

wind fires did in the past wreak havoc amongst the tree population, particularly along the eastern fringes. The dominant species of this substantial deciduous forest i.e. mopani (*Colophospermum mopani*) is also dominant over practically the whole of the northern district. The forest as such may therefore be regarded as one of the true edaphic climax plant communities still to be found in the Park. Associated tree species are collectively very much in the minority and include *Diospyros mespiliformis*, *Spirostachys africana*, *Acacia tortilis*, *Albizia harveyi*, *Lannea kirkii*, and *Sclerocarya birrea* — many fine specimens of which are nevertheless incorporated in the forest. The shrub-stratum is of *Courbonia glauca*, *Thylachium africanum*, *Salvadora angustifolia* var. *australis*, *Euclea divinorum*, *Dalbergia melanoxylon*, *Securinea virosa*, *Combretum mossambicense*, *Grewia* spp., *Capparis tomentosa* and *Maerua parvifolia*. The most prominent grasses are *Panicum maximum*, *Digitaria* spp., *Eragrostis* spp., *Cenchrus ciliaris*, *Sporobolus pyramidalis* and *Chloris myriostachya*.

The mopani climax forest is an important elephant habitat in the north during certain seasons and is in addition also colonized by large numbers of kudu, migratory buffalo herds, several herds of sable antelope, waterbuck (along the banks of the Shisha River), as well as numerous grey duiker, Sharpe's steenbuck and the large forest elephant shrew.

(xi) *The Pretoriuskop long grass savanna woodland and tree savanna.*

A distinctive and important game habitat which has developed on the light-coloured sandy loam soils with a mean annual precipitation of 28 inches in the area along the western boundary of the southern district, extending from the Sabi River to near the confluence of the Nsikazi and Crocodile Rivers. Although it seems clear that this veld-type had always been of a 'sour' nature (vide H. Glynn 1926, Annual reports of the Warden 1903-1913, Cohen 1875), it has undergone considerable changes in aspect and composition over the years and can now be regarded as a typical example of a fire climax community. The encroaching elements are mainly the tall, unpalatable thatch grass, *Hyparrhenia dissoluta* and several shrub species such as *Terminalia sericea*, *Parinari curatellifolia* ssp. *mobola* and *Dichrostachys cinerea* ssp. *nyassana*.

It is evident from early photographs that this habitat has changed progressively from an open tree savanna with sour grassveld of medium height to a more overgrown savanna woodland with tall grass. The factors contributing to this change will be discussed in a subsequent paper and has also been expounded by Van der Schijff (1958, 1959).

The dominant tree species of this veld-type is *Terminalia sericea* with *Dichrostachys cinerea* ssp. *nyassana* as the most important sub-dominant and associated species in *Sclerocarya birrea*, *Strychnos* spp., *Lannea discolor*, *Ziziphus mucronata*, *Combretum gueinzii*, *Peltophorum africanum*, *Parinari curatellifolia* ssp. *mobola*, *Ficus sycomorus*, *Ficus ingens*, *Trichilia roka*, *Syzy-*

gium guineense, *Diospyros mespiliformis*, *Albizia versicolor*, *Ficus capensis*, *Annona senegalensis*, *Antidesma venosum*, *Acacia karroo* and *Acacia sieberiana* var. *woodii*. Common shrubs in the tall grass veld are *Rhus* spp., *Heteropyxis natalensis*, *Lannea edulis*, *Euclea* spp., *Grewia* spp., *Ochna natalitia*, *Flacourtia hirtiuscula*, *Lippia javanica*, *Pavetta* spp., *Xeromphis* spp., *Ximenia* spp., *Ximenia caffra*, *Albizia harveyi*, *Ormocarpum trichocarpum*, *Gymnosporia* spp., *Mundulea sericea*, *Cassia petersiana* and *Dalbergia melanoxylon*. The grass cover is completely dominated by the tall *Hyparrhenia dissoluta*, although *Elyonurus argenteus* is the most abundant species. Associated species of importance are *Hyparrhenia fillipendula*, *Andropogon amplexans*, *Schizachyrium semiberbe*, *Pogonarthria squarrosa*, *Trachypogon capensis*, *Sporobolus pyramidalis*, *Loudetia simplex*, *Loudetia flavida*, *Digitaria* spp., *Eragrostis* spp., *Setaria flabellata*, *Setaria sphacelata*, *Panicum maximum* and *Microchloa caffra* together with several *Bulbostylis* and *Cyperus* spp.

The sourveld of Pretoriuskop and the surrounding country was the traditional habitat of oribi and white rhinoceros (Vaughan-Kirby, 1896), both of which became extinct and have recently been re-introduced in their old home ranges. Eland, tsessebe and ostriches were all prominent members of the animal community together with large herds of wildebeest and zebra, either before or during the early years following the proclamation of the old Sabi game reserve. Eland disappeared during the great rinderpest epidemic of 1897-98 (Yates, 1935), but tsessebe and ostriches survived here in small numbers until fairly recently, during which time the insidious encroachment of the veld by thatch grass and a number of shrub species rendered the habitat unacceptable and hastened their final disappearance. The same period on the other hand heralded a steady rise in the population curve of reedbuck, which are partial to long grass veld, as well as browsing species like giraffe, kudu and impala.

At present it may be said that the Pretoriuskop long grass is the principal reedbuck habitat in the Park and affords sanctuary to many more kudu and impala than at any time within living memory. Since a policy of biennial rotational burning has been implemented in this veld type there has been a slow but steady increase also of zebra and wildebeest populations and the area has also developed into an important sable habitat, harbouring no less than 150 of these noble animals.

