FOOD OF THE BLACK-BACKED JACKAL: A PRELIMINARY REPORT

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INTRODUCTION

The black-backed jackal *Canis mesomelas* has long been known to include a wide range of food items in its normal diet, but the extent of this variation and the nature of the prey species have received only scant attention. A knowledge of the animal's food habits is essential to a study of its ecology. It is also of value in determining the extent and causes of depredations by this jackal among domestic stock and other animals in which man has an interest, and for devising control methods. The black-backed jackal's ability to survive as one of the last of the bigger carnivores in areas occupied by man, despite vigorous attempts to control or exterminate it, is largely attributable to its remarkably adaptable food habits.

There is much in the popular literature relating to the food of jackals in natural wildlife habitats and in farming areas. At this stage it will suffice to note that, although the majority of prey species and food items found in the present study have been recorded by various writers, there has been no mention of the frequency or volume in which these foods are taken. The literature conflicts on the rôle played by carrion and other major food groups in the diet while the domestic stock-killing habit of the jackal often forms the focus of attention, with little said of its ecological rôle among the variety of animal communities falling within its dietary range.

The number of stomach analyses does not yet warrant extensive discussion or conclusive findings although there are promising possibilities, both biologically and from the stock farmer's point of view. The purpose of this report is to present the available findings and to suggest certain topics for further investigation. The collection and examination of stomach contents is continuing.

METHODS

The collection of jackal stomachs was begun in May 1961. Vermin clubs, private individuals and provincial nature conservation departments, as listed under "Acknowledgements", have assisted in collecting the 201 stomachs on which the food study was conducted. All specimens were preserved in 10 per cent formalin until examined. Collectors provided the following information for each stomach:

type of jackal, sex, approximate age,
date killed, locality killed,
local habitat, type of farming,
name and address of collector.

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In this way a certain amount of useful information regarding the jackal and its habitat was obtained.

When examining the contents of each stomach, a uniform procedure was adopted which consisted of the following steps. The stomach was removed from the preserving jar, opened and the contents placed in a volumetric glass container. Any excess formalin was drained off and the volume of the stomach contents obtained by water displacement. The material was then thoroughly washed with water through a sieve, this process generally removing soil and grit and fine unidentifiable matter. The nature of the washings was recorded. The remaining material was then systematically examined in shallow trays containing a little water.

First all non-food items such as grass, twigs, grit and stones were removed and their volume obtained by displacement of water. The remaining items were then separated out, identified if possible, their individual volumes measured and the total volume of all food material calculated. Unidentified specimens and useful reference samples were retained. Any food item constituting less than one per cent by volume of the food material in a single stomach was recorded as being present only as a trace. Examination of fatty and other sticky food material was greatly facilitated by the addition of a little liquid soap to the wash-water and the water in examination trays. Where applicable and practicable, the number of items of any one food type was recorded or else an estimate was obtained after measuring the volume of a small known number of them.

Of the 201 stomachs examined, 16 were empty. Thus both percentage occurrence and percentage by volume are calculated from the total of 185 stomachs which contained food material. All individual food items recorded as traces are included in the percentage occurrence but not in the percentage by volume figures. Any food item not specifically identified to date has been included only in the major groupings such as vertebrate, mammal or vegetable matter.

DISTRIBUTION AND SOURCE OF SPECIMENS

Stomachs were collected from jackals killed in all months of the year during the period May 1961 to May 1963. The distribution shown in Table 1 is reasonably well spread over the seasons. The high frequency of summer stomachs is probably attributable to the greater effectiveness of jackal-hounds during the moist summer months and to the higher incidence of young and inexperienced jackals during this period, spring being the whelping season.

Of the winter and autumn stomachs, 10·1 per cent were empty whereas the figure for spring and summer is only 5·4 per cent. This suggests that food is less available to the black-backed jackal between March and August than during the warm and moist months. The actual volume of food material occurring in all the stomachs of these two periods must also be considered when investigating the seasonal consumption of food.

