Skinner JD, Smithers RHN. 1990. Family Felidae - Cats. In: The mammals of the Southern African Subregion. 2 ed. University of Pretoria; p 391-423.

Abstract: The book chapter gives taxonomic notes, morphological description, and information about the distribution, habitat, and behaviour of 6 cats of the Southern African sub-region. In Namibia the cheetah occurred widely but sparsely throughout, even occasionally as far south as the Orange River mouth. In Botswana they have a wide distribution, exempt in the extreme southeast. In Zimbabwe they are absent from the northeast, which corresponds with their absence in parts of the Tete District of Mozambique and southern Malawi. They occur in Mozambique, south of the Zambezi River, only being absent from the south and southeast. They occur sporadically in the northern parts of the Cape Province, in the Kalahari Gemsbok National Park and in parts of the north-western, northern and eastern Transvaal to the southern border of the Kruger National Park. In Natal they were exterminated by the 1930s, but stock from Namibia was re-introduced to Hluhluwe, Umfolozi and Mkuze Game Reserves in 1965, and in 1978 to the eastern shores of Lake St. Lucia.

# THE
# MAMMALS
## OF THE
# SOUTHERN AFRICAN
# SUBREGION

BY

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her older offspring and central immigrant males in the vicinity of the den, other members of the clan being chased off.

Siblicidal aggression is common among raptors (Gargett, 1990), but Frank & Glickman (1989) have shown that twin spotted hyaena neonates start fighting immediately after birth and when twins are of the same sex, one invariably dies. The precocial cubs are born with deciduous canines and incisors fully erupted and locomotion, orientation and aggressive behaviours are well developed. Aggression continues for several weeks, coincident with elevated androgen secretion in cubs of both sexes. When the mother has access she intervenes. Hofer & East (1989a) found that in the wild mass of cubs of the same cohort could vary by as much as 30–50%. They showed that a twin may benefit from siblicide due to increased growth rate and some mothers may bias their reproductive effort towards daughters.

Social rank of mothers resulted in differences in maternal care in two ways (Hofer & East, 1989b). Those from high ranking females received meat at an earlier age and the proportion of meat was greater for the former. Secondly, high ranking mothers spent less time away from their cubs, feeding on prey nearer the den and usually returning to it daily.

When more than two cubs are found in a den, they are usually the progeny of more than one female. Kruuk (1972a) counted up to 20. The adults seldom enter the dens, but may lie near the entrances, the females suckling their cubs in this situation. Spotted hyaena cubs are permitted to suckle from only their own mothers and attempts to do so from other females are usually repulsed. However, Knight, van Jaarsveld & Mills (unpubl.) recorded that mutual suckling occurred when an intense drought resulted in increased cub mortalities in the Kalahari. Investment in lactation is high in spotted hyaenas and the cubs are suckled for nine to 15 months, being dependent on the female for this period. Cubs have an amazing capacity to consume milk, one cub being observed to suckle for five hours in one bout (East, 1989). In the Serengeti where prey migrates, mothers may be away for up to five days during which time cubs receive no nourishment and no water. They rarely waste energy on play and on cold nights huddle to conserve energy. Under these con-

ditions, mortality may be high and it is the male cub of a twin who dies first.

The average period of den occupancy averaged only 1.5 months in the Kalahari compared to over six months, even several years at a den in the Kruger National Park (Mills, 1990). Vacating a den seems to be related to infestation by fleas.

By the age of two months the cubs' heads are light grey and by about four months the spotting can be discerned on their flanks. The cubs are very playful, running and chasing each other and pestering the adults by climbing over them and biting. Scent-marking starts when the cubs are about four to six weeks old, although their scent glands are still inactive at this stage (Apps, unpubl. obs.). When the cubs are a few months old, they start to follow the mother for gradually increasing distances in the hunt. They do not actually join in the kill until they are nearly full grown.

The resemblance between the external genitalia of male and female spotted hyaenas has been the subject of discussion since the time of Aristotle (384–322 B.C.). Female spotted hyaenas mimic the males in the possession of a penis-like and highly erectile clitoris and a false scrotum and this has given rise to the erroneous supposition that they are hermaphrodites. This phenomenon is not restricted to spotted hyaenas, but is also seen in female spider monkeys, Ateles sp, and squirrel monkeys, Saimiri sp. Both adult male and female spotted hyaenas frequently fully erect their penis and clitoris respectively as it forms an integral part of the elaborate meeting ceremonies between pairs of natal clan members (Kruuk, 1972a; Hamilton, Tilson & Frank, 1985; Henschel & Skinner, 1987). Lindeque & Skinner (1982a) suggested that the masculinisation of the genital tubercle of female spotted hyaena foetuses results, as in the male, from an episode of androgen secretion by the foetal gonad. Adult males and females have similar androgen levels (Racey & Skinner, 1979; Lindeque, 1981) which seem to indicate that males have suppressed androgen levels (van Jaarsveld & Skinner, 1987). On the other hand, young females are exposed to high levels of androgens, a character usually associated with dominance and aggression. This probably explains the dominance of females over males (Glickman et al., 1987). Females have one pair of abdominal mammae.

