

THE PREY OF OWLS IN THE KRUGER NATIONAL PARK AS INDICATED BY OWL PELLETS COLLECTED DURING 1960-61

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INTRODUCTION.

The present study concerns the species-composition of the prey of owls in the Kruger National Park, as evident from examination of regurgitated owl pellets collected in various parts of this reserve. Samples thus obtained are biased in favour of the crepuscular and nocturnal species since diurnal forms are rarely preyed upon. Furthermore factors such as differences in the breeding seasons of the different species and the density of cover affecting the relative availability of prey species may influence the results.

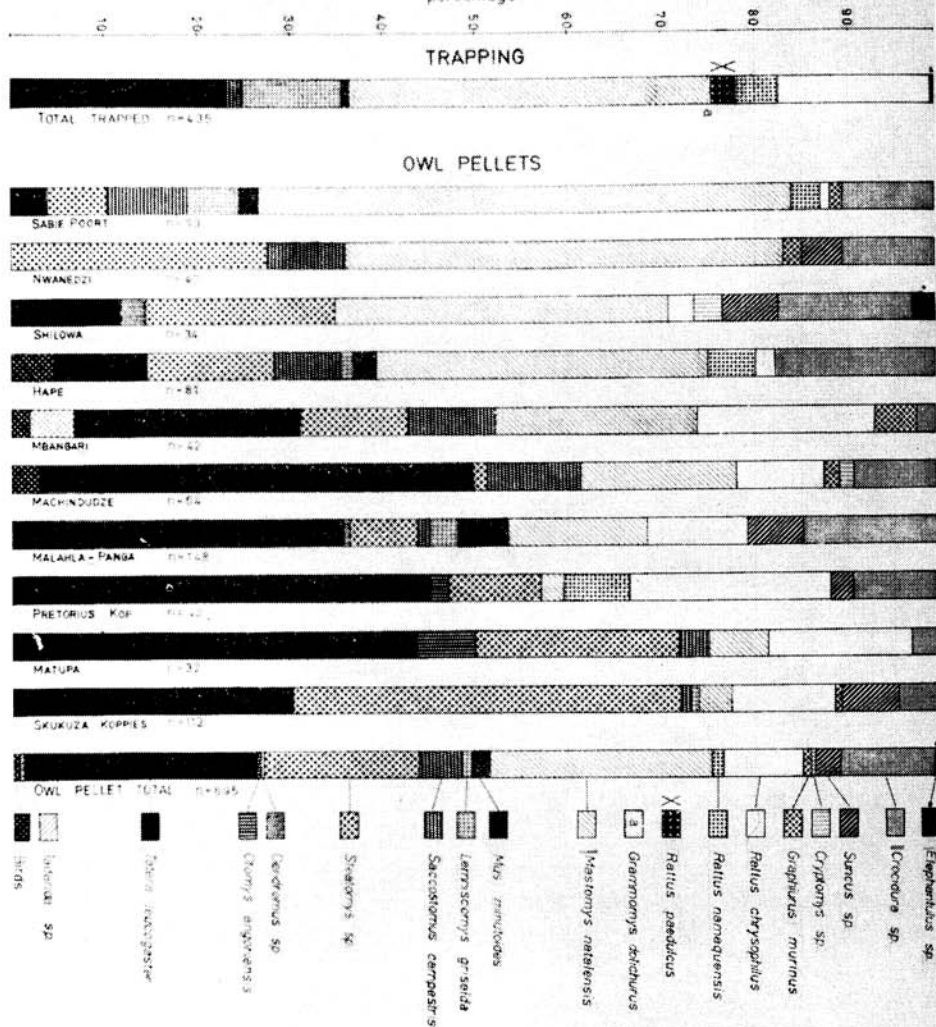
According to Bodenheimer (1949), a barn owl's hunting range varies from 5 sq. km. (approximately 2 sq. miles) to 25 sq. km. (9 sq. miles) in Israel, depending on the available prey. It can be assumed that the area of a barn owl's hunting range in Southern Africa will agree with that of Israel. The owl pellet collections in this study are all from barn owls, *Tyto alba affinis* (Pienaar, personal communication).