One hundred and seventy of the stomachs were obtained in the Transvaal, mostly from the south-western and east-central areas, while smaller numbers came from the south-eastern and north-central districts. Six stomachs were obtained from the mountainous areas of Natal, two from the Orange Free State and seven from the south-western Cape Province.

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TABLE 1: THE MONTHLY AND SEASONAL DISTRIBUTION OF STOMACHS

Season and month	All stomachs	Empty stomachs
Summer	68	4
December	21	
January	30	
February	17	
Autumn	46	3
March	26	
April	11	
May	9	
Winter	43	7
June	7	
July	26	
August	10	
Spring	44	2
September	12	
October	18	
November	14	
Total	201	16

Of the 201 stomachs, 71 had their origin on farms in magisterial districts where the sheep population is recorded as being over 50 per square mile (Bureau of Census and Statistics, 1953). Certain other stomachs were obtained from sheep farms but the surrounding areas were not devoted predominantly to sheep farming. The number of "farm stomachs" from non-sheep districts was 73. These came from cattle ranches, sheep farms, crop and fruit farms and mixed-farming areas. Fifty-seven stomachs were collected in nature reserves. Thirty-six of these jackals had access to surrounding farms.

The jackals yielding the specimens were killed in the following ways: by the "Humane Coyote-getter", 48; by vermin clubs mostly using hounds, 42; by professional hunters using hounds, 41; and by provincial hound-packs in training, 70. Knowing the means by which the jackals were killed and having examined the stomach contents, an indication may be obtained of the effectiveness of the various control methods in destroying the animals responsible for stock losses. This will be done when a sufficiently large sample of stomachs has been examined.

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RESULTS

Type of food

Carrion

Carrion occurred frequently and as a single food type it constituted the greatest bulk. It was found both in game reserve jackals and in stomachs obtained from farming areas. The presence of fly larvae and other maggots was taken to indicate that the food material was carrion. In some instances maggots constituted more than half the material classed as carrion. Infrequent cases arose where maggots were absent but the putridity of the material indicated that it was carrion. Fresh carrion was almost impossible to identify, except when the animal species eaten was obviously too large for the jackal to have killed of his own accord, even if hunting in a pack.

In stomachs from nature reserves, carrion usually consisted of antelope remains. The general absence of large predatory carnivores in the game reserves in question makes it unlikely that fresh or rotten carrion was scavenged by jackals from their kills. The food group "carrion" thus covers any dead animal which the jackal may have come across together with any other suitable food items of animal origin which it may have scavenged. The baited "Humane Coyote-getter" head remains, when found in a stomach, were not regarded as carrion but as non-food items. The carrion eaten by farm jackals consisted largely of sheep remains.

Rodents

Rodents of many species occurred in both farm and game reserve jackal stomachs. Six springhares accounted for a third of the total rodent food volume. Porcupine and ground squirrel remains each occurred once. Smaller rodents were found more frequently and included gerbilles, vlei rats, common mole rats, four-striped rats, pygmy and multimammate mice. Specimens of the following genera have been identified: *Hystrix*, *Pedetes*, *Xerus*, *Tatera*, *Otomys Mastomys*, *Cryptomys*, *Rhabdomys* and *Mus*. Frequently four or more rodents were found in a single stomach.

Carnivores

Carnivorous species were infrequent food items. Three mongooses, one domestic dog and a large domestic cat were recorded.

Antelope

Antelope remains occurred in 18 stomachs and included a variety of species. The antelope varied in size from the smallest species up to adult impala. Hoof remains showed that newly born and young antelope were frequently preyed upon. It was seldom possible to identify antelope remains to the species.

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Insectivores

Hedgehog and shrew were each recorded once but volumetrically constituted only trace amounts.

Hoofed domestic stock

One record was obtained of domestic pig, the animal being fairly young. The pig herd in question was on open range at some distance from the farmstead. Goat was recorded once. Woolled and non-woolled sheep constituted the great majority of domestic stock occurrences. Sometimes more than one jackal ate from a single sheep causing the apparent number of sheep depredations to be too high. Most sheep remains were recorded in stomachs collected by professional vermin hunters whose hounds often pick up the jackal's trail from the carcass of a freshly killed sheep.