# XXXI. Family FELIDAE

## Cats

## Subfamily FELINAE

This family comprises a single Subfamily of living forms, the Felinae, and two or more Subfamilies of fossil genera. The Felinae is a well-defined and homogeneous group represented in the Subregion by three genera and eight species. This includes one introduced species, the domestic cat, Felis catus, which has become feral in many parts of the Subregion. They cross freely with the indigenous wild cat, Felis lybica.

Often cats are considered to be the most typical carnivores. All of them have a preference for flesh, although the smaller species can subsist on an insectivorous diet when flesh is not available. They are adept stalkers and killers, their teeth admirably adapted to delivering the killing bite and to slicing food into chunks of a size suitable for swallowing. Their sharp curved claws, sheathed in most species when not in use, hold struggling prey until the killing bite can be delivered. The claws are protractile rather than retractable, for their normal position, with the muscles at rest, is retracted within the sheaths, the action of the ligaments being to extend them when they are required (Fig. XXXI.1). The cheetah is the exception for, although the

claws can be extended, they do not retract into sheaths and remain exposed.

Hallmarks of members of the Subfamily are the conspicuous upstanding ears, rounded head, well developed long vibrissae, large eyes, muscular, lithe bodies and the soft padded feet with hair between the pads. The tails vary in length in different members, but in all of them express their mood. All members have five digits on the front and four digits on the hind feet.

In the skull the zygomatic arches are bowed outwards to accommodate the powerful muscles which actuate the lower jaw and are heavily built for the anchoring of muscle.

The dental formula is:

$$I\frac{3}{3} \ C\frac{1}{1} \ P\frac{2-3}{2} \ M\frac{1}{1} = 30$$

The incisor teeth lie in a straight row. The fourth upper premolar, the carnassial, is the largest tooth; the first molar in the lower jaw, the second member of the carnassial shear, has a wide open V-shaped occlusal surface, the function of which is to help prevent tough food sliding out of the slicing apparatus. The cheekteeth are all laterally compressed and adapted to slicing rather than crushing. The upper molar tooth is always small, its long axis set at right angles to the
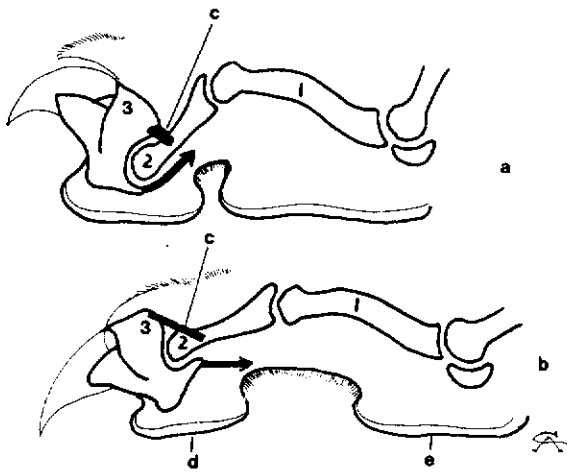
Fig. XXXI.1. Claw mechanism in Felidae
(a) at rest: claw in retracted position, whole digit flexed.
(b) claw in use: contraction of muscle in direction
protracts the claw, whole digit extended.
(c) retractor ligament (d) digital pad (e) carpal pad
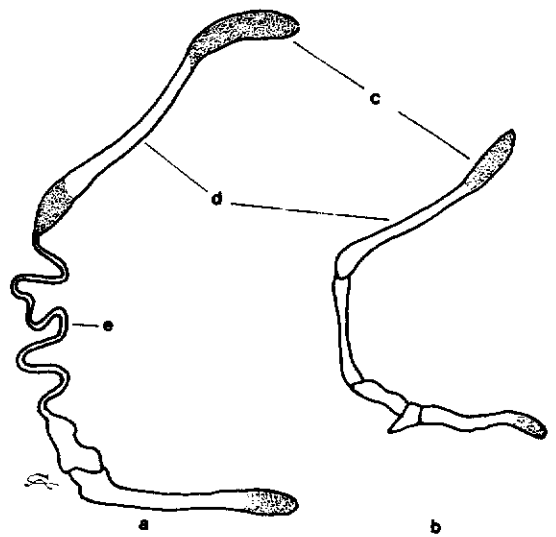1, 2, 3 phalanges (after Ewer, 1973).



Fig. XXXI.2. Suspensorium (hyoidean apparatus):
in members of the genus
(a) *Panthera* (b) *Felis* (c) cartilage (d) bone
(e) elastic cartilage (after Pocock, 1939)

toothrow. When in use it occludes on the posterior part of the lower molar.