Until comparatively recently elephants shunned the long grass veld but wandering bulls often visit the area nowadays during the summer months. Warthog and waterbuck are encountered in satisfactory numbers and the only small herd of roan antelope which still roam about in the southern district periodically enters the area from the east.

(xii) *Mixed Combretum savanna woodland.*

The grey to reddish sandy granitic soils west of the great Karroo sandstone reef and between the Timbavati and Crocodile Rivers is covered by a

mixed *Combretum* savanna woodland which blends imperceptibly in areas with what may be more aptly described as a mixed *Combretum*-*Acacia* tree savanna. For the purpose of this paper the latter may be considered merely as a gradation of the major veld-type, although *Acacia* spp. such as *Acacia delagoensis*, *Acacia swazica*, *Acacia burkei* and *Acacia gerrardii* are rather more abundant in this association.

Combretum spp., including *Combretum apiculatum*, *Combretum suluense*, *Combretum zeyheri*, *Combretum hereroense* and *Combretum imberbe* are the dominant species in the tree and shrub strata of the savanna woodland. *Terminalia sericea*, *Sclerocarya birrea*, *Acacia nigrescens*, *Lonchocarpus capassa*, *Bolusanthus speciosus*, *Terminalia prunioides*, *Lannea discolor*, *Lannea kirkii*, *Commiphora* spp., *Pterocarpus angolensis*, *Acacia gerrardii*, *Dombeya rotundifolia*, *Ziziphus mucronata*, *Albizia harveyi*, and *Peltophorum africanum* also contribute to the arboreal community. The other prominent species in the shrub stratum are *Strychnos innocua* subsp. *dysophylla*, *Xeromphis* spp., *Ehretia* spp., *Pterocarpus rotundifolius*, *Ormocarpum trichocarpum*, *Acacia exuvialis*, *Albizia harveyi*, *Heeria reticulata*, *Euclea divinorum*, *Grewia* spp., *Dalbergia melanoxylon* and *Gymnosporia* spp.

The grazing is predominantly sweet and of excellent quality with the following grass species most obvious: *Digitaria eriantha*, *Setaria flabellata*, *Schmidtia bulbosa*, *Panicum maximum*, *Heteropogon contortus*, *Trichoneura grandiglumis*, *Loudetia simplex*, *Andropogon amplexans*, *Brachiaria serrata*, *Perotis patens*, *Aristida* spp., *Eustachys paspaloides*, *Pogonarthria squarrosa*, *Themeda triandra* and *Eragrostis* spp.

The mixed *Combretum* savanna woodland is the outstanding game habitat, and supports the largest ungulate community of any one area in the Park. That part covering the western half of the Central district particularly includes the home ranges and seasonal grazing grounds of the great migratory herds of wildebeest and zebra, besides large numbers of kudu, giraffe, warthog, impala, waterbuck and steenbuck as well as several large herds of buffalo, sable, a sprinkling of tsessebe and reedbuck and a few wandering herds of elephant. In the Southern district the only substantial herd of roan antelope south of the Sabi River also inhabits this veld-type.

(xiii) *Acacia nigrescens* — *Sclerocarya birrea* tree savanna.

The heavy basaltic soils of the Lebombo flats east of the Karroo sandstone reef and south of the Olifants River are covered by a typical tree savanna intermingled in parts with a more heavily overgrown woodland, particularly in the more broken country bordering the Lebombo foothills. This major game habitat is characterised by its parkland aspect and is heavily grassed.

Acacia nigrescens is the dominant tree in the community with *Sclerocarya birrea* the obvious subdominant. Associated species of note are *Acacia tortilis*, *Lannea kirkii*, *Lonchocarpus capassa*, *Combretum imberbe*, *Phoenix reclinata* and *Acacia xanthophloea* (along the banks of water courses), *Albizia*

harveyi, *Ziziphus mucronata*, *Ficus stuhlmannii*, *Combretum hereroense*, *Balanites maughamii*, *Terminalia prunioides*, *Acacia gerrardii* and *Diospyros mespiliformis*. The shrub stratum giving rise to thickets in parts includes such species as *Pterocarpus rotundifolius*, *Securinea virosa*, *Dichrostachys cinerea*, *Albizia harveyi*, *Commiphora* spp., *Dalbergia melanoxylon*, *Heeria insignis*, *Ximenia caffra* var. *natalensis*, *Grewia* spp., *Euclea divinorum*, *Ehretia amoena*, *Acacia exuvialis*, *Maerua parvifolia*, *Combretum mossambicense* and *Gymnosporia senegalensis*.

The grazing is inherently sweet veld but has become progressively infested by the unpalatable 'stinkgrass', *Bothriochloa insculpta*, which is now dominant over large tracts of this parkland community. This grass is very poorly utilized by most grazing species except zebra and wildebeest and is particularly favoured in its competitive association with other more palatable species — a situation which lends itself to selective grazing and deterioration of the habitat. The *Bothriochloa insculpta* infestation is so far advanced in certain areas of this veld-type that the habitat has been rendered unsuitable for selective grazing species such as tsessebe. They are today practically non-existent in favourite haunts of former years, such as the area immediately surrounding Satara.