Apart from the analysis of owl pellets from the Kalahari Gemsbok National Park (Davis, 1958) previously published work on the species-composition of owl pellets in Southern Africa has been restricted to the central Transvaal. This includes regular collections by Kolbe (1946) at Onderstepoort and collections from Bryanston, near Johannesburg, during 1953-54 (Davis, 1959) and November 1955 to October 1956 (de Graaff, 1960). These collections resemble each other in that the multiimammate mouse (*Rattus (Mastomys) natalensis*) is the commonest prey. The studies by Kolbe and Davis show the same basic pattern of seasonal variation in proportions of small mammals, birds and insects. The prey consisted nearly exclusively of small mammals during the winter months (June to August) while birds were more heavily preyed upon during late spring and summer, i.e. the period following their breeding seasons, as shown by Davis (1959).

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Fig 1

percentage



MATERIAL.

The material consists of thirteen collections of owl pellets from ten localities in the Kruger National Park, made by the Biologist and members of his staff, mostly during the winter months of 1960 and 1961. The shrew remains were identified by Dr. J. Meester at the Transvaal Museum, while other small mammal material was identified at the Medical Ecology Centre.

Some of the data presented here have been used by Pienaar (1961) in a checklist of mammals from the Kruger National Park.

THE DIFFERENT OWL PELLET COLLECTIONS: ENVIRONMENT AND FINDINGS

The various mammal species represented in the owl pellets have been grouped into sixteen categories consisting of either genera or species. Birds form a further category, but beetle and other insect remains have been omitted. The genus has been used as a category where species identification is uncertain, or, as in the case of *Crocidura*, where it is more practical to use the genus only in the graph.

The different collections, as represented in the second to eleventh columns of fig. 1, are arranged mainly according to the frequency of multimammate mice (*Mastomys natalensis*).

1. SABIE POORT.

Collected during December, 1960.

According to van der Schijff's (1958) map of the vegetation zones of the Kruger National Park, Sabie Poort falls within the *Combretum* communities. The most important factor influencing the small mammal fauna at Sabie Poort is most probably the Lebombo mountain range which is narrower at this gorge than at any of the other localities where pellets were collected.

Multimammate mice represent 57 per cent (i.e. 53 specimens) of the collection. The other species in the pellets are ten shrews of which nine are *Crocidura bicolor*; pouched mice (*Saccostomus campestris*) (8 specimens); fat mice (*Steatomys pratensis*) (6); single-striped rats (*Lemniscomys griselda*) (5); gerbils (*Tatera leucogaster*) (3); rock rats (*Rattus namaquensis*) (3); dwarf mice (*Mus minutoides*) (2) and one specimen each of the bush rat (*Rattus chrysophilus*) and dormouse (*Graphiurus* sp.). Most of these species are probably fairly poorly represented because the mountainous environment is rather unsuitable for them. This cannot be said of the rock rat which prefers this habitat, but does not normally occur in large numbers.

2. NWANEDZI.

The collection was made during May, 1960.

Nwanedzi camp is on the gradual western slope of the Lebombo mountains to the north of Sabie Poort and about 15 miles east of Satara rest camp.

Only three shrew species (viz. *Crocidura hirta*, *C. bicolor* and *Suncus* sp.) and four rodent species are represented in the pellets from here. The percentage of multimammate mice (47%) and fat mice (27.6%) are very high, exceeded only by those from Sabie Poort in the case of multimammate mice and those from Skukuza Koppies in the case of fat mice. No gerbils or bush rats were recovered.

