DIET OF THE BLACK BACKED JACKAL *CANIS MESOMELAS* IN THE CENTRAL NAMIB DESERT, SOUTH WEST AFRICA

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ABSTRACT

The diet of *Canis mesomelas* was studied in the central Namib Desert, South West Africa. A sample of 772 scats was collected from three main sites (coastal, dry riverine and open plains) and two minor sites (Diamond Area 2). Scats from the coastal site contained predominantly bird material whereas scats from the riverine and plains sites contained predominantly plant material. The present study is compared with other feeding studies of this species, particularly in South Africa.

INTRODUCTION

This study was initiated to determine the diet of *Canis mesomelas* in three major habitat types (coast, riparian and gravel plains) of the central Namib Desert, South West Africa. Scats were collected at three main sites situated in the Namib Desert Park and, in addition, small collections were made in Diamond Area 2 at Conception Bay and Sossus Vlei. Because few data are available on the diet of carnivores in South West Africa (Shortridge 1934; Gaerdes 1974) this is the first of a planned series of studies analysing scats to determine the diet of carnivores in the central Namib.

Nearly all studies of carnivore diets in southern Africa have examined stomach contents, including Bothma (1965, 1966a, 1966b, 1971a, 1971b), Grafton (1965), Smithers (1971), Viljoen & Davis (1973) and Rowe-Rowe (1974b); although Grobler & Wilson (1972) and Rowe-Rowe (roneoed, Natal Parks Board) have examined the scats of *Panthera pardus* and *Aonyx capensis*, *Lutra maculicollis* and *Atilax paludinosus* respectively. Faecal analysis for a number of carnivores has been carried out on the North American continent, *e.g. Lynx canadensis* (Saunders 1963), *Lynx rufus* (Gashwiler *et al.*, 1960), *Vulpes fulva* (Dodds 1955) and *Canis latrans* (Dearborn 1932; Murie 1935). Previous workers in South Africa have only examined stomach contents of *C. mesomelas* (Grafton 1965; Bothma 1971a; Rowe-Rowe 1974a) and no attempt has been made to examine the scat. Various hunt-clubs and nature conservation departments in South Africa operate problem-animal killing programmes; thus stomachs of several species (notable *C. mesomelas*) are commonly available for study. This study was undertaken in a game reserve and therefore no animals could be collected.

The analysis of carnivore stomach contents is preferable to that of scat analysis, whenever a sufficient number of animals can be collected. However, it is not always possible to collect a large enough sample, particularly when the species involved occurs in a protected area as in the

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present study. Scat analysis has the disadvantage that some food items may have been totally absorbed by the animal's digestive tract and therefore leave no trace; however large numbers of scats are usually available for study and it is felt that the bulk of food items taken by the animal at least shows some trace in the scat, with the possible exception of such items as soft-bodied insects, fruits with tiny seeds and probably some small reptiles. The author feels that the method of scat analysis is an acceptable method in assessing the majority of the dietary items of the larger carnivores (from the size of *Canis mesomelas*) as well as giving an indication of quantities taken.

Shortridge (1934) mentions a wide range of food items for *C. mesomelas* in South West Africa, among them small mammals, nestlings and eggs of ground nesting birds, lizards, tortoises, insects, wild fruits and occasionally grass. Further, he notes that *C. mesomelas* is said to join up with *Hyaena brunnea* (the brown hyaena) along the coast scavenging dead fish and other marine refuse. Roberts (1951) states that the natural diet of *C. mesomelas* consists of small rodents, ground birds and other small animals and also berries and fruit.

STUDY AREAS

The three main study areas are situated in the Namib Desert Park, South West Africa, which is some 1 409 500 ha in extent, bounded in the west by the Atlantic Ocean and in the east by the Khomas Hochland. Rainfall is low and varies between 15 and 110 mm per annum at two regularly attended weather stations. Elevation ranges from sea-level to approximately 1 300 m. The collection sites were Sandwich Harbour (2314 AD), Gobabeb on the Kuiseb River (2315 CA) and Ganab (2315 BA) on the open gravel plains (map references from Davis 1949). Two small collections were made at Conception Bay (2314 CD) and Sossus Vlei (2415 CB) in Diamond Area 2.

