Differential passage rates of prey components through the gut of serval *Felis serval* and black-backed jackal *Canis mesomelas*

J.M. BOWLAND and A.E. BOWLAND

Bowland, J.M. and A.E. Bowland. 1991. Differential passage rates of prey components through the gut of serval *Felis serval* and black-backed jackal *Canis mesomelas*. *Koedoe* 34(1): 37-39. Pretoria. ISSN 0075-6458.

Feeding trials conducted on *Felis serval* and *Canis mesomelas* showed that the same prey item may appear in up to seven scats (mean=2.8, n=7). The basic assumption that prey remains of the same species in different scats represent different individuals is invalid. Therefore over-estimation of some prey species relative to others in the diet of carnivores studied can occur.

Key words: serval, black-backed jackal, carnivores, faecal analysis.

J.M. Bowland and A.E. Bowland, Department of Zoology and Entomology, University of Natal, Pietermaritzburg. (Present address: *P O Box 125, Skukuza, 1350 Republic of South Africa).*

Introduction

Scat analysis is a widely used technique in carnivore feeding studies. There are problems in relating undigested prey remains in the scats to prey consumed. Differential digestibility of different prey types causes under-estimation of highly digestible prey relative to prey leaving a large proportion of indigestible remains (Putman 1984). Large prey items may only be partially consumed with mostly highly digestible meat being eaten leaving very little trace relative to smaller prey where indigestible material is also consumed (Bearder 1977). The numbers of prey consumed represented by remains in the scat cannot be precisely determined (Putman 1984) and is confounded by differential passage rates of different parts of the same prey item (Meriwether & Johnson 1980). Often either only teeth and bones or only hair of rodent prey are found in a scat (Maddock 1988; Hiscocks & Bowland 1990).

Passage rate trails were conducted on four servals *Felis serval* (Schreber, 1776) (three females and one male) and two black-backed jackals *Canis mesomelas* (Schreber, 1775) (one male and one female) to monitor the spread of a single prey item ingested amongst subsequent scats and the distribution of various components of that prey item between the scats.

Methods

Animals were housed individually indoors. On day 0 the animals standard diet of unplucked chickens was interrupted with one white rat *Rattus rattus* (200 g). The standard diet was resumed for the remainder of the trial with feeding at 17:00 daily. Scats were collected at 08:00 and 17:00 daily from day 1 to day 10 when the trial ended. An additional trail was conducted on one female serval where her standard daily diet of 500 g *Rattus rattus* was interrupted with two *Mastomys natalensis* on day 0.

Scats, softened with boiling water, were macerated under running water in a 1 mm mesh sieve. The percentage of rodent hair in each scat was estimated visually and presence or absence of rat teeth and bones was recorded.

Results

In all trials the entire rodent substitute was consumed. Defaecation rate was generally one scat/day (24 hours), but varied according to the quantity eaten the previous night.

The servals passed the majority of hair, teeth and bones in one or two scats (Table 1). Recovery of teeth consumed was low

Table 1
Passage rate of prey components through the gut of servals
(%H=percent hair in scat; B=bone; T=teeth; P=present; .=absent; -=no scat)

Serval	1			2			3			4			3		
Food item	1 *Rattus rattus*			1 *Rattus rattus*			1 *Rattus rattus*			1 *Rattus rattus*			2 *M. natalensis*		
Day	% H	B	T	% H	B	T	% H	B	T	% H	B	T	% H	B	T
1	0	.	.	90	P	P	85	.	.	60	P	P	0	.	.
							0	.	.						
2	90	P	P	—	—	—	95	P	P	80	P	.	85	.	P
3	0	.	.	—	—	—	0	P	.	0	.	.	5	.	.
							0	.	.						
4	5	.	.	70	P	P	1	.	.	0	.	.	0	.	.
				0	.	.									
5	0	.	.	0	.	.	0	.	.	0	.	.	0	.	.
6	0	.	.	0	.	.	0	.	.	0	.	.	0	.	.
7	1	.	.	0	.	.	0	.	.	0	.	.	0	.	.
8	0	.	.	0	.	.	0	.	.	0	.	.	0	.	.
9	0	.	.	0	.	.	0	.	.	0	.	.	0	.	.
10	0	.	.	0	.	.	0	.	.	0	.	.	0	.	.

(x=23.7 %; SD=19.2; range 8.3-56.3). Bone recovery was also low, but not quantified. Maximum passage rate time was seven days for hair with a mean of 4.2 days. Hair occurred in two to four scats. All bones and teeth recovered were passed in the first two scats following ingestion. The passage rate pattern for the serval on a standard diet of *Rattus rattus* with a *Mastomys natalensis* substitute did not differ from those on the chicken standard diet.