Important grazing grasses associated with *Bothriochloa* in the grassveld community are *Digitaria* spp., *Panicum* spp., *Themeda triandra*, *Cenchrus ciliaris*, *Urochloa mossambicensis*, *Eragrostis superba*, *Setaria woodii* and *Heteropogon contortus*.

The vegetation of this habitat may also be regarded as a relatively stable pyrophyllous climax community, but although the grazing is of poor quality over large areas, most of the ungulate species found in the mixed *Combretum* savanna woodland to the west seem to thrive here and it also carries the largest giraffe population in the whole of the Park.

(xiv) *The mopani scrub and tree savanna of the northern Lebombo flats.*

The Lebombo flats north of the Letaba River are covered by a savanna vegetation in which mopani (*Colophospermum mopani*) either in scrub or tree form is the dominant species. In areas where the tree stratum has not yet been drastically lowered, such as that immediately north and south of the Shingwidzi River, the vegetation is perhaps better described as a savanna woodland, but the indications are that these areas have become overgrown in recent years, with fire depredation as the main causative factor.

Excavation studies of the root systems of mopani coppices in the scrub savanna also seem to indicate that the extensive areas covered by scrub mopani on the Tsende and Babalala flats today presented a much more open tree savanna aspect in bygone days, before man-made fires became a destructive factor of importance.

Apart from mopani, other trees are very sparsely scattered in this habitat and the only species of importance are *Combretum imberbe*, *Acacia*

nigrescens, *Acacia tortilis*, *Sclerocarya birrea*, *Lonchocarpus capassa* and *Acacia xanthophloea* (along the poorly drained depressions).

The shrub stratum is richer in variety and includes *Dalbergia melanoxylon*, *Commiphora* spp., *Dichrostachys cinerea*, *Grewia* spp., *Ormocarpum trichocarpum*, *Albizia harveyi*, *Gymnosporia senegalensis*, *Acacia exuvialis*, *Securinega virosa*, *Gossypium herbaceum* var. *africanum*, *Heeria insignis*, *Combretum mossambicense*, *Euclea divinorum*, *Ximenia americana* var. *microphylla*, *Terminalia prunioides*, *Rhigozum zambesiaceum*, *Cissus lonicerifolius* and *Hyphaene crinita* (along the water courses and depressions).

The grass cover of this habitat is very heavy and dense in parts and although it is generally undergrazed, this is not due to the poor quality of the constituent grass species, as these are for the most part palatable and well loved by grazing species. *Panicum coloratum*, *Themeda triandra* and *Cenchrus ciliaris* are dominant species in the grass veld with associated species such as *Digitaria* spp., *Bothriochloa insculpta*, *Urochloa rhodesiensis*, *Heteropogon contortus*, *Schmidtia bulbosa*, *Setaria woodii*, *Eragrostis* spp., *Aristida* spp., *Enneapogon cenchroides*, *Panicum maximum*, *Fingerhuthia africana*, *Cymbopogon excavatus* and *Ischaemum brachyatherum*.

The dominant ungulate species in this habitat is Burchell's zebra but the mopani scrub and tree savanna of the Lebombo flats is also an important subsidiary habitat of eland, roan antelope, tsessebe, wildebeest and sable. Kudu, grey duiker, Sharpe's steenbuck and ostriches are fairly abundant. Steenbuck are particularly well represented and considerable herds of elephant and buffalo move into the flat country during the wet season.

(xv) *The mixed mopani-Combretum veld of the dry north-western zone.*

The vegetation of the relatively poorly-watered western half of the Park north of the Timbavati River is a mixed mopani-combretum veld which is preponderately a rather dense savanna woodland intermingled with patches of a more open tree savanna. *Colophospermum mopane* is the dominant in both the tree and shrub strata, particularly on the heavier loam soils. *Combretum apiculatum* is sub-dominant but often also the most prominent species on the poorer gravelly soils. Other species forming an integral part of the tree community include *Terminalia sericea* (on sandy, well drained soils), *Combretum imberbe*, *Sclerocarya birrea*, *Bolusanthus speciosus*, *Cassia abbreviata* var. *granitica*, *Phyllogeiton discolor*, *Ziziphus mucronata*, *Gardenia spatulifolia*, *Albizia harveyi*, *Spirostachys africana*, *Lannea kirkii*, *Acacia tortilis*, and *Diospyros mespiliformis*. The shrub stratum and thickets are of *Mundulea sericea*, *Heeria insignis*, *Cissus lonicerifolius*, *Strychnos innocua*, *Grewia* spp., *Euclea divinorum*, *Securinega virosa*, *Dichrostachys* spp., and *Albizia harveyi*.

The grass cover is shorter and much less dense than on the adjoining Lebombo flats but of excellent variety and quality. *Digitaria* spp. are dominant with associated species such as *Aristida graciliflora*, *Tricholaena mo-*

nachne, *Bothriochloa insculpta*, *Cymbopogon excavatus*, *Hyparrhenia dissoluta*, *Heteropogon contortus*, *Andropogon amplexans*, *Enneapogon cenchroides*, *Eragrostis rigidior*, *Rhynchelytrum repens*, *Schmidtia bulbosa*, *Pogonarthria squarrosa*, *Panicum maximum*, *Sporobolus* spp., and *Microchloa caffra*.




