Two bush rats, two rock rats, two single-striped rats (none of which are represented in the owl pellets) and five multimammate mice were trapped at Nwanedzi in 1953. Trapping more to the west in true *Acacia nigrescens*-*Sclerocarya* communities produced gerbils.

The faunal composition at Nwanedzi, as indicated by the owl pellets and trappings, agrees mainly with that of collections also located in *Combretum* plant communities.

3. SHILOWA.

Collected 28 August, 1960.

Shilowa Cave is situated in a small gorge on the western slope of the Lebombo range, 25 miles to the north of Letaba rest camp. It lies in *Combretum* plant communities, bordering the *Colophospermum mopane* communities. The small collection from here includes a mole rat (*Cryptomys* sp.), a climbing mouse (*Dendromus* sp.) and an elephant shrew (*Elephantulus* sp.).

Here again the major prey was multimammate mice (38%) and after that the much smaller fat mice (21%) and shrews (21%) including two specimens of *Suncus* sp., two of *Crocidura hirta*, one of *C. bicolor* and one of *Crocidura* species (unidentified).

4. HAPÉ.

Collected on 5 March and 7 June, 1960.

Hapé hut is situated on a koppie about three miles west of the Pafuri camping area and nearly a mile south of the Levubu River. It lies in the northern stony region of the *Colophospermum mopane* communities with rather sparse grass on and around the koppie, while riverine vegetation with thick undergrowth lies towards the north.

Multimammate mice represent 34.6 per cent of the remains collected, with a moderate occurrence of shrews (18.5%), fat mice (13.6%), gerbils (9.9%) and pouched mice (7.4%). Rock rats (5%), dwarf mice (2.5%), bush rats (2.5%), a single-striped mouse (1.2%) and birds (4.9%) were also recovered.

The collections represented in the second to fifth columns are from stony areas and include a high percentage of multimammate mice (an average of 52 per cent for the four collections), a moderate percentage of fat mice (16.4 per cent average) and a low percentage of gerbils (7.1 per cent average) and bush rats (1.7 per cent average).

6. MBANGARI.

Collected on 6 June, 1960.

This collection comes from about 13 miles north-west of Satara, near the Timbavati River which forms the border between the *Combretum* and *C. mopane* vegetation communities.

The numbers of the gerbils (23.8%), multimammate mice (21.4%), and bush rats (19.0%) are about equal with a moderate number of fat mice (11.9%) and only two dormice and two bats (4.8%) each. One *C. bicolor* was recovered and an unknown number of *C. hirta* which was recovered is not included in the calculations.

7. MACHINDUDZI.

Collected during July and September, 1960 from a hollow baobab tree.

Machindudzi is situated along the eastern firebreak and near the indistinct northern border between the *C. mopane* and *Baphia obovata* (the Nwambia sandveld) communities. The percentage occurrence of the different species in the pellets from Machindudzi can be compared with that of collections trapped at Nwambia pan and in the Nyando bush to the east of the pan. This trapping was done in August, 1959. Unfortunately only nine specimens were trapped in the Nyando bush.

TABLE 1.

Comparison of percentage occurrence of species trapped during 1959 in the Nwambia environment, and recovered from owl pellets collected at Machindudzi.

	Nwambia pan n = 59	Nyando bush n = 9	Machindudzi n = 64
Nasilio	1.7	--	—
Bush rats	16.9	11.1	9.4
Multimammate mice	27.1	11.1	17.2
Pouched mice	5.0	11.1	9.4
Gerbils	30.5	66.7	46.9
Bats	5.0	—	—
Tree mice	10.2	—	—
Single-striped mice	1.7	—	—

Table 1 shows that gerbils are the commonest small mammals in all three groups. The largest percentage occurrence is in the Nyando bush followed by Machindudzi and Nwambia pan. In the case of multimammate mice the order of occurrence is reversed. The difference in soil character might be the governing factor, that of Nyando bush more sandy and that around the pan less sandy to hard.