Although the felids are not a large Family, they are well represented in the fossil record in Africa, although the most primitive forms are recorded from Europe. In Africa *Afro-similis africanus* is recorded from early Miocene beds in East Africa. The true sabre-toothed cats of the Subfamily Machairodontinae occur in Pliocene and Pleistocene beds in Africa. Hendey (1974) recorded a good specimen from Langebaanweg, Cape Province, and other genera are recorded from this site, as well as Makapansgat and Kromdraai, in the Transvaal.

Among the extant species the lion, *Panthera leo*, is represented in early Pleistocene beds in the Subregion. The genus *Felis* is rare in these beds, but well represented in the middle and later Pleistocene Epoch. The cheetah, *Acinonyx jubatus*, is first known from fossil remains from Bulawayo, Zimbabwe in late Pleistocene beds dated about one million years old.

Key to the genera (Meester *et al.*, 1986)

1. Claws not retractable into sheaths; body with solid black spots; black line from inner corner of eye, down side of nose to upper lip; face short; skull arched in profile, short and high, total skull length 146–203 mm; legs long
   ... *Acinonyx*

   Claws retract into sheaths; body unicoloured or with rosettes or bars as well as spots, or indistinctly marked bars and spots; no black line from inner corner of eye to upper lip; skull less arched in profile
   ... 2

2. Hyoid apparatus modified by conversion of median part of suspensorium into a long, elastic tendon; size large, total skull length in adults 175 mm or more
   ... *Panthera*

   Hyoid apparatus of normal mammalian type, suspensorium a chain of bones joined end to end; size smaller, total skull length in adults not exceeding 155 mm
   ... *Felis*

## Genus *Acinonyx* Brookes, 1828

Rosevear (1974) stated that the generic name *Acinonyx* is probably derived from the Greek *akaina*, a thorn, and *onyx*, a claw, referring to the foot with its unsheathed claws. It has been suggested that its origin lies in the Greek prefix *a-* signifying deprivation of, and *kineo*, to move, in reference to the commonly held, but mistaken, belief that the claws are

incapable of retraction. The specific name *jubatus* is derived from the Latin, having a crest or mane, which refers to their nuchal crest of long hair.

The genus is monospecific, the cheetah, *A. jubatus*, now recognised as the only species occurring throughout its wide distributional range which extends from Africa to parts of the Middle East.

The fossil record shows that the giant cheetah, *Acinonyx pardinensis*, occurred in Europe during the Villafranchian period some 3,8 to 1,9 million years ago. During the early Pleistocene Epoch a smaller species, *A. intermedius*, had a distributional range that extended eastwards to China and by the late Pleistocene Epoch some 700 000 years ago fossil remains reveal that the cheetah then living was indistinguishable from the cheetah we know today.

The early historical records of the occurrence of cheetahs in the Cape Province are vague and unclear about their former distribution. Backhouse (1844) recorded their spoor at Goodhouse on the Orange River, which he visited in 1840, but never saw one himself although they were reported locally to be common (Skead, 1980). Nearly a century later, Shortridge (1942) did not see cheetahs in this area but it was reported to him that a few were to be found in the Bushmanland and Kenhardt districts and that possibly they might survive in the Richtersveld and along the Orange River opposite Goodhouse. In recent times, five were shot on the golf course at Oranjemund 3 km from the Orange River mouth in 1965 (Sweatman, pers. comm.).

Further to the southeast, Jackson (1919) reported on five cheetahs being killed in the Beaufort West district in the 1860's. The Zoological Society of London purchased from Mr Arthur Mosenthal a young live male aberrant cheetah which originated from the Beaufort West area, which lived in the Zoological Gardens for many years (Sclater, 1877). On its death the skin and skull were preserved and are now in the collection of the British Museum (Nat. Hist.), London. This was named the "woolly cheetah", *Felis lanea*, as its fur was more woolly and dense than the cheetah and it had shorter, stouter limbs. Its body was covered with fulvous blotches, not black as in the cheetah, and it had no characteristic black marking between the eye and the mouth.

Pocock (1927) described what he believed to be a unique African species from Zimbabwe, *A. rex*, in which many of the spots on the upper parts of the body and on the flanks had coalesced into bars (Fig. 247.1). Pocock (1939) subsequently stated that this was simply an individual aberration of the normal *A. jubatus*.

No. 247

## *Acinonyx jubatus*  (Schreber, 1775)

# Cheetah
# Jagluiperd

Plate 19

## Colloquial Name
The name cheetah is derived from the Hindu *chita*.

## Taxonomic Notes
Originally described from a specimen from southern Africa, Allen (1939) listed seven subspecies from the continent of which five generally are recognised (Smithers, 1975b). Only one occurs in the Subregion, *A. j. jubatus*. Following their biochemical analyses, O'Brien, Wildt & Bush (1986) concluded that the southern African cheetah population is genetically uniform (monomorphic), which makes them very susceptible to diseases. This, however, requires confirmation.