Potentially this vast territory is one of the best game habitats in the Park — the only limiting factor being the lack of permanent drinking facilities in the sparsely populated areas away from the perennial rivers. As it is this area constitutes the most important elephant habitat in the whole Park. The triangle between the Tsende and Great Letaba Rivers and the western boundary, an area of some 500 square miles is the permanent habitat of almost half the total elephant population of the Park, and provides adequately in all their ecological needs. It would be safe to maintain that their number may be doubled with ease without their adversely affecting the habitat, if the latter had only been better watered. Apart from elephants the western half of this vegetational zone, particularly, is inhabited by splendid resident herds of sable antelope and eland. Wildebeest and tsessebe are progressing favourably. Kudu, zebra, impala, waterbuck and buffalo are relatively abundant, whereas reedbuck, steenbuck, duiker, Sharpe's steenbuck and warthog occur in gratifying numbers. Even a few small herds of roan antelope have found a safe retreat in this area and were unaffected by the awful anthrax epidemic of 1960, which took such heavy toll of their numbers to the north and east.

SYSTEMATIC LIST OF THE LARGE MAMMALS OF THE KRUGER NATIONAL PARK AND DISCUSSION OF THEIR DISTRIBUTION AND PRESENT-DAY STATUS

The mammals of the Kruger National Park are of tropical affinity and endemic in the East and South African subregion of the primary zoogeographical division known as the Ethiopian region. Roberts (1951) subdivided the East and South African subregion south of the Zambezi and Cunene Rivers into 26 zoogeographically distinct districts. The Kruger National Park lies in, what is designated by him, the Eastern Low Country. The mammals here are largely akin to those of the Eastern Bechuanaland area (absentees being the Gemsbok and Red Hartebeest), being connected therewith through the Limpopo valley. Several species inherently resident in the southern tropical littoral however, have invaded the Park from the east, notably Nyala, Livingstone's Suni and smaller mammals such as the forest elephant shrew (*Petrodromus tetradactylus*), the Mocambique scrub hare (*Lepus capensis aquilo*), and Mocambique golden mole (*Amblysomus (Chrysotricha) obtusirostris limpopoensis*).

South African genera which inhabit the Natal and south-eastern Transvaal midlands have two representatives in the higher-lying south-western area of the Park — the reddish golden mole (*Chlorotalpa* cf. *C. sclateri guillarmodi*) and oribi (*Ourebia oribi*). The Natal or red duiker is typically an inhabitant of the eastern side of the Drakensberg escarpment and eastern Transvaal

LEGEND

-  Pumbe Sandveld
 -  Deciduous Shrub Thickets (Nyandu Bush)
 -  Bush or Forest Clad Mountainous or Rocky Outcrops
 -  Lebombo Mountain Range
 -  Light Montane Forest and Overgrown Valleys
 -  Riparian Forest
 -  Mopani Scrub Savanna of Lebombo Flats
 -  Mopani Tree Savanna of Lebombo Flats
 -  Grassland Plains and Dambos
 -  Mixed Mopani-Combretum Savanna Woodland
 -  Mixed Mopani-Combretum Tree Savanna
 -  Climax Mopani Woodland
 -  Dense Thornbush Thickets
-
-  Mixed Combretum Savanna Woodland
 -  Mixed Combretum-Acacia Tree Savanna
 -  Long Grass Savanna Woodland and Tree Savanna
 -  Dry Deciduous Forest
 -  *Acacia nigrescens*-*Sclerocarya birrea* Tree Savanna
 -  *Acacia nigrescens*-*Sclerocarya birrea* Savanna Woodland

