nel 1978) and also in different habitats (Nel *in prep.*) and the same probably applies to the other two species as well.

In contrast to East Africa, black-backed jackals in the southwestern Kalahari, have not been observed hunting adult antelope and little quantitative data are available on hunting success when hunting singly or in pairs on small mammals, *e.g.* springhare *Pedetes capensis*. Ferguson (1980) mentions that of 33 attempts by single jackal to capture springhares 11 (33%) were successful, while 63% of 21 instances where pairs were hunting succeeded.

Foraging in bat-eared foxes has been described by Nel (1978). The prey type foraged affects the spacing of individuals in a group — when feeding on termites group members remain close together, and are “called” to good food patches (Nel & Bester 1983). When foraging on beetles, grubs etc. individuals are spaced further apart and feeding proceeds on an individual basis (Nel *in prep.*).

As far as can be determined Cape foxes forage and feed alone, even when the male still forms part of the family group. All three species exhibit the typical canid “pounce”, and both the black-backed jackal and Cape fox cache food (Ferguson 1980; Bester 1982).

Activity

Due probably to changes in the activity rhythm of their main prey type, harvester termites *Hodotermes mossambicus*, bat-eared fox activity rhythms also show a seasonal change. In summer they are nearly strictly nocturnal (except on cool, overcast days), this activity regime gradually shifting to a diurnal activity pattern in late summer through autumn to winter.

Elsewhere in South Africa, where they are undisturbed by man, *e.g.* the Namib desert, the same situation applies (*pers. obs.*). This is in contrast to the situation in East Africa (Lamprecht 1978) where they are almost entirely nocturnal.

Black-backed jackal similarly are more active by day in winter than in summer, although most activity takes place at dusk or dawn, and into the night (Ferguson 1980).

Cape foxes are seldom active in daylight, except at dens where cubs may play, or when lying outside burrows basking in the early morning sun. Hunting is strictly confined to the dark hours.

Summary and conclusions

The three canid species common occurring in the southwestern Kalahari conform to socioecological patterns found elsewhere for canids (*e.g.* Moehlman 1983) — pair bonding occurs (although the pattern in *V. chama* is not yet quite clear), helpers are found in some species, and extended periods of family group relationships are found. Many aspects of their socioecology however, still have to be resolved. A fair amount of food/niche separation occurs between the species, their activity periods differ, and some degree of habitat selection may also exist. Mills (1981) found that, based on spoor counts in riverbed habitat and dune habitat, Cape foxes occur in more or less equal densities in the two habitats, while black-backed jackals are more common in the riverbeds, and bat-eared foxes are more common in the dunes. Censusing, mainly of riverbed habitat, shows that numbers of at least some species fluctuate from year to year, as well as mean group sizes (Nel *et al.* 1984), but how true this is for all species, or what the proximate and ultimate reasons are, still have to be resolved.

Probably behavioural differences, to some extent, are dictated by differences in diet — *i.e.* food caching and provisioning of young (or females at dens) only occur in black-backed jackals or Cape foxes, where food to a large extent consists of vertebrate prey.

Allogrooming occurs in bat-eared foxes and black-backed jackal, but is absent in Cape foxes (Bester 1982), mouth sniffing or nuzzling (“greeting”) occurs in all three species, while body slamming occurs only in black-backed jackals and Cape foxes. Thus some behaviour patterns are common to all three species, while others occur only in some. The reasons for this awaits further study.

The behaviour ecology of black-backed jackals, Cape foxes and bat-eared foxes in the Kalahari has only been cursorily appraised, as shown above. The good visibility in this area makes visual observation of the three species possible and studies on their socioecology are continuing.

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