Sandwich Harbour is a lagoon isolated by the southern Namib 'dune sea' to the east and by the Atlantic Ocean to the west. A sand-bar separates the lagoon from the open sea and water moves between the two through a narrow opening at the northern end of the bar. Extensive mud-flats occupy the southern part of the lagoon. Large reed-beds (*Typha* and *Phragmites*) and sedge meadows (*Arthrocnemium*) and to a lesser extent *Eragrostis cyperoides* are present in the north. *Acanthosicyos horrida* and *Capparis hereroensis* occur in the dune area (Robinson 1974).

The Gobabeb collection area is situated near the Namib Desert Research Station. Scats were collected in the Kuiseb river bed as well as on the southern bank. The riverine vegetation consists chiefly of *Acacia albida*, *Acacia giraffae*, *Ficus sycamorus*, *Tamarix usneoides*, *Salvadora persica*, *Euclea pseudebenus* and *Nicotiana glauca*. At various points along the southern bank stands of *Acanthosicyos horrida* occur. The 'dune sea' begins to the south of the Kuiseb River and bare gravel plains occur to the north.

Scats from Ganab were collected on a low granite outcrop approximately two kilometres from an artificial water point. A large, wooded, sandy wash, where *Acacia giraffae* and *Euclea pseudebenus* are fairly numerous, runs through open plains. Species of *Stipagrostis* make up most of the ground cover of the surrounding plains.

MATERIALS AND METHODS

A total of 266 scats was collected at Sandwich Harbour (192 in July 1974, 42 in September 1974 and 32 in March 1975); 405 scats were examined from Gobabeb and these have been assigned to two groupings, namely a dry season, April–September 1974, collection, and a wet season, October–March 1973–1974, collection. Further division showed no significant differences. There were 216 scats examined for the wet season and 189 for the dry season. A collection of 87 scats was made at Ganab in March 1975. The Conception Bay sample was collected in January 1974 and the Sossus Vlei sample in May 1975. The latter two samples consisted of 5 and 9 scats respectively.

Each scat was macerated in water and sieved to remove sand and grit. The contents were then identified by macro-analysis of the undigested portions which included rodent jaws, hair, feathers, elytra and seeds. Not all food items could be identified and these are listed as unidentified within the relevant categories. In addition to the scat analysis the stomach content of one male *C. mesomelas* (collected as a road casualty) was examined from the Swartbank area (2314 BD). A number of visual feeding observations have also been made, particularly at the Sandwich Harbour site.

In Tables 1, 2 and 3 each collection period (*e.g.* March) is divided into two columns, these being total occurrence and percentage occurrence. Total occurrence indicates the actual number of scats containing a particular item; percentage occurrence shows the actual percentage of scats containing a particular item.

RESULTS

Sandwich Harbour

Animal food plays a more important role than does plant food at Sandwich Harbour (Table 1). This can be ascribed to the presence of large numbers of birds and edible marine refuse and only one suitable plant species present in any quantity. Bird remains were present in 94,7 per cent of all scats, with bird material making up the bulk of the scat contents. In addition to the species present in the scats two additional prey species were visually recorded, *Pelecanus onocrotalus* (one individual) and *Ardea cinerea* (one individual). It is not known to what extent birds are actually captured and killed by *C. mesomelas*, but it would appear that most bird food items are scavenged. Dead birds are frequently encountered at Sandwich Harbour, particularly *Phalocrocorax capensis*. Numbers of this species are high in the area and Berry (1974) states that it is the most numerous resident avian species on the South West African coast.

Insects (Coleoptera and Orthoptera) were the next most numerous food items and were present in 22,5 per cent of all scats, and insect remains varied from a trace to 100 per cent of scat content. The occurrence of *Locustana pardalina* remains in the jackal scats showed an increase in March 1975, following the rainy season when this species is present in increased numbers. The large, prickly fruits of *Acanthosicyos horrida* are broken away from the plant by *C. mesomelas* and the skin is then peeled away to expose the seeds and fruit which are eaten. Sandwich

Harbour was the only collection site where non-food items were found in the scats, these being silver paper, plastic and elastic.

Gobabeb

Plant food occurred in 92,3 per cent of all scats whereas animal food was present in 77,3 cent of all scats examined (Table 2). In the dry period there is a slight increase in the presence of animal food (7,4 per cent) and a slight decrease in the presence of plant food (6,9 per cent) when compared with the wet period.

Oryx gazella hairs and pieces of skin with hair attached are almost certainly scavenged. During 1972–1973 a fairly large number of *O. gazella* died in the vicinity of the Kuiseb River.

TABLE 1

Occurrence of food items in the scats of *Canis mesomelas* in the central Namib (Sandwich Harbour); total number of scats examined: March (32), July (192) and September (42).