Reptiles

Reptiles were recorded in nine stomachs and included five lizards, three small tortoises and one young night adder.

Birds

Domestic poultry were found in two stomachs. The jackals in question had probably both fed on the same fowl, obtained from the vicinity of a Bantu kraal. It was seldom possible to identify the remains of wild birds. More than a third of such occurrences consisted of only a few feathers. It was, however, clear that many species of bird fell prey to jackals. The following species or groups were identified: spurwing goose, guineafowl, korhaan, francolin, pipits, longclaws and canaries. Most unidentified avian remains did not appear to come from ground birds. No nestlings were recorded although the egg of a wild bird occurred once.

Insects

Most insects were traced to their order, although this was sometimes not possible. The following orders were represented: Orthoptera, Isoptera, Coleoptera, Hymenoptera, Diptera, Odonata and Hemiptera. Most frequent were beetles, winged termites, winged ants, grasshoppers and crickets. In terms of numbers eaten, insects far outnumbered all other food types and on occasion constituted an entire meal. Very large beetles were recorded in numbers ranging up to about 20 per stomach while small species sometimes totalled more than 100. Winged termites, when occurring, were usually present in very large numbers, ranging up to approximately 1,300 per stomach. Other insects which occurred in large numbers per stomach were crickets and grasshoppers. Many stomachs containing insects also held other invertebrates, from which it may be inferred that jackals do not feed on insects and other invertebrates only opportunistically but actively hunt for such prey species.

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Myriapods

Myriapods were infrequent food items and volumetrically formed only a trace amount. Millipedes were recorded twice and centipedes occurred in seven stomachs. Up to six centipedes were found in individual stomachs.

Crustaceans

The only crustaceans recorded were two small fresh-water crabs. The stomach contents of the two jackals showed them to have hunted together.

Arachnids

Arachnids were found in 14 stomachs. Spiders, sometimes up to three per stomach, were the usual items within this class. One scorpion was recorded.

Vegetable food

Ground nuts were found in small quantities in four stomachs. In two cases it appeared that the jackals had dug for the nuts while the crop was still growing. In the other two the ripe nuts were probably taken after the crop had been lifted and stacked. Grapes constituted the only other cultivated crop found, 104 grapes forming 97·0 per cent of the bulk in the stomach concerned.

Wild berries and fruit occurred largely in stomachs obtained from the south-western and northern Transvaal. In a few instances wild vegetable food provided the bulk of the jackal's meal, but normally it amounted to only a moderate percentage of any one meal. Almost 400 berries were counted from one stomach and another contained more than 150 small wild figs. The fruits of the following have been identified: *Ficus* sp., *Carissa bispinosa* and *Diospyros lyciodes*, these being the species most frequently eaten. Other wild berries and fruits still require identification.

Non-food items

Non-food items found in the stomachs included dry grass, bark, twigs, soil, grit, pebbles, stones, newspaper, rubber and an elastic band. The remains of the "Coyote Getter's" baited head were also regarded as non-food material. Items such as twigs, dry grass and pebbles are probably consumed by the jackal when they cling to animal food being eaten. Green grass, which appeared to have been deliberately eaten, occurred in 32 per cent of the stomachs but amounted to only a "trace" by volume and was not regarded as food. Vegetable matter with a high fibre content is not digested and passes out in the faeces.