The frequency of fat mice is lower at Machindudzi than at any of the other localities where pellets were collected, consisting of a single specimen only. Other species present in the pellets are shrews (9.4%) one each specimens of mole rat and dormouse (1.6%) and birds (3.1%).

Tree rats (*Thallomys paedulus*) were trapped in tamboti trees (*Spirostachys africanus*) at Nwambia pan. No tree rat remains are present in any of the owl pellets.

8. MALAHLA-PANGA.

Collected on 26 July and 3 September, 1960.

Malahla-Panga is about 15 miles south of Punda Milia rest camp, situated in mixed *C. mopane-Combretum* veld.

The collection from Malahla-Panga is not only the largest numerically but also consists of a large number of species, eleven in all. Gerbils are the commonest prey species (35.6%) with shrews (20.8% in all, consisting of *Crocidura hirta* 5.4%, *C. bicolor* 9.4% and *Suncus* sp. 6.0%) next. Only one climbing mouse and a relatively large number of dwarf mice (5.4%) are represented in this collection.

The collections from Mbangari, Machindudzi and Malahla-Panga all have a moderately low percentage of multimammate mice (16 per cent of the total for all three). This is a little higher than the percentage of bush rats (11%). The gerbil has a high (36%) and the fat mouse a low (6.6%) rate of occurrence.

9. PRETORIUS KOP REST CAMP AND MATUPA CAVE.

The Pretorius Kop collection was made on 28 June, 1961 and that at Matupa on 30 Mey, 1961.

Matupa Cave is about 8 miles to the north of Pretorius Kop rest camp. Both localities lie within the *Dichrostachys-Terminalia-Hyparrhenia* vegetation communities, i.e. the so-called 'long grass' area.

The two collections differ in that the one from Pretorius Kop includes rock rats and *Suncus* sp. but lacks pouched mice, and resemble each other in the presence of vlei rats (*Otomys angoniensis**). The only record of a vlei rat trapped in the Kruger National Park is that of a single specimen collected at Stangane vlei near Punda Milia (Pienaar, 1961). The Matupa and Pretorius Kop collections agree in the low rate of multimammate mice occurrence. At Pretorius Kop only one specimen was recovered. The rate of occurrence of gerbils in both cases is close to 45 per cent. The Matupa collection includes relatively more fat mice.

* *Otomys angoniensis* is used to include *O. tugelensis* (Davis, 1962).

10. SKUKUZA KOPPIES.

Collected : 29 July, 1960.

These Koppies are 7 miles from Skukuza on the Malelane road. The vegetation community is of the *Combretum* type with hard gravelly soil.

The owl pellet collections from here differs from the other in having fat mice, *Steatomys pratensis*, as the commonest prey species (42 per cent of the total). Notwithstanding the fact the rodents were trapped around Skukuza Koppies, no fat mice were collected.

Furthermore, none were collected throughout the Park, as indicated in the first column of fig. 1. The high percentage of fat mice in the owl pellets is therefore remarkable. It also stresses the value of owl pellets to the zoologist in compiling small mammal distributional data. Apart from gerbils and fat mice eight other species were collected, amongst others 6.2 per cent of *Suncus* sp., i.e. the relatively largest collection made of this shrew.

The collections from *Pretorius Kop*, *Matupa Cave* and *Skukuza Koppies* have an exceedingly low rate of occurrence of multimammate mice, from 2 to 6.3 per cent per collection, with an average of 3.8 per cent in the three collections. In all three collections bush rats were more numerous (averaging 14%) with a large percentage of fat mice (31%). As previously mentioned, *Pretorius Kop* and *Matupa* are in the 'long grass' area while *Skukuza Koppies* is in *Combretum* veld. This might be responsible for the difference. The collection with the second largest relative abundance of fat mice is that from *Nwanedzi*, also in *Combretum* veld. The multimammate mouse — gerbil relationship however, varies greatly between the *Skukuza Koppies* and *Nwanedzi* collections.