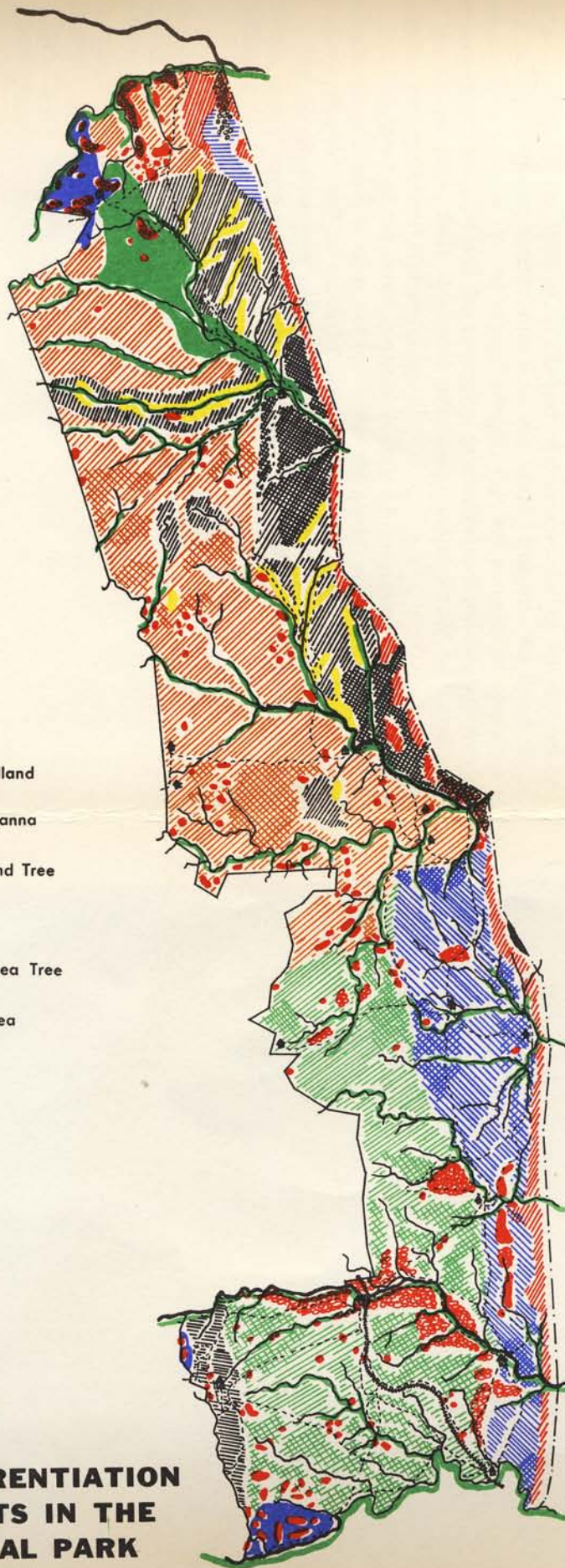


FIG. 1

**ECOLOGICAL DIFFERENTIATION
OF GAME HABITATS IN THE
KRUGER NATIONAL PARK**

forested areas but are found in small numbers in the extreme south-western corner of the Park.

For the purpose of this paper only the larger ungulate species and carnivores larger than jackals will be considered. A check-list with distribution data for the small mammals of the Park will form the substance of a subsequent paper.

The distribution data presented below is based on the results of a five-year survey period, and an attempt has been made to provide an indication in the maps of seasonal variation in the habitats of migratory populations. In most instances the limits of distribution of a species during the dry season are indicated by the shaded areas on the maps, whereas the lined areas denote their summer or wet season ranges. For the purpose of elucidating environmental selection and the ecological relationships of mammalian species in the Kruger Park, their respective distribution maps should be correlated with the cartographical scheme in fig. (i).

A discussion of the developmental history of individual animal populations in the Kruger Park does not fall within the scope of this paper and only passing reference will be made to historical data.

The classification and nomenclature adopted in the systematic list which follows is with some exception that of Ellerman, Hayman and Morrison-Scott (1953).

SYSTEMATIC LIST

CLASS — MAMMALIA.

SUB-CLASS — THERIA.

INFRA-CLASS — EUTHERIA (PLACENTALIA).

SUPER-ORDER — FERAEE.

ORDER — CARNIVORA.

SUB-ORDER — FISSIPEDIA.

SUPER-FAMILY — CANOIDEA.

Family — CANIDAE.

Canis mesomelas mesomelas Schreber.

Saddle-backed Jackal.

Distributed throughout the Park (fig. (ii)) but only in parts of the central district may they be described as of common occurrence. As is the case with wild dogs this species seem to be susceptible to parasitic epizootics of a Rickettsial nature which have caused sharp declines in the growth curve of the population. In the southern and northern districts they are decidedly rare today, and there is at present probably less than 500 of these carnivores in the Park as a whole.

Diet: Carrion, small mammals such as hares, squirrels, mice and rats, the young and eggs of ground-nesting birds, small reptiles such as lizards and tortoises, and insects such as termites and locusts. They have been

seen to eat young grass shoots like domestic dogs and where the opportunity presents itself will predate on the newly-born young of the smaller antelope species.

Breeding : Pups (1-2 months old) have been recorded during October and others have been seen during July-August.

Canis adustus adustus Sundevall.

Side-striped Jackal.

Distributed throughout the Park but nowhere common. (Fig. (iii)). They may be met with singly or in pairs in open country or woodlands but seem to avoid forests.

Diet : Not entirely carnivorous, and in addition to locusts and other insects will eat certain wild fruits. They probably only rarely attack any mammal of larger size than a hare.

Breeding : No records to date but Ansell (1960) mentions that pups have been found during the period September-November.

Latest estimation of numbers : Probably not more than 300 in the Park as a whole.

Lycaon pictus pictus Temminck.

Wild dog or Cape hunting dog.

Gregarious carnivores which roam in packs of variable size over extensive areas of the Park (Fig. iv), with the focal point of population density in the mountainous areas of the southern district and the western half of the northern district. The wild dog population of the Park has suffered notable fluctuation in numbers primarily due to Rickettsial epizootics, which all but wiped them out in the Low Country during the period 1927-1933. (Stevenson-Hamilton, 1939).

Diet : Exclusively carnivorous, killing medium to fairly large ungulates. Impala are first on the list of prey species in the Park.

Breeding : Pups (2-8 in a litter) have been recorded from March to September with a peak period during late fall and winter. The same breeding sites, particularly in the mountainous areas, are often resorted to during the whelping season.

Latest estimation of numbers : 150-160 in the northern district, 65-80 in the central district and 100-120 in the southern district.

SUPER-FAMILY — Feloidea.

Family — Hyainidae.

Crocuta crocuta Erxleben.

Spotted Hyena.

Solitary or semi-gregarious nocturnal scavengers which are generally distributed throughout the Park (Fig. v). In the southern, and particularly the

central districts, they are very common and often a nuisance around the rest camps. During recent years they have taken to begging along the road sides. In the northern district they are much less common and their numbers were at one time seriously decimated by a mysterious disease during the 1950's. Hyaenas south of the Olifants River suffered a similar fate during the period 1912-1930. (Stevenson-Hamilton, 1939).

Diet : Mainly carrion, being a frequent scavenger at lion kills. On occasion they may however kill their own prey — often disabled or sick animals, and usually not larger in size than kudu.

Breeding : Most young are reared during the winter months when food supplies are more abundant, but pups (2-4 in a litter) have been recorded throughout the year so that they probably do not have a definite breeding season.