Scat composition	*March*		*July*		*September*	
	Total occurrence	*% occurrence*	*Total occurrence*	*% occurrence*	*Total occurrence*	*% occurrence*
ANIMAL FOOD	32	100,0	192	100,0	42	100,0
Vertebrata	32	100,0	184	95,8	42	100,0
Mammalia	2	6,2	6	3,1	6	14,3
Rodentia	2	6,2	6	3,1	6	14,3
Aves	30	93,7	180	93,7	42	100,0
Pisces	—	—	14	7,3	2	4,8
Invertebrata	10	31,2	42	21,9	8	19,0
Orthoptera	8	25,0	30	15,6	4	9,5
Coleoptera	4	12,5	4	2,1	4	9,5
Crustacea	—	—	2	1,0	—	—
Mollusca	—	—	10	5,2	—	—
PLANT FOOD	4	12,5	14	7,3	6	14,3
Grass	2	6,2	14	7,3	—	—
Acanthosicyos	2	6,2	—	—	6	14,3
NON-FOOD ITEMS	6	18,7	2	1,0	—	—

Jackals have been observed chewing the hide and bones of such carcasses known to be more than two years old. Domestic goat hair was found in six scats, all from the wet period. Goats, sheep and donkeys are kept by Topnaar Hottentots who are resident at Soutrivier, some 3 km to the west of Gobabeb. It is not known whether the presence of goat hair is due to scavenging or capture; the former is more likely as the goats are closely guarded by dogs during the day and are penned at night. The presence of certain insect groups in the scats coincides with influxes of these species, particularly following the rainy period (December–March), namely Scarabaeini, Dynastinae, *Acanthophorus capensis* and Orthoptera (particularly Acrididae). Plant food plays an important role in the diet of *C. mesomelas* in the vicinity of the Kuiseb River, especially *Euclea pseudebenus* fruits. Up to 177 separate *Euclea* seeds have been counted from one scat (diameter of seed 3–4 mm) although the average number was 38. It was found that a fairly high percentage of the fruits (15 per cent) had not been digested. Grass was the next most frequently recorded plant food (15,7 per cent of all scats). Grafton (1965) does not include grass as a food item of this species while Bothma (1971a) does accept grass. Because of its fairly frequent occurrence in the present study it is felt that grass must be deliberately taken by *C. mesomelas* as a food item (Table 2).

Ganab

Both animal and plant foods were present in all the scats examined. Mammal remains were surprisingly frequent (59 per cent of all scats), by far the highest percentage for the three main collection sites (Table 3). *Rhabdomys pumilio* was the main identified mammal species present in the scats and the occurrence of *Lepus capensis* was surprisingly high (14 per cent of all scats). The Artiodactyla remains were entirely *Oryx gazella* and undoubtedly scavenged as at Gobabeb.

Ganab is the only scat collection site where reptile remains were identified as prey items. *Leptotyphlops* sp. was identified while pieces of an unidentified snake and lizard were also present. Of the Invertebrata, Orthoptera, Coleoptera and Scorpiones were most frequently noted (72, 93 and 45 per cent respectively). Isoptera (4,6 per cent) and Myriopoda (10,3 per cent) were only found in the Ganab sample. Plant food seemed to be of importance, occurring in all the scats. *Euclea pseudebenus* fruits and seeds were present in 82,7 per cent of all scats and the occurrence of grass was high (51,7 per cent of all scats).

Other samples

Two further scat samples were collected at Conception Bay (2314 CD) (5 scats) and Sossus Vlei (2415 CB) (9 scats). As the samples are so small only the items present are listed here. The following were identified from the Conception Bay sample: feathers of *Spheniscus demersus*, other unidentified feathers, Coleoptera and large quantities of *Cappcris hereroensis* seeds (the latter making up more than 50 per cent of the total scat content). In the Sossus Vlei sample rodent remains were present in all scats but only *Rhabdomys pumilio* cranial remains could be identified with any certainty. One scat had six *Acacia giraffae* seeds and a number of small feathers in addition to rodent remains. No insect remains were present.

TABLE 2

Occurrence of food items in the scats of *Canis mesomelas* in the central Namib (Gobabeb); total number of scats examined: wet season (216) and dry season (189).