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TABLE 2: PERCENTAGE OCCURRENCE AND PERCENTAGE BY VOLUME OF FOOD ITEMS FOUND IN 185 STOMACHS OF THE BLACK-BACKED JACKAL

Food items	Number of stomachs	Percentage occurrence	Percentage by volume
Animal food	184	99·5	95·4
Vertebrates	157	84·9	54·2
Class Mammalia ..	144	77·8	48·8
Order Rodentia ..	60	32·4	9·0
Order Lagomorpha ..	29	15·7	9·4
Order Carnivora ..	5	2·7	1·7
Order Artiodactyla ..	18	9·7	9·7
Order Insectivora ..	2	1·1	*Trace*
Hoofed domestic stock	32	17·3	18·5
Sheep	30	16·2	17·0
Pig	1	0·5	*Trace*
Goat	1	0·5	1·1
Class Reptilia	9	4·9	0·8
Class Aves	60	32·4	4·5
Wild species ..	58	31·4	3·1
Wild bird's egg ..	1	0·5	*Trace*
Domestic poultry..	2	1·1	1·4
Invertebrates	88	47·6	8·2
Class Insecta	84	45·5	8·0
Class Myriapoda ..	7	3·8	*Trace*
Class Crustacea ..	2	1·1	*Trace*
Class Arachnida ..	14	7·6	*Trace*
Carrion	50	27·0	28·7
Vegetable food	35	18·9	4·5
Cultivated crops and fruit	5	2·7	1·2
Wild berries and fruit ..	30	16·2	3·4

Percentage occurrence and volumes of food

The percentage occurrence figures of Table 2 include all traces of identifiable food material. The number of different food types per stomach varied from one to ten but was most frequently three or four. The volumetric column of the table does not include the traces (below one per cent) found in individual stomachs. The trace amounts listed are those items which totalled less than 0·5 per cent of the 30,297·5 cc. of food from all stomachs. Trace volumes constitute 4·8 per cent of the total and unidentified mammals contribute another 1·8 per cent.

The volumes of the major food groups in the diet of the jackal are presented diagrammatically in Figure 1. The segment of the circle representing "other foods" includes reptiles, insectivores, carnivores and invertebrates other than insects.

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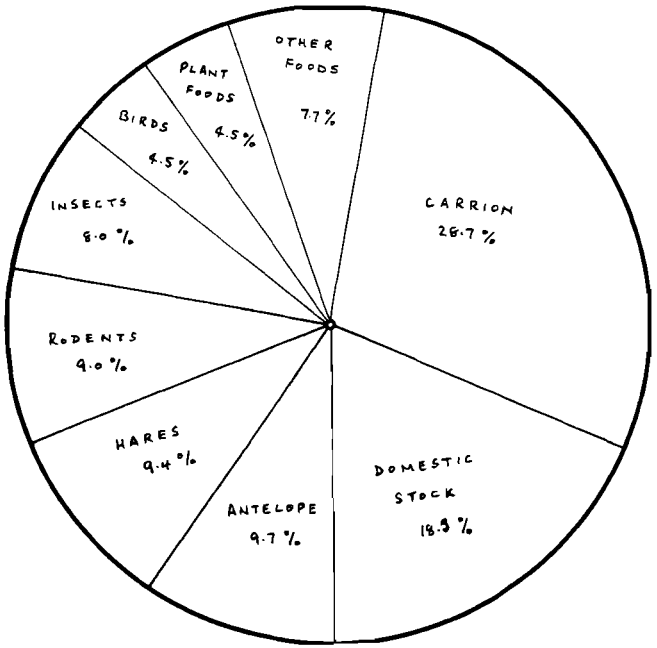

FIGURE 1. Relative volumes of different foods in the diet of the black-backed jackal.

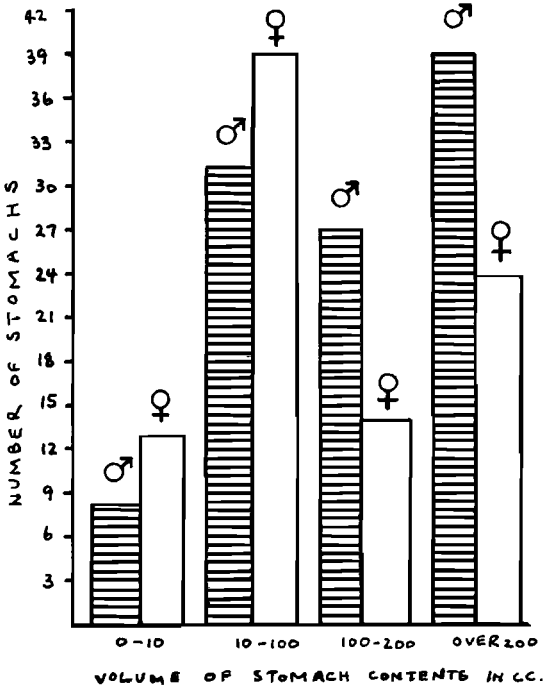

FIGURE 2. Frequency of different volumes of stomach contents in male and female jackals.