THE TOTAL OWL PELLET COLLECTION.

The last column shows percentage of each species in the entire collection. The following section deals with the relative abundance of the different species and with some of the problems of classification.

The only skull of an elephant shrew is incomplete and it is therefore not clear whether it is *Elephantulus (Nasilio) brachyrhynchus*, hitherto the only species recorded from the northern Kruger National Park, or *E. intufi*, occurring in the Soutpansberg mountain range. Elephant shrews are expected to be a rare prey of owls because they are mainly diurnal (*E. intufi* to a larger extent than *brachyrhynchus*) and because of their habit of darting under cover when disturbed.

Although shrews prefer cover they are probably an easy prey for owls, being almost exclusively nocturnal and because they move around rather slowly. The total of 73 specimens of *Crocidura* is misleadingly low because an unknown number of *C. hirta* was recovered from pellets from *Mbangari*, *Matupa* and *Skukuza Koppies*. Apart from three specimens which are uncer-

tainly identifiable, the recorded specimens are as follows: two *C. cyanea infumata* from Machindudzi, 30 *hirta* recorded from all the localities except Sabie Poort and 38 *bicolor* from all the localities except from Pretorius Kop rest camp.

The *Suncus* specimens belong to a hitherto undescribed species (J. Meester, personal communication).

The arboreal dormice (*Graphiurus* ? *murinus*) and bats (in this collection *Tadarida (Chaerephon)* sp.) are rarely found in owl pellets. Contrary to findings in the Western Cape (Davis, unpublished records) the rodent mole *Cryptomys* sp. ? *hottentotus*, can be regarded as only an occasional prey of owls in the Kruger National Park.

The species status of the fat mouse, *Steatomys*, is still uncertain. Ellerman et al. (1953) lumped Roberts' (1951) six species into the single species *pratensis*. Ansell (1960) regards three species as valid in Northern Rhodesia, viz. *krebsi*, *minutus* and the multimammate *pratensis*. The specimens from the pellets are most probably *pratensis* (following Ansell). This agrees with the identification of a number of specimens collected in areas adjoining the southern part of the Kruger Park. The slow-moving, strictly nocturnal fat mouse must be regarded as an easy prey for owls. However, no record exists of fat mice forming an equally large proportion of owl pellet remains in collections from other parts of South Africa.

In the case of skull fragments of the climbing mouse, *Dendromus*, species identification is not practical. Both *D. (Poemys) melanotus* and *D. mystacalis* are known to occur in the Transvaal lowveld.

The gerbils were not only the commonest prey (represented by 176 specimens recovered, i.e. 25 per cent of the total) but when their weight is taken into account (averaging 70 gm), also the most important source of food. Numerically the multimammate mouse (165 specimens, average weight 35 gm.) follows the gerbil closely but it is less important as food than the gerbil when the weight of prey consumed by the owl is considered. The same applies to the fat mouse (112 specimens, average weight about 25 gm.) which is far less important by weight as a source of food than the multimammate mouse or even the bush rat (59 specimens, mean weight about 65 gm.).

Birds form a higher proportion of the owl's prey than shown in the twelfth column (1 per cent only) because their numbers were only recorded in the Hapé, Machindudzi and Mbangari collections.

Gerbil skulls are usually recovered from the pellets in a far more complete state than those of the other rodent species. Those of multimammate mice, bush rats, fat mice and single-striped rats normally have the cranium broken. It is possible that the more docile nature of the gerbil might allow it to be killed by owls with less extensive damage to the skull than in the case of many other species.

SMALL MAMMALS TRAPPED IN THE KRUGER NATIONAL PARK.

The first column of fig. 1 represents trapping results with the numbers of each species indicated as a percentage of the total collected. These figures are partly based on collections done in the Kruger National Park by officials of the Medical Ecology Centre during April and October — November, 1953 and partly on collections done in collaboration with the Biologist of the Park during May, 1958 near Skukuza and August 1959 in the north-eastern part of the reserve. Apart from those of the 1959 collection the majority of specimens were trapped near rest camps.