Scat composition	*October–March (wet season)*		*April–September (dry season)*	
	Total occurrence	*% occurrence*	*Total occurrence*	*% occurrence*
ANIMAL FOOD	159	73,6	153	81,0
Vertebrata	75	34,7	81	43,0
Mammalia	57	26,4	72	38,0
Rodentia	24	11,1	30	15,9
Lagomorpha	1	0,46	1	0,46
Artiodactyla	18	8,3	27	14,3
Domestic (*Capra hircus*)	6	2,8	—	—
Unidentified	24	11,1	15	7,9
Aves	15	6,9	9	4,8
Invertebrata	138	63,8	135	71,4
Orthoptera	48	22,2	78	41,3
Coleoptera	102	47,2	99	52,4
Solifugae	—	—	6	3,2
PLANT FOOD	207	95,8	168	88,9
Euclea fruits and seeds	204	94,4	162	85,7
Grass	30	13,9	33	17,5
Acanthosicyos seeds	21	9,7	9	4,8
Salvadora seeds	6	2,8	3	1,6
Acacia albida seeds	9	4,2	3	1,6
Acacia giraffae seeds	1	0,46	—	—
flowers	1	0,46	—	—
UNIDENTIFIED	18	8,3	15	7,9

The stomach contents of a male animal were also examined. This specimen was collected as a road casualty in the Swartbank region (2314 BD). The following were recorded: 27 grasshoppers and locusts (more than 70 per cent of the content), bone and gristle fragments, one *Rhoptropus* species (Reptilia), one *Ptenopus* species (Reptilia), small pieces of egg shell and a small quantity of grass. No volumes were measured.

TABLE 3

Occurrence of food items in the scats of *Canis mesomelas* in the central Namib (Ganab); 87 scats examined.

Scat composition	*Total occurrence*	*% occurrence*
ANIMAL FOOD	87	100,0
Vertebrata	72	82,8
Mammalia	51	58,6
Rodentia	24	27,6
Lagomorpha	12	13,8
Artiodactyla	9	10,3
Carnivora	2	2,3
Unidentified	27	31,0
Aves	4	4,6
Reptilia	9	10,3
Invertebrata	87	100,0
Orthoptera	63	72,4
Coleoptera	81	93,1
Isoptera	4	4,6
Solifugae	4	4,6
Scorpiones	39	44,8
Myriopoda	9	10,3
Unidentified	18	20,7
PLANT FOOD	87	100,0
Euclea fruits and seeds	72	82,7
Grass	45	51,7
UNIDENTIFIED	17	19,5

Table 4 gives an indication of the variety of prey items taken by *C. mesomelas* in the central Namib Desert, and Figure 1 compares the quantity of the various food items taken in the three main collection areas.

TABLE 4

The variety of identified food items found in *Canis mesomelas* scats from the central Namib Desert, South West Africa.

Food item	*Sandwich Harbour*	*Gobabeb*	*Ganab*
ANIMAL FOOD			
Mammalia	×	×	×
Petromys typicus		×	
Thallomys paedulcus		×	
Rhabdomys pumilio	×	×	×
Rattus rattus	×		
Gerbillus sp.	×	×	×
Lepus capensis (?)		×	×
Carnivora (no identification)			×
Oryx gazella		×	×
Raphicerus campestris		×	
Capra hircus		×	
Aves	×	×	×
Spheniscus demersus	×		
Phalacrocorax capensis	×		
Phoenicopteridae	×		
Anas capensis	×		
Scolopacidae	×		
Larus hartlaubii	×		
Stigmatopelia senegalensis		×	
Reptilia			×
Leptotyphlops sp.			×
Serpentes (other)			×
Sauria (*Rhoptropus*, *Ptenopus*)			×
Pisces	×		
Arachnida			×
Mollusca	×		
Donax serra	×		
Perna perna	×		

Food item	*Sandwich Harbour*	*Gobabeb*	*Ganab*
Solifugae		×	×
Scorpiones (at least 2 sp.)			×
Myriopoda			×
Crustacea (Brachyura)	×		
Insecta	×	×	×
Coleoptera	×	×	×
Julodis sp.		×	
Physosterna sp.		×	
Onymacris (*rugatipennis*?)		×	
Scarabaeini (at least 2 sp.)		×	×
Anthia sp.		×	×
Acanthophorus capensis	×	×	×
Isoptera			×
Orthoptera	×	×	×
Acrididae	×	×	×
Locustana pardalina	×	×	×
PLANT FOOD			
Acanthosicyos horrida (seeds)	×	×	
Salvadora persica (seeds)		×	
Acacia albida (seeds)		×	
Acacia giraffae (seeds & flowers)		×	
Euclea pseudebenus (seeds and fruit)		×	×
Grass	×	×	×

DISCUSSION

To determine the diet of *C. mesomelas* in South Africa Grafton (1965) examined the contents of 201 *C. mesomelas* stomachs and Bothma (1971a) examined a further 224 stomachs. The majority of these stomachs were collected in the Transvaal and Cape Province. None were collected in arid regions although several were obtained in semi-arid areas. Rowe-Rowe (1974a) has examined the contents of 72 stomachs from the highland regions of Natal. More than 50 per cent of the specimens were collected in nature reserves.