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The sex of six jackals from which stomachs were taken was not recorded by the collector. The contents of stomachs from 105 males averaged 171·6 cc. in volume while 90 females averaged 129·3 cc. This appears contrary to the general belief that the bitch is a more active hunter than the male jackal (Van der Merwe 1953). Figure 2 shows how small meals predominate amongst females and larger meals among males. It is recognised that the sample includes fifteen more males than females but random correcting for this inequality would alter the distribution but little. The meals eaten by males averaged 33 per cent larger than the average of 129·3 cc. for females. Part of this difference may be caused by the bitch giving some of her food to the pups, but only 25 per cent of the 90 females were killed when they might have been rearing young.

The monthly and seasonal averages of the volume of food per stomach have been calculated from all 201 stomachs and are set out in Table 3.

TABLE 3: MONTHLY AND SEASONAL AVERAGE VOLUMES OF FOOD FROM THE CONTENTS OF 201 JACKAL STOMACHS

Month	Average volume in cc.	Season	Average volume in cc.
December	160·2		
January	187·6	Summer	170·1
February	162·6		
March	127·8		
April	199·3	Autumn	148·5
May	118·4		
June	187·2		
July	132·5	Winter	133·8
August	81·6		
September	164·2		
October	140·1	Spring	159·1
November	172·9		

The monthly average volumes of Table 3 fluctuate erratically but the averages for the four seasons show that considerably more food is eaten during spring and summer than during the autumn-winter period. This, together with the distribution of empty stomachs, implies a lesser availability of food for jackals during the dry months than during the moist spring and summer.

Fifty-seven stomachs, obtained from jackals in wildlife areas (ranging from forest reserves to a full game sanctuary), contained an average of 153·2 cc. of food per stomach. The remaining

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144 stomachs, obtained from jackals in farming areas, had an average food volume of 149·7 cc., only 3·5 cc. less than that of game reserve jackals.

The total volume of food material contained in the 201 stomachs examined amounted to 30,297·5 cc., an average of 150·7 cc. per stomach. After subtracting the 16 empty stomachs from the total, the average per stomach is 163·8 cc.

The greatest volumes of food recorded in single stomachs were 512·0 cc., 521·0 cc., 580·0 cc., 620·1 cc., 684·4 cc. and 809·0 cc., these large meals being usually composed of carrion, antelope or sheep. The six heaviest fresh stomachs plus contents recorded from the 46 weighed were 484·0 gm., 586·6 gm., 587·7 gm., 678·1 gm., 794·5 gm. and 908 gm. The average weight of an empty stomach is in the vicinity of 70·0 gm. A black-backed jackal is thus capable of eating 10 per cent or more of its body weight at one meal. The size of the individual pieces of food material varied greatly with the largest nearing a volume of 100 cc. Bulky food items were usually swallowed in portions varying from 20 cc. to 50 cc. in volume.

DISCUSSION

The relative importance of percentage occurrence and percentage by volume for any one food type is difficult to determine. The chief value of a percentage occurrence analysis is that it gives an indication of the foods likely to be eaten by jackals and an index to the relative availability of prey species. A volumetric analysis, on the other hand, shows fairly accurately the actual amounts of the different foods eaten by jackals in general. This method does not, however, give any indication of the numbers of food items involved and the volumetric figures are strongly influenced by the size of the individual food items.