## Description
Cheetahs are famed as the fastest animals on earth over short distances. They have spotted coats and are tall and slender in form, with long tails. On account of its unique pattern of striped markings, the variant known as the "king cheetah", has attracted considerable attention and at first was known only from skins, and later a number of sightings, the most recent from Tshokwane in the Kruger National Park in 1989 (van Dyk, pers. comm.) and the northern Transvaal where two cubs were captured. All the skins and sightings came from a restricted area in eastern and southeastern Zimbabwe, the northern and eastern Transvaal and eastern Botswana (Hills & Smithers, 1980) (Fig. 247.2). However, between 1980 and 1989, 18 "king cheetahs" have been bred
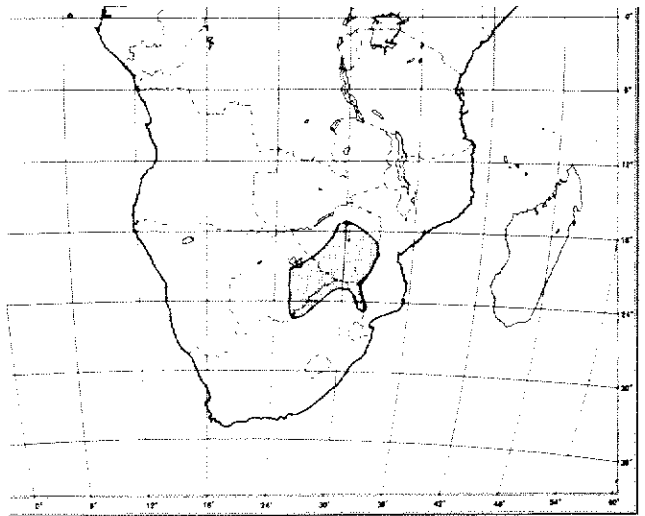


Fig. 247.2. Area within the Southern African Subregion within which there are material and visual records of the "king cheetah".



Fig. 247.3. Photograph of a "king cheetah" born at de Wildt Estates, Transvaal, from a male *A. jubatus* from Messina, Transvaal and a female from Acornhoek, Transvaal. Age 10 months (Photo J.D. Skinner).

at the De Wildt Cheetah Research Centre of the National Zoological Gardens, Pretoria (van Dyk, pers. comm.) and the family trees of nine of these have been reported on by van Aarde & van Dyk (1986) (see Fig.247.3). Their research confirmed that the "king cheetah" merely represents a colour variant of *A. jubatus* and that the "king" trait is inherited as an autosomal recessive allele which probably arose as a mutation at the tabby locus.

The body of the cheetah is slender and is held high off the ground on the long thin legs. Their heads are distinctly rounded, their muzzles very short, the relatively small, rounded ears set widely apart from each other. They have a total length, from the tip of the snout to the end of the tail, of about 2,0 m, the tail about half the length of the head and
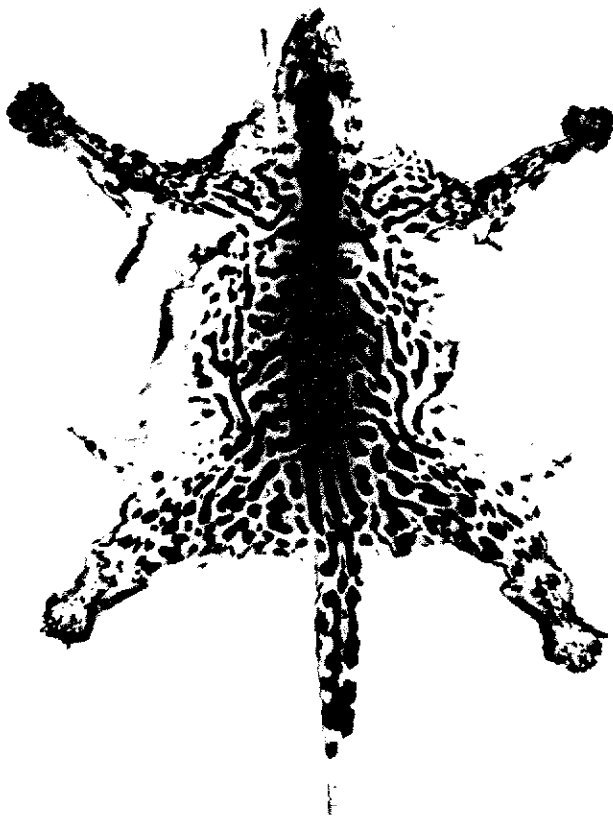


Fig. 247.1. Photograph of the type skin of the "king cheetah", *Acinonyx rex* Pocock, 1927 from Macheke, Zimbabwe. This skin no longer exists (Photo R.H.N. Smithers).

body, and a mass of between 40,0 kg and 60,0 kg (Table 247.1). They stand about 0,8 m at the shoulders, a height accentuated by the erectile crest of hair. The profile of the back is slightly concave, and the hindquarters are lower than the shoulders.