Latest estimation of numbers : Several thousand.

Hyaena brunnea Thunberg.

Brown hyaena.

These interesting animals are rare in the southern and central districts of the Park but are found in appreciable numbers north of the Letaba River, especially in the area along the western boundary. (Fig. vi).

Diet : They will feed on carrion but the hunting instinct is more strongly developed in these beasts than in their spotted kin, and they will often attack and kill even large antelopes such as kudu and waterbuck. Alleged to raid the lairs of lion and carry off the young cubs. The undigested nails of young lions have been found in their droppings.

Breeding : No records to date. According to Stevenson-Hamilton (1947) 2-4 pups are born in a litter.

Latest estimation of numbers : Less than 200 in the Park as a whole.

Family — FELIDAE.

Acinonyx jubatus jubatus Schreber.

Cheetah.

These sleek and graceful hunters were never abundant in the Lowveld country within historical times, and control measures that have been applied in the past were completely unjustified — a practice which has been discontinued since 1958. These animals are today decidedly rare in the Kruger National Park, and although their present distribution covers the whole area it is only in certain parts of the southern section where they may still be found in reasonable numbers, either singly, in pairs or family groups. (Fig. vii).

Diet : Carnivorous. Mainly preys on medium and small antelopes (particularly impala, which is the most abundant prey species), smaller mammals and the young of larger species. Are known to kill also ostriches and certain game-bird species.

Breeding : 2-5 Cubs are born in a litter usually during fall and the winter months.

Latest estimation of numbers : Southern district 81. Central district 93. Northern district 45. Total 219.

Panthera pardus Linnaeus.

Leopard.

Leopards are common in the Park and widely distributed, (Fig. viii), but in view of their timid nature and nocturnal habits they are not very often seen, a fact which also complicates the estimation of their numbers. They may be encountered in all types of country, including montane areas and are usually seen singly or in pairs.

Diet : Carnivorous but may on occasion feed on carrion. Small to medium-sized antelope are killed (impala, bushbuck and steenbuck being important prey species), along with the young of larger antelope, small mammals such as cane rats, hares, rock hyrax, aardvark and porcupines and ground-nesting birds.

Breeding : Apparently no fixed breeding season and litter size usually varies from 2-3. Most breeding records have been obtained during the winter months and fall.

Latest estimation of numbers : 650 (probably more) in the Park as a whole.

Panthera (Leo) leo krugeri Roberts.

Lion.

Irrespective of whether control measures to limit their numbers had been severe or relaxed, the population curve of lion in the Kruger Park fluctuated primarily as a result of favourable or adverse hunting conditions. During periods of prolonged drought such as from 1926-1935, 1944-1948 and 1950-1954 when large concentrations of game around the available watering points created conditions which favoured the predator species, the lion population increased rapidly. Conversely, during a series of successive very wet years which caused a dispersal of prey, the lion population suffered and there was a sharp decline in their numbers, such as during 1936-1943. It is significant that during 1938 and 1939 more lions had to be destroyed because of man-eating tendencies than the total number during the whole of the preceding and subsequent period, and the mortality rate amongst young cubs was particularly high. In general, however, it is quite clear that apart from these periodic fluctuations the growth curve of the lion population exhibit a steady incline over the years which simulates that of their prey species; so that there are at present more lions in the Kruger Park than at any stage within historical times. The large numbers of lion in the Park is however no cause for concern as it is evident that their prey populations retain that advanced level in relative abundance which is true of all natural communities.

The realization of this basic ecological truth has brought about the end of lion control on an organized scale — a practice which, viewed in the light of the results achieved, must be regarded with considerable misgiving.

Lions are at present to be found throughout the Park (Fig. ix), ranging from the extreme north-east at Pafuri (where their absence for about a decade since 1950 was one of the principal factors contributing to the population outburst of prey-species and the overstocked conditions which exist today) to the Crocodile River in the south, with focal points of population density in the Tshokwane area and the Sabi- and Timbavati River belts.

Diets : Carnivorous. Medium to large mammals are preyed upon with wildebeest, impala, zebra, waterbuck, kudu, giraffe and buffalo (in order of preference) featuring most prominently in kills. Records of hippopotami and young elephants being attacked by lions are rare in the Kruger Park, but crocodiles have been reported killed by these powerful beasts of prey.

Breeding : Cubs (2-5 per litter) may be born at any time of the year although the majority seem again to be reared during the dry season.

Latest estimation of numbers : 200 Inhabiting the southern district, 488 in the central and 347 in the northern districts respectively. Total 1035.

SUPER-ORDER — PAENUNGULATA.

ORDER — PROBOSCIDEA.

Family — ELEPHANTIDAE.

Loxodonta africana africana Blumenbach.

African Elephant.

At the turn of the 19th century only about a score of elephants had escaped the guns of ivory hunters in the Eastern Transvaal Lowveld and their presence in the remote and secluded forested area near the Olifants Gorge was only discovered in 1905. In 1912 their numbers were estimated at 25, but so well did this original nucleus herd react to the absolute sanctuary afforded them, that they more than doubled that number by 1936. Considerable immigration by elephants from the adjoining Portuguese territory increased the elephant population to about 100 in 1926 and to 250 in 1936. By this time there had already occurred since 1931 a recolonization of the northern mopani-veld, a process which was to be re-enacted in a southerly direction during 1939-41. Both movements were preceded in characteristic fashion by the extensive scouting patrols of a few old bulls. By the end of 1941 elephants had crossed the Sabi River for the first time in almost a hundred years and during the summer of 1952, two elephant bulls had also re-entered the last area in the Park (the long grass veld around Pretoriuskop) as yet without a wandering or established elephant population.