There is a marked difference between the species-composition of the owl pellet material (twelfth column) and that obtained from trapping. In all, 163 specimens (37.5%) of multimammate mice were trapped and only 102 (23.4%) gerbils. The percentage of bush rats (7.9%) and rock rats (4.1%) trapped is moderately higher compared with the number recovered from owl pellets while the single-striped rat represents 10.6 per cent (46 specimens) of the total trapped against only 1.7 per cent (12 specimens) of the total from owl pellets. The most probable reason for this difference is that the single-striped rat is mainly diurnal. Out of a total of 46 single-striped rats trapped 35 came from north of the Shingwedzi River. The others were mainly collected along the eastern portion of the Park. This confirms a distribution pattern indicated by the owl pellet collections.

The percentage occurrence of the gerbil, pouched mouse and dwarf mouse as estimated from trapping results is lower than that based on recoveries from owl pellets. No shrews or fat mice were trapped and no tree rats (*R. paedulus*) or thicket rats (*Grammomys dolichurus*) have been recovered from the pellets. The vlei rat collected in 1960, as previously been mentioned, was trapped near Punda Milia.

Trapping results from some of the areas, compared with the owl pellets recovered from corresponding areas agree to a certain degree, e.g. in the Machindudzi and Nwanedzi collections already mentioned. Trapping in the Hapé-Pafuri area produced about equal numbers of gerbils, multimammate mice and bush rats. This results differs greatly from those obtained from the owl pellets.

The total number of specimens trapped north of the Shingwedzi River compared with the numbers from owl pellets from Hapé, Machindudzi and Malahla-Panga combined is as follows: multimammate mice 36% trapped against 22% recovered from owl pellets; gerbils 23% against 27% and bush rats 16% against 7%. The lower proportion of gerbils in relation to multimammate mice in trapping results is even more marked when comparing the trapping results from Skukuza Camp area and Skukuza Koppies with material from pellets from the latter locality. The percentage of bush rats is subequal (10.7% from pellets, 13% trapped); only 10% of trapped animals are gerbils

against 30% of the recoveries from owl pellets; and 11% of trapped animals are multimammate mice against only 3.6% from owl pellets.

Trapping results from Olifants River Bridge and Gorge Camp agree with results from the owl pellet recoveries from Nwanedzi in that only one gerbil was trapped out of a total of eighteen specimens.

In comparing different collections from the same localities and collections from different localities seasonal changes in species composition have not been considered. Population lows or population ebbs of the different species will also be of importance in the species composition of the owl's prey at the various localities. A regular pellet collection or a population study might therefore clear up some of these observed discrepancies. The relative trapability of the different species (e.g. fat mice against multimammate mice) is still another factor not taken into consideration.

GAZETTEER.

Hapé	.....	.....	.....	.....	.....	.....	22°26'S., 31°15'E.
Machindudzi	..	.....	.....	.....	.....	.....	22°33'S., 31°16'E.
Malahla-Panga	.....	.....	.....	.....	.....	.....	22°53'S., 31°05'E.
Matupa	..	.....	.....	.....	.....	.....	25°03'S., 31°18'E.
Mbangari	.....	.....	.....	.....	.....	.....	24°15'S., 31°37'E.
Nwambia	.....	.....	.....	.....	.....	.....	22°43'S., 31°22'E.
Nwanedzi	.....	.....	.....	.....	.....	.....	24°27'S., 31°58'E.
Pretorius Kop rest camp	..	.....	.....	.....	.....	.....	25°10'S., 31°16'E.
Sabie Poort	25°11'S., 32°01'E.
Shilowa	23°29'S., 31°34'E.
Skukuza Koppies	25°05'S., 31°36'E.

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