## Table 247.1

Measurements (mm) and mass (kg) of adult cheetahs, *A. jubatus* from Namibia (Labuschagne, 1979)

|  | Males | | | Females | | |
|---|---|---|---|---|---|---|
|  | x̄ | n | Range | x̄ | n | Range |
| TL | 2060 | 7 | 1910–2210 | 1900 | 6 | 1840–1960 |
| T | 717 | 7 | 650–760 | 667 | 6 | 630–690 |
| E | 75 | 7 | 75 | 75 | 6 | 75 |
| Sh.ht | 881 | 7 | 830–940 | 847 | 6 | 790–940 |
| Mass | 53,9 | 7 | 39,0–59,0 | 43,0 | 6 | 36,0–48,0 |

The pelage is distinctive; the background of the upper parts and flanks is buffy-white, darker along the mid-back, and is covered with numerous jet black, round or slightly oval spots. The chin, throat and posterior parts of the belly are white, the chest and anterior part of the belly spotted. The distal parts of the tail are spotted, the spots tending to coalesce into black rings. Towards the tip of the tail, which is white, there are two or three black rings. The under surface of the tail is white, except where crossed by the black rings. The front limbs are spotted on the insides and outsides, the hind feet from the ankles to the toes devoid of spots. The top of the head and the cheeks are finely spotted and they have a characteristic black band or "tear mark" curving downwards from the inner corners of the eyes to the corners of the mouth, and white marks above and under the eyes. The pupils of the eyes are round.

The pelage is slightly harsh, the hair short. In the "king" form it is slightly longer and distinctly silkier. They have an erectile crest of greyish hair up to 70 mm long on the nape of the neck and shoulders, which in some individuals continues down the mid-back for varying distances. In some individuals it is hardly noticeable, being poorly developed. The underfur may be sparse in some individuals, abundant in others, in the latter case sometimes dominating the pelage, which may be a factor of age or season.

They have long legs and five digits on the front feet and four on the hind, the first digits on the front feet set well back from the other four and not marking in the spoor (Fig. 247.4).

## Skull (Fig. 247.5)

The high domed skull of the cheetah is characteristic, reflecting the rounded head of the live individual. In profile it is highest at the level of the middle of the eye orbits, sloping abruptly both forward to the nasals and back to the supraoccipital crest. The braincase is rounded, the sagittal crest confined to its posterior part, where it rises abruptly from the surface of the braincase to a height, in old specimens, of up to about 10 mm, where it joins the well developed back-sloping supraoccipital crest. Forward across the top of the braincase the sagittal crest is less in evidence, dividing into two low ridges to end on the postorbital processes, which are incomplete. The top of the skull between the post-orbital processes is flat and very broad, the rostrum short and wide. The nasal openings are very large, facilitating the rapid intake of air required after extreme exertion. The zygomatic arches are broad in the front, narrower behind, relatively lightly built and widen out posteriorly. Unlike other felids, they are distinctly upcurved when viewed from the side. The mandible is relatively lightly built, the coronoid high and narrow.

The dental formula is:

$$I\frac{3}{3} C\frac{1}{1} P\frac{3}{2} M\frac{1}{1} = 30$$

The second upper premolar, the first in the series of those present, is missing in some individuals. The outer upper incisor is slightly enlarged, but all these teeth are small and poorly developed. The canines are short, sharp and rounded. In the fourth upper premolar, the upper section of the carnassial shear, the antero-internal cusp, which is well developed in other felids, is represented, at most, by a small knob which occludes between the fourth premolar and first
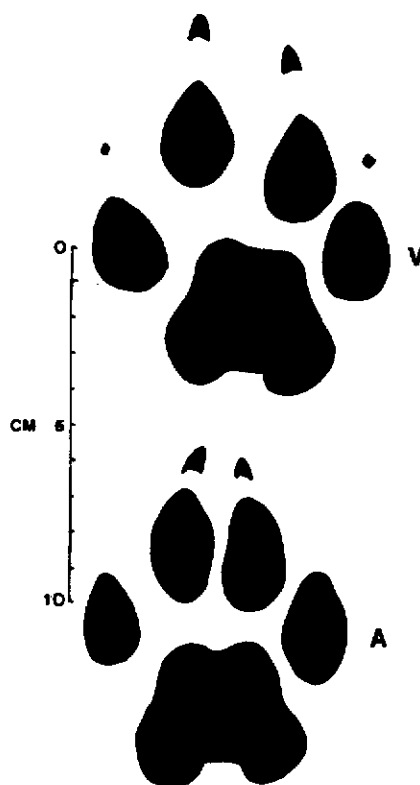


Fig. 247.4. Spoor: cheetah, *A. jubatus*.
F. Right forefoot H. Right hind foot.

molar of the mandible. Its reduction allows the jaws to close tightly. The cheekteeth are all adapted to slicing. The canines do not require to be long as their function in the killing bite is to hold the prey by the throat, while strangulation proceeds. Unlike some other felids, they do not use these for severing the spinal cord at the nape of the neck. It has been said that the cheetah's throat bite is designed to sever the jugular vein of its prey, but examination of kills does not confirm this.