The occurrence and volumetric methods of analysis are both necessary and equally useful in a food habits study. It is felt, however, that for a full ecological study of the black-backed jackal due regard must be taken of the numbers of the different food items eaten when the food habits are evaluated. To determine the interaction between jackals and a particular prey species this aspect and the relative populations of predator and prey must be taken into account. For this reason records have been kept of the numbers involved within the food item groups and subgroups. Only general mention has been made of some of these figures.

The figures from Table 2 for the major food subgroups are given in Table 4 with ascending numbers indicating the importance and relative position (from 1st to 12th) of the groups as evaluated by each method of analysis.

The relative importance figures of Table 4 indicate the differing evaluations the food groups receive from the two analytical methods. When evaluating the food habits of the black-backed jackal for biological or economic purposes it is apparent that the findings of both methods should be considered together with the actual numbers of prey species involved in each food grouping.

Errors of identification must arise to some degree in the classification of certain food material as carrion. This is true for any potential prey species but is important only when the prey species is fairly large or is of economic importance to man. Sheep provide a good example.

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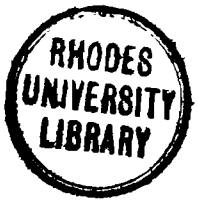
TABLE 4: RELATIVE IMPORTANCE OF THE MAJOR FOOD GROUPS BY PERCENTAGE OCCURENCE AND PERCENTAGE VOLUME

Food group	Percentage occurrence	Relative importance	Percentage by volume	Relative importance
Carrion	27·0	4	28·7	1
Rodents..	32·4	2	9·0	5
Antelope	9·7	9	9·7	3
Hares	15·7	7	9·4	4
Domestic stock (hoofed)	17·3	5	18·5	2
Wild birds	31·4	3	3·1	8
Poultry	1·1	12	1·4	9
Reptiles	4·9	10	0·8	11
Insects	45·5	1	8·0	6
Invertebrates (other) ..	12·5	8	*Trace*	12
Vegetable food (wild) ..	16·2	6	3·4	7
Cultivated crops ..	2·7	11	1·2	10

There is no way of determining whether fresh sheep remains in a stomach are of a sheep killed by the jackal or from one which died of some other cause and was subsequently fed upon by the jackal. In either case the stomach is recorded as having contained sheep remains as a result of jackal depredation. The converse occurs however, when rotten sheep remains are found in a stomach. This material is recorded as being carrion regardless of whether the sheep might possibly have been killed by the jackal and was then fed upon over a period of days by which time the remains would be rotten and maggot-infested. The errors just described will balance each other to some extent. The writer believes, however, that the error of carrion being recorded as sheep is more frequent than the converse and that many sheep mortalities ascribed to jackal depredations are in fact the result of other causes. This is particularly so in marginal sheep areas where the condition of stock is poor and the care bestowed upon the flocks is generally of a low order.

A knowledge of the weight and volume of food eaten by a jackal in one day or as a single meal can be employed in control methods using poisoned baits. The indiscriminate scattering of highly poisoned bait has in the past caused the death of many animals other than the vermin it was intended to kill. One reason for this is that the poison-to-bait weight ratio was too low and the amount of bait laid at one station too small. A large amount of poison in a small amount of bait could thus kill a variety of animals which were able to consume all or sufficient of the bait to receive a lethal dose. Knowing the potency towards jackals of the poison in use and with average figures of the amount of bait this animal could consume in one meal, it is possible to prepare more selective baits and thus prevent the unnecessary death of other animals.

The limitations imposed by the low total of 201 stomachs examined to date in this study



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preclude the investigation of many aspects of the food habits of the black-backed jackal. Some aspects for further investigation are:

(i) the amount and nature of food eaten by jackals in farming areas as compared with game reserves or natural wildlife habitats;

(ii) the degree and causes of seasonal variations in the type and volume of food eaten; and

(iii) variations of diet according to geographic locality as influenced by type of farming, natural vegetation types, degree of ground cover, climate and the abundance of potential prey species.