The official estimate of elephant numbers in 1958 was 995, which was an underestimation as was proved by subsequent aerial surveys.

At present there is no area in the Park not inhabited by resident or migratory elephant herds, although the population in the southern district is relatively small and augmented annually by an influx from the central district during the dry season. (Fig. x). The northern mopani veld is still the principal habitat of elephants in the Park and here the area between the Tsende and Great Letaba Rivers and the western boundary affords permanent sanctuary to almost half the total number of elephants in the Park!

Feeding habits: Rough in habit of grazing, browsing, peeling of bark and digging of roots, but delicate when picking pods and wild fruits.

Breeding: Single calves are born at any time of the year. Twins are rare. Cows become sexually mature at 12-13 years of age. Calves are normally dropped every fourth year (gestation period 22 months) during the sexually active life of the cow.

Latest estimation of numbers: 1750 (1601 were counted during an aerial survey in April 1962) of which 1266 were counted in the area north of the Olifants River.

SUPER-ORDER — MESAXONIA.

ORDER — PERISSODACTYLA.

SUB-ORDER — CERATOMORPHA

SUPER-FAMILY — RHINOCEROTOIDEA.

Family — RHINOCEROTIDAE.

Diceros bicornis bicornis Linnaeus.

Black Rhinoceros.

The only large mammalian species which became extinct in the Eastern Transvaal Lowveld during historical times, not at present represented in the fauna of the Kruger National Park. The last living specimen was seen by ex-ranger Kirkman along the Nwatiwambo spruit in the famous Nwativhiri bush east of Skukuza during October 1936. Formerly these great beasts roamed throughout the whole of the Low country east of the Drakensberg escarpment and according to Vaughan-Kirby (1896) were particularly abundant in the Nwativhiri bush, the Gomondwane thickets, along the Timbavati river and the Nyandu bush on the eastern boundary north of Shingwidzi. The indiscriminate slaughter and persecution by hunters during the latter half of the 19th century reduced their numbers to the brink of extinction. Three were reported soon after the proclamation of the Shingwidzi Reserve in 1903 along the headwaters of the Tsende River and during the 1920's solitary specimens were seen on the Lebombo south-east of Tshokwane and along the Bubube

River in the north. These were the last of the few however, and even the last survivors in the Nwativhiri bush had disappeared forever by 1945.

An attempt will be made to re-introduce sufficient numbers of these animals during the next few years to build up a breeding population within their selected habitats in the Kruger National Park.

Diceros (Ceratotherium) simus simus Burchell.

Square-lipped or White Rhinoceros.

The square-lipped rhinoceros was at one time an inhabitant of the present Kruger National Park, although there is no evidence that it ever occurred in the area north of the Sabi River.

It had been exterminated many years before the proclamation of the old Sabi Game Reserve in 1898 by native, half-caste and other hunters from the east coast. According to Glynn (1926) a few remained near Lower Sabi until the later 'seventies'. Stevenson-Hamilton (1947) thought it possible that the earliest white hunters and pioneers may have encountered it in these regions; but it certainly did not exist after the seventies of the last century. Their habitat of choice seems to have been the higher lying regions around Nelspruit, White River and Pretoriuskop and possibly also the open country of the Lebombo Flats south of the Sabi.

Having been extinct for 80 years or more, it was therefore an achievement of considerable merit of the National Parks Board of Trustees in translocating 4 fully mature square-lipped rhinoceros, with the aid of officials of the Natal Park's Board from the Umfolozi reserve in Natal, to a specially constructed enclosure along the Faai spruit near Pretoriuskop, during October 1961. These newcomers have settled down amicably in their new habitat and will form the nucleus of a breeding herd in one of their favourite haunts of old. (Vide fig. xi). Two more were added to their number during 1962, so that there are now 4 cows and 2 bulls in the Kruger Park. More are to follow during the coming year not only to augment the Pretoriuskop population but also to establish a breeding herd in some other suitable area in the southern district.

Feeding habits: Grazing although a few herbaceous species are browsed upon.

Breeding: According to Player and Feely (1960) a single calf is born after an eighteen months gestation period. There is no fixed breeding season although females in oestrus are most frequently encountered during the period July to September. Calves are born at three-yearly intervals. The young calf begins to graze when only about a week old but suckles for at least a year. One case of twins has been recorded.

Latest estimation of numbers: 6 Adults. One female may be pregnant.

SUB-ORDER — HIPPOMORPHA.

SUPER-FAMILY — EQUOIDEA.

Family — EQUIDAE.

Equus (Hippotigris) burchelli antiquorum H. Smith.
Burchell's Zebra.

One of the most common grazing species in the Park with great migratory herds inhabiting the central district (particularly the western mixed *Combretum* veld) as well as the whole length of the Lebombo flats. Substantial herds may be encountered however, in the majority of the other habitats, these animals being of catholic taste in their grazing habits and highly adaptable to changing environmental conditions. (Vide fig. xii).

Feeding habits: Grazing close and able to subsist in areas with poor or coarse grass cover. Some browsing and digging of corms and rhizomes particularly during dry periods.

Breeding: Foaling occurs mainly during the period September-February, with a peak in November-February. Occasional foals are dropped during the intervening period however.