## Distribution

The distribution of the cheetah has been modified greatly over historical times by modern man's colonisation of the African Continent. The demand for skins and an over-emphasis on their predatory habits on domestic stock have led to a shrinking in their distributional range and their disappearance from very large areas of the continent. In addition, material records are few, as skins are traded rather than passing to museum collections.

Outside the continent they are still found in the northern parts of the Arabian Peninsula (Harrison, 1968), in Iraq, Iran and east of the Caspian Sea to Afghanistan and Baluchistan. At one time widespread in India, they became extinct by 1952, as they are in the countries immediately bordering the eastern Mediterranean.

### North Africa and the Sahara

They are recorded from the following Saharan massifs: Ahaggar in southeastern **Algeria**; Adrar des Fores on the borders of Algeria with **Mali** and Aïr in northwestern **Niger**. In Libya, until 1969, they were still found sparsely throughout, except in the extreme south and southeast.

### South of the Sahara, excluding the Southern African Subregion

In West Africa their optimum habitat is found in the Sahel and Sudan zones, with seasonal occurrences marginally into the Guinea Savanna during the dry season, after the grass is burnt. Although there are very few material records, it is likely that they occur from southwestern **Mauritania** through to **Chad**. In the central and southern parts of the **Sudan** there is a specimen from the El Duiem. They occur in **Ethiopia, Somalia** and in the extreme southeast of **Uganda**.
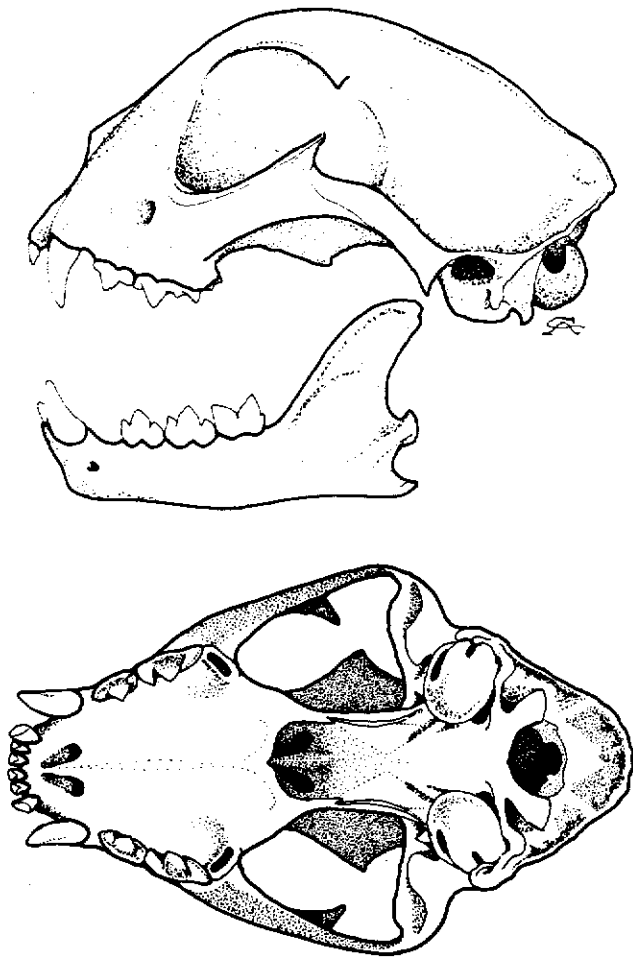
Fig. 247.5 Skull: cheetah, *A. jubatus*
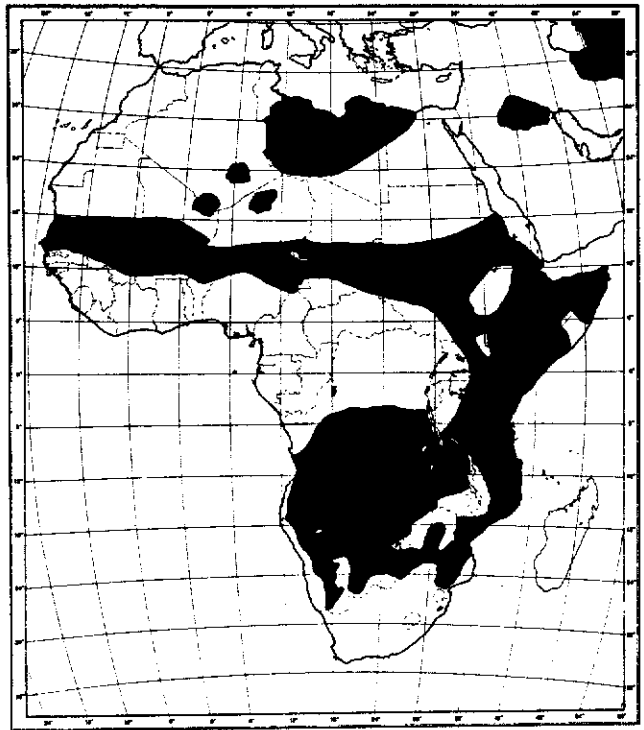TL skull 175 mm