C. mesomelas in southern Africa has an extremely varied and opportunistic diet as has been confirmed in the present study. At Sandwich Harbour where large numbers of birds are present jackal scats were found to contain chiefly bird remains, consisting of feathers, skin, bones and in some cases whole feet. At the Gobabeb and Ganab collection sites plant food formed an import-

ant part of the diet. Of all the scats examined 53,1 per cent contained plant food while 94,9 per cent of the Ganab and Gobabeb scats contained plant food. Plant food was usually the predominant scat component, especially when *Euclea pseudebenus* was present. Significant amounts of grass in the scats from the Namib Desert Park suggests that it is deliberately taken by *C. mesomelas* as a food item. Of the Ganab scats 51,7 per cent contained grass, varying from a trace to over 50 per cent of the scat content, while 15,7 per cent of the Gobabeb samples and 6,7 per cent of the scats collected at Sandwich Harbour contained grass. This shows a decrease in the quantity of grass present in scats as one moves towards the coast. As grass constitutes most of the vegetation on the plains in the Ganab area and decreases towards the coast, this is understandable. *Euclea pseudebenus* and *Salvadora persica* in the vicinity of Gobabeb have been found to bear fruit throughout much of the year although little is available in the dry months preceding the rains. *E. pseudebenus* fruits, which fall to the ground in large numbers, often become buried beneath wind-blown sand and jackals frequently scratch for these when fresh fruits are not available. When dry, the thin fruit covering has a date-like flavour. *Acanthosicyos horrida* fruits form a part of the diet of *C. mesomelas* at Sandwich Harbour and Gobabeb.

Bothma (1971a) considers that plant food plays a relatively minor role in the diet of *C. mesomelas* in South Africa. Bothma (1966b) found that the main food items of 11 stomachs collected in the Kalahari Gemsbok National Park were insects, rodents and carrion. Plant food made up only 1 per cent of the total volume. Bothma (1971a) considers carrion to be a very important food item. Rowe-Rowe (1974a) also found that the stomach contents of *C. mesomelas* from the highland areas of Natal were made up chiefly of animal food, plant food (grass) playing a minor role in the diet. Wyman (1967) notes that *C. mesomelas* in Serengeti subsisted chiefly on small game and dung beetles, but the same species in Ngorongoro subsisted chiefly on a diet of scavenged wildebeest remains. Martensz (1971), in a study of *Vulpes vulpes* in arid north-western New South Wales, Australia, found that this species consumed large quantities of carrion, in this case *Megaleia rufa*.

Insects formed an important part of the diet of *C. mesomelas* in the present study. Locusts (Orthoptera) and beetles (Coleoptera) contributed most of the insect material in the three main collection areas. Bothma (1971a) found insects to be important in the diet of *C. mesomelas* in South Africa.

It would seem that two behavioural aspects are influenced by food availability in the central Namib Desert. These are the number of animals running together and the times of activity. At Sandwich Harbour where animal food, in the form of living and dead birds, is fairly easily obtained, jackals may often be seen running in small packs of three or more individuals (a group

of nine has been noted: Stuart 1976). Jackals are frequently seen on the open beaches and exposed sand-bar during daylight hours. At Gobabeb, however, animals tend to run singly when foraging. The examination of tracks seems to indicate that a pair of animals split during foraging, only coming together when returning to shelter. Gobabeb animals are predominantly crepuscular and nocturnal. Ganab animals usually run singly or in pairs but groups of up to five individuals have been noted. However, such groups have only been observed in the vicinity of the Ganab water point and these are almost certainly temporary groupings. *C. mesomelas* at Ganab and on the open plains move about during the day and and night but seem to be predominantly crepuscular and nocturnal. Temperatures at Sandwich Harbour tend to be lower than at Gobabeb and Ganab thus this could also influence the daytime activity of *C. mesomelas*. Scats at Sandwich Harbour are frequently deposited on small middens, whereas those from Gobabeb and Ganab are usually deposited singly but in most cases within a fairly small area.

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