Table 2
Passage rate of prey components through the gut of black backed jackals (%H=percent hair in scat; B=bone; T=teeth; P=present; .=absent)

Jackal	1			2		
Day	%H	B	T	%H	B	T
1	0	.	.	15	P	.
2	90	P	P	70	.	.
3	30	P	.	0	.	.
4	30	.	.	0	.	.
5	10	P	.	0	.	.
6	0	.	.	0	.	.
7	0	.	.	0	.	.
8	0	.	.	0	.	.
9	0	.	.	0	.	.
10	0	.	.	0	.	.

Passage rate of the jackals (Table 2) was similar to that of the servals with the majority of remains being passed in the first two scats following ingestion. Digestibility was apparently higher in the jackals with zero tooth recovery with the male and 6 % recovery with the female. Up to 5 % of the jackal scats comprised their own hair from grooming.

There was not a noticeable difference in passage rate of different components of the prey in either the servals or the jackals, however, remains of the same prey item occurred in an average of 2.8 scats (n=7).

Discussion

A basic assumption when determining an animal's diet by frequency of occurrence in scats is that each occurrence of a prey species in different scats represents different prey individuals (Grobler & Wilson 1972; Shepherd & Leman 1983). This study shows that such an assumption may be questionable and may result in over-estimation of prey when sequentially passed scats are collected. Such collection requires consideration when scats are collected regularly from frequently used paths or latrines.

In similar trials on cheetah *Acinonyx jubatus* (Schreber, 1775), (Hiscocks & Bowland 1990) which were fed a rabbit substitute passage rates were generally longer than in these trials, and rabbit bone appeared in scats without hair. This difference may stem from the difference in digestive systems of the carnivores. However, it is more likely to be a result of the different size of prey items (white rat vs. rabbit). Since the rabbit comprises more indigestible material it might take longer to pass through the gut. The fastest passage rate recorded in this study was that of the small *Mastomys natalensis* fed to the serval, although it could not be shown to be statistically different from the other passage rates. This could easily lead to over-estimation of large prey species relative to small prey species in the diet of a carnivore determined from field collected scats. However, when prey species are large in comparison to the predator and are only partially consumed, the reverse situation may arise as little indigestible material is consumed due to behavioural avoidance by the predator (Bearder 1977).

Meriwether & Johnson (1980) suggest circumventing such error by determining the relationship between biomass ingested and biomass recovered in the faeces, rather than trying to account for individual prey. Although such correction factors have been successfully used (Lockie 1959; Floyd *et al.* 1978) they require time-consuming feeding trails on captive carnivores and are influenced by digestibility which is affected by season, prey type and prey age (Lowe 1980) and by variation between the individuals of the predator species (Bowland 1990).

References

BEARDER, S.K. 1977. Feeding habits of spotted hyaenas in a woodland habitat. *East African Wildlife Journal* 15: 263-280.

BOWLAND, J.M. 1990. *Diet, home range and movement patterns of serval on farmland in Natal.* M.Sc. thesis, University of Natal, Pietermaritzburg.

FLOYD, T.J., L.D. MECH and P.J. JORDAN. 1978. Relating wolf scat content to prey consumed. *Journal of Wildlife Management* 42: 528-532.

GROBLER, J.H. and V.J. WILSON. 1972. Food of the leopard *Panthera pardus* (Linn.) in the Rhodes Matopos National Park, Rhodesia, as determined by faecal analysis. *Arnoldia* (Rhodesia) 5(35): 1-10.

HISCOCKS, K. and A.E. BOWLAND. 1990. An indication of differential passage rates of prey components through the gut of cheetah. *Lammergeyer* 40: 18-20.

LOCKIE, L.D. 1959. The estimation of the food of foxes. *Journal of Wildlife Management* 23: 224-227.

LOWE, V.P.W. 1980. Variation in digestion of prey by the tawny owl (*Strix aluco*). *Journal of Zoology* 192: 283-293.

MADDOCK, A.H. 1988. *Resource partitioning in a viverrid assemblage.* Ph.D. thesis, University of Natal, Pietermaritzburg.

MERIWETHER, D. and M.K. JOHNSON. 1980. Mammalian prey digestibility by coyotes. *Journal of Mammalogy* 61: 774-775.

PUTMAN, R.J. 1984. Facts from faeces. *Mammal Review* 14: 79-97.

SHEPHERD, A.J. and P.A. LEMAN. 1983. Analysis of viverrid scats from the northern Orange Free State. *South Arican Journal of Zoology* 18(4): 400-401.