They are distributed widely in **Kenya**, although absent in parts of the west and coastally. There are no records for northwestern **Tanzania**, although otherwise they have a wide distribution. They occur in southern and southeastern **Zaire**, and in the central and southern parts of **Angola**. They are widespread in **Zambia**, excluding the Zambezi Valley and parts of the Eastern Province. They occur in **Malawi** in reserves in the Central and Northern Provinces. There are scattered records from the central and eastern parts of **Mozambique**, north of the Zambezi River.

*Southern African Subregion*

In **Namibia** they occur widely but sparsely throughout, even occasionally as far south as the Orange River mouth. In **Botswana** they have a wide distribution, except in the extreme southeast. In **Zimbabwe** they are absent from the northeast, which corresponds with their absence in parts of the Tete District of Mozambique and southern Malawi. They occur in **Mozambique**, south of the Zambezi River, only being absent from the south and southeast. They occur sporadically in the northern parts of **the Cape Province**, in the Kalahari Gemsbok National Park and in parts of the northwestern, northern and eastern **Transvaal** to the southern border of the Kruger National Park. In **Natal** they were exterminated by the 1930's, but stock from Namibia was reintroduced to Hluhluwe, Umfolozi and Mkuze Game Reserves in 1965, and in 1978 to the eastern shores of Lake St. Lucia.

**Habitat**

In general cheetahs are believed to be animals which frequent open plains, which is probably brought about by their being depicted so often in film or seen in this type of habitat. However, they are just as at home in savanna woodland, an association in which they occur throughout a great part of their distributional range. In the southern part of Africa in the past they occurred both in the South West Arid and the Southern Savanna zones in parts of which, in fact, they are still found. They can in addition utilise the fringes of desert, as can be seen by their occurrence in the pro-Namib of Namibia. They do not occur in forest or in woodland, with a thick underbush or tall grass cover, although they will use this for shelter.

While they will drink when water is available, its presence is not an essential habitat requirement. In southern Botswana it may be available to them only seasonally for limited periods. They rely on their prey for their moisture requirements.

**Habits**

Cheetahs are predominantly diurnal, with peaks of activity around sunrise and sunset. Pettifer (1981b) noted that in cold weather they sun themselves in the early morning, moving later than in warm weather. During the hottest hours of the day they lie up in the shade, choosing an elevated resting place from which a clear view of the surrounding terrain is obtained.

In Botswana, Smithers (1971) recorded that over half his observations were of two's or family parties of three or four, with fewer solitary individuals. As the cubs remain with the female for almost a year, usually one is seeing a family party. However, males form bachelor groups of up to four or five, with strong cohesion between members. Pettifer (1981b) noted that, in a group of three males released in a natural area, when one got injured, the group remained together without food for a period of 11 days. Each member of this group took turns in leading the group and selecting the prey when hunting.

Where a female is accompanied by cubs these are always of one litter, for before she produces another litter, members of the former litter disperse, siblings often remaining together for a time thereafter. Males do not accompany these family groups, only joining the females when they are in oestrus.

Cheetahs have very large home ranges. In the eastern Transvaal, Pettifer (1981a) recorded a mean area of 76,6 km² (range 69,5–85,9) for three females and 48,8 km² for two males, excluding random excursions far outside these areas. In Namibia, Morsbach (in Stuart & Wilson, 1988) gave a mean of 1 500 km² for females and 800 km² for males. Their home ranges overlap to a considerable extent and within them they have a preferred area to which they will return. The selection of resting or sleeping sites within the home range is opportunistic, but these are chosen to offer a clear view of the surrounding area.

Males are apparently not territorial and may move over areas held by several females (Morsbach, in Stuart & Wilson, 1988), and Labuschagne (1979) also mentions nomads which ignore boundary markings of resident cheetahs. Pettifer (1981a) noted that, when he introduced three strange male cheetahs to a natural area where cheetahs were resident, aggressive encounters took place, suggesting territorial tendencies. On the other hand, cheetahs are assiduous urine and faecal markers, the urine-marking effective up to periods of about 24 hours, and is carried out only by the males. Male urine marks are examined assiduously by members of other groups and the area avoided. This mechanism allows another group, after about 24 hours, to use the same ground previously used by the other. The female urine has no territorial significance, although when they are in oestrus it attracts males. Where groups do contact each other, while there may be some threatening behaviour, with the ears drawn back, the head held low and the mouth open, usually nothing more serious develops. Males may fight over a female in oestrus, when deaths of combatants have been recorded. In such encounters individuals slap each other with a downward motion of one or both front paws and biting ensues.

