

which had trespassed on its pathway, the two animals immediately turned away from each other and continued their running. Occasionally, however, an altercation did occur (neck- and shoulder-orientated threat-gape).

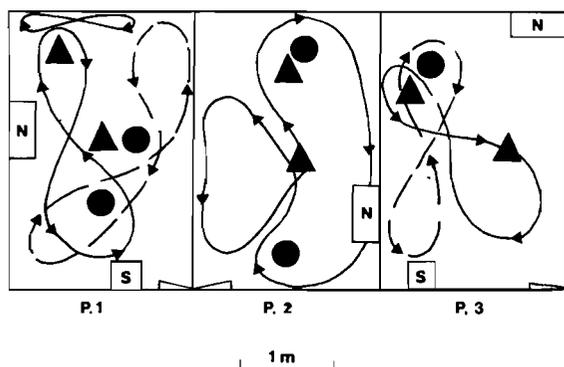


Figure 3 Activity pathways used by pairs 1, 2 and 3. — female path; - - male path; ▲ rock; ● tree; N nestbox; S shelter.

(e) Defence. Defence usually occurs in most animals in response to attack or threat. No generalized defence posture, as has been described in some mustelids (Rowe-Rowe 1975), was ever seen in the slender mongoose. Whenever the animals were in a situation when threat might have been expected, for example when the observer was in the cage, the body hairs were raised. Piloerection was particularly pronounced in the tail and shoulder region, giving an impression of increased body size. Squirting of scent from anal glands, as recorded in *Ictonyx striatus* (Rowe-Rowe 1975) and *Atilax paludinosus*, was not observed in slender mongooses.

(f) Displacement behaviour. No displacement behaviour was seen in agonistic encounters. Territorial displays were not observed when mongooses had access to neighbouring cages.

The establishment of dominant-submissive relationships is important for the reduction of agonistic encounters. In the slender mongoose, this relationship seemed unstable and uncertain in some cases perhaps explainable by the fact that normally any two animals remain together long enough only to mate and perhaps rear a family, necessitating the maintenance of a dominant-submissive relationship for only a short period. It may also be suggested that the enforced sociality in captivity required a more stable dominant-submissive relationship to be formed, but due to the nature of the normally solitary animals, this relationship fluctuated throughout the year.

The results indicate that slender mongooses avoid each other in most instances, which results in limiting the number of agonistic encounters. Whenever a confrontation did occur, however, the captive animals seemed to rely most heavily on threat and submissive displays, indicated by the fact that these two displays were slightly more elaborate than the other agonistic behaviour observed. Neck exposure, which seems characteristic of canids (Fox 1969), was commonly recorded for slender mongooses.

However, because this is a solitary species, little use would be made of agonistic behaviour in comparison with the sociable dwarf mongooses where continual interactions occur to maintain the hierarchical structure of the group (Rasa 1972). This limited need for agonistic displays in slender mongooses may explain the relatively poor variety and degree of development of both agonistic displays and displacement behaviour.

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The responses of a captive bontebok ram to faecal pellets from conspecific rams

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Faeces or urine often function in mammalian olfactory communication, and many species tend to defaecate at particular locations to form conspicuous dung piles (Ralls 1971). In the bontebok *Damaliscus dorcas dorcas* there is reason to suspect that dung plays a role in olfactory communication. Bontebok males exhibit territorial behaviour, and territorial males (unlike females and juveniles) frequently use dung patches. Also mutual anus

sniffing is prevalent in agonistic encounters between territorial males (David 1973). If dung does in fact play a role in territorial advertisement a male should be able to distinguish between the scent of his own faecal pellets and those of his territorial neighbours. This study was designed to test this assumption.

The subject was a 2–3-year-old bontebok male that had been captured as a yearling at the Bontebok National Park, Swellendam. He was housed in a 20 m × 5 m walled enclosure at the Stellenbosch University experimental farm. Samples of faecal pellets were presented to the bontebok simultaneously with his daily ration of lucerne hay. A group of 15–20 pellets was placed on a groundsheet 0,5 m in front of the food receptacle, which was stationed at one end of the enclosure under a 1,5 m × 2,5 m lean-to shelter. A one-way glass window above the food receptacle permitted close observation without disturbing the animal. Observations usually started at 09h00, after presentation of the dung, and ended at 16h00. The time spent by the bontebok in sniffing at the pellets was recorded to the nearest second using a stop watch. Any other overt responses were noted. The duration of the first feeding bout of the day was recorded to the nearest minute. (The bout was regarded to have commenced when the bontebok entered the lean-to shelter and ended when he left it.)

Faecal pellets from strange males were presented on altogether 14 days and the subject's own pellets on seven days. As a control the duration of eight first-of-the-day feeding bouts were timed without pellets being present.

All observations were made during the months April and May. In some antelope species the intensity of territorial behaviour and scent marking varies seasonally (Novellie 1975). However, bontebok are territorial all year round (David 1973) so responses to a stranger's dung might therefore be expected to be consistent.

The samples of faecal pellets were collected from a captive 14-month-old male in Stellenbosch, and from free-ranging males at the Cape of Good Hope Nature Reserve (Cape Point) and the Bontebok National Park. At the two reserves an attempt was made to collect only fresh samples known to have come from adult males, either extracted from immobilized males or collected after a male

had been observed defaecating. However, such opportunities were limited so some samples were collected from territorial dung patches. Each sample was placed in a clean glass bottle.

The bontebok usually had from six to ten feeding bouts per day, and in between remained away from the lean-to shelter. The duration of sniffing at the pellets was highest during the first feeding bout and thereafter waned with each successive bout. This permitted the use of the habituation procedure to demonstrate discrimination of individuals by scent (Harrington 1976). This entails presenting the subject with a succession of scent samples from one individual until he becomes habituated. A sample from another individual is then presented. Renewed response at this point indicates that the subject perceived the difference between the two individuals.