A knowledge of the food habits of the black-backed jackal which includes such details will do much towards providing basic ecological information and elucidating the reasons for jackal predation upon domestic stock. Such knowledge is essential to any programme aimed at controlling the jackal or preventing its depredations on domestic small stock. The findings of this study reveal the highly omnivorous habits of the black-backed jackal which includes many pest species in its diet, even in sheep farming areas. Many of the stomachs examined came from confirmed sheep-killing jackals which were selectively hunted and killed. The material used is thus not fully representative of the diet of the average jackal, being weighted towards stock-killing jackals. Even so, the data show that the diet includes many species that farmers consider harmful to their crops or animals. Volumetrically, domestic stock, poultry and birds amount to 24 per cent of the food taken while rodents, hares and insects total 27 per cent. Foods of no apparent interest to the farmer make up the remainder of the diet. The conclusion may be drawn that the black-backed jackal's food habits are in many ways beneficial to both crop and sheep farmers and that the animal exerts considerable ecological influence upon the fauna of its environment. Jackal control measures should therefore be applied with caution and should be selective towards only those individuals known to be predators on domestic stock.

ACKNOWLEDGEMENTS

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Transvaal Vermin Clubs: Avondster (2 stomachs); Bloedrivier (15); Brandwag (5); Doornhoek (1); Klipveld (1); Maraheki (2); Opskud (5); Ottosdal (3); Soutpan (2); Spoed (1); Standerton (1); Swartwater (1); Uitvalskop (1); Witgatboom (1).

Hunters of the Federal Vermin Control Association: P. C. Snyman (34); C. L. de Jager (7); J. C. Strauss (1).

Natal Parks, Game and Fish Preservation Board (5); Department of Nature Conservation, Cape Provincial Administration (7).

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Nature Conservation Branch, Transvaal Provincial Administration (106).

The writer is grateful for the rodent identifications made by Messrs. D. H. S. Davis and C. J. Coetzee of the Medical Ecology Centre, Johannesburg.

ABSTRACT

A study was made of the food habits of the black-backed jackal *Canis mesomelas* by analysis of stomach contents. Two hundred and one stomachs were collected between May 1961 and May 1963, most being obtained in the Transvaal. Percentage occurrence and percentage by volume were calculated for the various foods found in 185 stomachs. Vegetable food (excluding grass) occurred in 18·9 per cent of the stomachs, vertebrates in 84·9 per cent and invertebrates in 47·6 per cent. The most frequent food groups were insects (45·5 per cent), rodents and birds (both 32·4 per cent), carrion (27·0 per cent), hoofed domestic stock (17·3 per cent), wild vegetable food (16·2 per cent), hares (15·7 per cent) and antelope (9·7 per cent). A large variety of foods was found in individual stomachs.

Volumetrically, vegetable food amounted to 4·5 per cent of the diet, animal food made up 95·5 per cent, vertebrates 54·2 per cent and invertebrates 8·2 per cent. By volume, the major food groups were carrion (28·7 per cent), domestic stock (18·5 per cent), antelope (9·7 per cent), hares (9·4 per cent), rodents (9·0 per cent), insects (8·0 per cent) and birds (4·5 per cent).

One hundred and five stomachs from male jackals contained an average of 171·6 cc. of food while 90 females gave an average of 129·3 cc. The average food volume for all stomachs was 150·7 cc. Average food volumes were greater in spring and summer than for the autumn-winter period, suggesting a lesser availability of food from March to August. The merits of the two analysis methods used are discussed and the difficulty in identifying carrion is emphasised. Further investigation is necessary for an understanding of the ecological significance of the jackal's diet and its economic importance to the sheep farmer. The black-backed jackal is a highly omnivorous feeder; although a confirmed sheep-killer at times, it also feeds on many harmful pest species.

REFERENCES

BUREAU OF CENSUS AND STATISTICS. 1953. Livestock, fowls and farm slaughterings. *Agricultural Census*, No. 27 (5). Govt. Printer, Pretoria.

VAN DER MERWE, N. J. 1953. The jackal. *Fauna and Flora* 4: 83.

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