Latest estimation of numbers: 12,500-13,000 of which 9,000 inhabit the central district and 1,000 the area south of the Sabi River.

SUPER-ORDER — PARAXONIA.

ORDER — ARTIODACTYLA.

SUB-ORDER — SUIFORMES.

Family — SUIDAE.

Potamochoerus porcus mashona Lönnberg.
Bush Pig.

Of limited distribution in the Kruger Park, inhabiting the broken country along the southern border of the Levubu river, the *Androstachys* forests of the Olifants Gorge area and some mountainous isolates in the southern district. (Fig. xiii). Secretive by nature and seldom seen abroad by day.

Feeding habits: Shallow digging and browsing in valley and plateau woodlands.

Breeding: No records to date in the Kruger Park. Ansell (1960) sets the farrowing season as from October to March, during the rains in Northern Rhodesia. Litters are usually 3-4 but may be as many as 6.

Latest estimation of numbers: Several hundred. May be more or less, population data being exceedingly difficult to obtain.

Phacochoerus aethiopicus Pallas.
Warthog.

Warthogs are very numerous in certain areas of the central and southern districts but of more limited distribution and number in the northern district,

although nowhere scarce. (Fig. xiv). Although warthogs are essentially water-loving animals and very partial to regular mud-baths, it is remarkable how well they are able to survive severe drought conditions. They are often encountered considerable distances away from permanent water during the dry season and subsist entirely on the juicy rhizomes, corms and grass roots which they dig.

Feeding habits : Shallow digging and close grazing.

Breeding : Farrowing is from November to December but occasional litters (2-6) are dropped during January to April.

Latest estimation of numbers : 3,500 (probably more) of which at least 2,000 inhabit the central district.

Family — HIPPOPOTAMIDAE.

Hippopotamus amphibius Linnaeus.

Hippopotamus.

All the perennial rivers of the Kruger Park and many permanent pools and dams in the seasonal rivers are inhabited by hippopotami, and they are today one of the most firmly established and thriving ungulate communities in the whole area. (Vide fig. xv). During the wet season wandering hippopotami are often encountered many miles from the nearest permanent water and great distances are covered by these animals during their lonely sojourns.

Feeding habits : Very close grazing and a little browsing.

Breeding : Calves are born singly (very rarely twins) at any time of the year.

Latest estimation of numbers : 3,200 (1,567 Olifants River; 643 Letaba River; 417 Sabi River; 364 Crocodile River; 150 Levubu River; seasonal rivers and dams 40).

SUB-ORDER — RUMINANTIA.

Family — GIRAFFIDAE.

Giraffa camelopardalis wardi Lydekker.

Giraffe.

At the time of proclamation of the old Sabi and Shingwidzi Reserves the position of the giraffe population in the Lowveld was critical. Not more than 15 survived in the Sabi Reserve and north of the Olifants River their number was even more deplorable.

Absolute protection in the Reserves however, soon paid handsome dividends, in the area south of the Olifants River particularly. In 1911 they were frequently encountered along the Timbavati and Olifants Rivers and the number south of the Sabi had increased to about 30 or 40. By 1912 giraffe had already recolonized the area along the present western boundary between the Olifants and Nwaswitsontso Rivers. In 1918 the number in the Sabi Reserve were estimated at 150 and in 1938 the Warden considered the whole Park to contain some 200 of these animals. The annual reports of the

Warden since that period make general mention of a rapid progress and population growth.

The area between the Olifants and Sabi Rivers had always been the centre of population density, and radiation and population dissemination occurred from here. The Pretoriuskop long grass veld was first re-entered by giraffe in 1933. By this time the Olifants River had also been crossed and in 1953 the Letaba River was also forded for the first time from the south.

The group along the eastern boundary north of the Shingwidzi River which had always been there, seemed to have been overlooked or forgotten for a considerable period, but in 1925 it was reported that they were also slowly increasing in numbers.

The present distribution of giraffe in the Kruger Park is depicted in fig. xvi. It is obvious that the central district is still the dominant giraffe habitat in the Park. A limiting factor which stifles population growth north of the Olifants River is the relative scarcity of fodder trees (particularly *Acacia* spp.) in this area.

Feeding habits: Delicate high browsing. Have on occasion been recorded to take grass (*Bothriochloa insculpta*).

Breeding: Calves are born singly at any time throughout the year with a peak period during September-October and again in February-April. Twins have been recorded.

Latest estimation of numbers: 2,850 (2,200 in the central district and 400 in the southern district).

Family — BOVIDAE.

Cephalophus natalensis amoenus Wroughton.

Natal or Red duiker.

The status of these tiny buck in the Kruger National Park is doubtful at present. A large portion of their chosen habitat (forest-clad mountain slopes and ravines) in the Boulders block was excised from the Park by the western boundary fence in 1960, west of the Nsikazi-Crocodile River junction. There are still a few in the densely wooded kloofs of Numbi hill but their numbers will have to be augmented to ensure survival in this area. (Vide fig. xvii).

Feeding habits: Delicate low browsing in thickly wooded areas.

Breeding: No records in the Park. Lambing season October-November (Asdell, 1946).

Latest estimation of numbers: Doubtful.

Sylvicapra grimmia caffra Fitzinger.

Common or grey duiker.

Generally distributed throughout the Park but relatively more abundant in the Punda Milia sandveld, the Nyandu bush, the western boundary area of Tshokwane section, the Pretoriuskop area and the Sabi River belt. (Fig. xviii).