The samples of bontebok faecal pellets collected were too small to present a succession of separate subsamples until the subject had habituated. A single pellet group thus had to remain on the groundsheet to be encountered by the bontebok during each feeding bout. If this sample were simply replaced by one from the second individual, there would be a danger of bias in that entry of the observer into the enclosure or rearrangement of the pellet pile could provoke renewed interest in the pellets. Also contrasts in odorousness of the two samples could develop because one remained for some hours on the groundsheet while the other was kept in a different location.

The following procedure was designed as a control. Pellets from the individual to be presented first (referred to hereafter as male A) were divided into two equal groups, one being placed in the bontebok's enclosure and the other on a groundsheet outside. A group of pellets from the second individual (referred to as male B) was placed next to the latter group. The three samples had approximately equal numbers of pellets.

After the bontebok had habituated to the first half of male A's pellets this was replaced by the second. An increase in response at this stage would indicate the suspected bias. After one feeding bout, the latter group was replaced by male B's pellets. A further increase in response here would indicate discrimination.

Table 1 Results of discrimination trials (for explanation see text)

Trial	Source of pellets		Column A	Column B	Column C
	Male A	Male B	Duration of sniffing at first half of male A's pellets after habituation	Duration of sniffing at second half of male A's pellets	Duration of sniffing at newly placed male B's pellets
1	patch C.G.N.R.	patch C.G.N.R.	2 s	17 s	8 s
2	patch C.G.N.R.	patch C.G.N.R.	6 s	2 s	12 s
3	patch C.G.N.R.	patch C.G.N.R.	0 s	0 s	5 s
4	male B.N.P.	male B.N.P.	0 s	2 s	11 s
5	male B.N.P.	male B.N.P.	0 s	10 s	33 s
6	patch B.N.P.	patch B.N.P.	1 s	5 s	26 s
7	patch B.N.P.	male B.N.P.	0 s	0 s	12 s
			$\bar{X} = 1,3$ s	$\bar{X} = 5,1$ s	$\bar{X} = 15,3$ s

Abbreviations: C.G.N.R. = Cape of Good Hope Nature Reserve
B.N.P. = Bontebok National Park

The above procedure was repeated on seven days with seven pairs of pellet samples. The samples were matched so that both members of the pair came from the same reserve (either Bontebok Park or Cape of Good Hope Nature Reserve).

The bontebok usually responded to both his own and strange pellets by sniffing at them and occasionally also by muzzling them. Other overt reactions were less common. After one bout of sniffing at his own pellets, the bontebok performed glandular weaving, a ritualized behaviour pattern involving deposition of scent from the preorbital glands onto a grass stalk and then wiping the horns over the stalk (see David 1973). Sniffing at strange pellets was followed on one occasion by glandular weaving, twice by horning of the food receptacle and three times by defaecation. All of these actions are associated with marking of territorial dung patches (David 1973).

The presence of pellets near the food neither prolonged nor reduced the duration of feeding bouts. Mean durations of first feeding bouts of the day were 13,1 min with no pellets present, 9,0 min with own pellets and 12,4 min with strange pellets. Differences among these means are not statistically significant ($0,5 < P < 0,7$, Kruskal-Wallis test, Siegel 1956).

The bontebok spent more time sniffing pellets from strange animals than his own. Considering only first feeding bouts of the day the mean duration of sniffing at own pellets (1,7 s) is significantly lower than the mean for strange pellets (12,4 s, $P < 0,01$; Mann-Whitney U-test, Siegel 1956).

Results of the seven trials using the habituation procedure are shown in Table 1. Duration of sniffing tended to increase after the presentation of the second half of male A's pellets (see columns A and B, Table 1) but the difference is not statistically significant ($P = 0,13$, Randomization test for matched pairs, Siegel 1956). The further increase in sniffing duration after the presentation of male B's pellets (compare columns B and C, Table 1) is significant ($P = 0,03$).

It was therefore apparent that the bontebok could distinguish not only between his own faecal pellets and a stranger's but also between the pellets of individual males he had not previously encountered. The territorial dung patch could thus communicate its owner's identity to neighbouring territorial males.

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The feeding behaviour of the redbilled oxpecker

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In southern Africa the redbilled oxpecker *Buphagus erythrorhynchus* utilizes 21 ungulate species for feeding (Grobler 1979; Stutterheim 1979, 1980). The food of oxpeckers consists in order of decreasing relative importance, of ixodid ticks, tissue, flies and mucus (Moreau 1933; Van Someren 1951; Bezuidenhout & Stutterheim 1980). Various aspects of the feeding behaviour of the redbilled oxpecker have been reviewed by Attwell (1966). Bezuidenhout & Stutterheim (1980) came to the conclusion that the feeding method used depends on the type of food being eaten. However, the characteristics of the different ungulate species utilized may influence the feeding method adopted.

Feeding behaviour of oxpeckers was studied on 16 ungulate species in the Kruger National Park (March 1973 to January 1975), Tuli-Block in southern Botswana (January 1977), Hluhluwe-Umfolozi Game Reserve complex (June 1977) and on farms in the northern Transvaal (July 1977). The eight feeding postures noted were described by Bezuidenhout & Stutterheim (1980). Counts were related to observation time and species of ungulate. It was not possible to observe the feeding method used while feeding in an ear. The number of times the head was lifted to swallow the collected material was therefore counted. It was impossible to count the number of times the bill was opened or closed during scissoring and the number of cycles completed were counted. It was also not possible to determine if insect catching was successful and any attempt was therefore counted. Observations were timed with a Heuer stopwatch and stopped when the birds changed their activity.