Cheetahs are terrestrial and ill-adapted to climbing, but do make use of trees with stout sloping trunks or branches on which to rest, using them as observation posts. Their normal method of locomotion is a slow, stately walk from which, if disturbed, they may break into a fast gallop in which they do not exert themselves to the extent witnessed in the final spurt to catch prey. They are averse to swimming.

Cheetahs chirrup when excited or when they meet members of their own group. A female may also use this vocalization to contact scattered cubs. This call is bird-like and can be heard over several hundred metres and may be accompanied by a soft chirr (Schaller, 1972b). They purr loudly when content, and in threatening, may growl, snarl, hiss or cough. Schaller described how, when they are approached by another predator at a kill, they may moan, which he interpreted as a threat, and they will bleat when lost or pursued.

Cheetahs can attain a speed of 74 km per hour when fully extended (Bigalke, 1964). This is faster than the best greyhound and twice the speed attainable by man. Such speeds can be maintained only for short distances of up to 300 m and are employed only in the final sprint to catch prey, after which they tire and give up if unsuccessful. It has been known for a long time that, given the right terrain, a cheetah can be run down by a man on horseback, as it cannot maintain its speed over long distances.

## Food

Pettifer (1981a) found that a group of three male captive-bred and reared cheetahs released in a natural area in the Transvaal, hunted as a group only when they were hunting large species such as giraffe and waterbuck, although simultaneous hunts of smaller species would take place, resulting in two cheetah killing two impala. Not all hunts are successful. Pettifer (1981a) recorded that of 97 hunting attempts on impala, only nine succeeded, although five out of 12 hunts on young giraffe were successful. The cheetahs usually ignored giraffe unless they were accompanied by calves, when one of the group would chase the giraffe group, the other two attacking a selected calf. One would hook its dew claws into the giraffe, while the other attacked it high up on the shoulder, bringing it to the ground. One or both would then take a strangle-hold on its throat. This behaviour has not been observed in wild cheetahs which apparently are not taught by their mothers to hunt giraffe.

In open country cheetahs may simply walk up to the prey, pausing motionless from time to time if the prey shows anxiety. In woodland or scrub country, cover may be used for concealment in stalking. Cheetahs prefer to attack stragglers around the fringes of the herd and, if the selected prey mingles with a large herd, they frequently abandon the chase. Cheetahs approach to about 100 m, and the chase after small bovids starts if the prey takes fright and runs off, whereupon cheetahs give chase, maintaining maximum speed for about 300–400 m. If they catch up with the prey, one of the cheetahs slaps it with one or both of the front

limbs, using the dew claws to secure a hold and so throwing the prey off balance, when it is seized by the throat. The kill takes time to achieve, as it is a process of strangulation. After killing, the prey may either be eaten *in situ* or dragged to shelter to be consumed. Some time may elapse before the exhausted cheetah starts to feed. Cheetahs feed rapidly, keeping a careful watch, probably because other predators frequently drive them off their kills.

They usually eat the meat off the ventral surface first, then the liver and the heart, but most of the intestines are dragged out and discarded. Unless the prey is very small the bones and most of the skin are left at the end of the meal, an adult impala looking like a fully articulated skeleton with parts of the skin and most of the ribs remaining. However, with a 29,5 kg baboon the pattern was different, the whole vertebral column and ribs being eaten (Brain, 1981).

The principal prey consists of any medium-sized or small bovids or the young of larger bovids; prey with masses of up to about 60 kg are favoured. In addition they take a wide range of ground-living birds and small mammals including guineafowl, bustards, hares and porcupines. Pienaar (1969b) and Wrogemann (1975) included ostriches.

In the Transvaal Lowveld, impala and reedbuck are taken, together with waterbuck, kudu and tsessebe (Pienaar, 1969b, Pettifer, 1981a). In Botswana, in the drier areas, springbok and springhaas figure highly in their diet and, where impala replace springbok in the northeastern sector, they were the principal food (Smithers, 1971). Even with smaller species such as blesbok they prefer to tackle the smaller herds (Pettifer, 1981a). Cheetahs are injured often in their attempts to tackle large species such as wildebeest, zebra and buffalo (Pettifer, 1981b). Cheetahs will also scavenge on ungulate carcasses (Pienaar, 1969b; Richardson, 1980).

In common with lions and domestic cats, cheetahs may suffer from an essential fatty acid deficiency, which Davidson, Cantrill & Varaday (1986) found could be cured by augmenting their diet with natural oils.

## Reproduction

In the wild cheetahs are not restricted to a breeding season (Labuschagne, 1979; Pettifer, 1981b) and young are born at any time throughout the year. If a female loses a litter it has been found she may mate again and successfully rear the next litter (Wrogemann, 1975). The courtship of cheetahs is a subtle and complex process. Although much still remains to be learnt, the pioneering work of Meltzer (1988), has contributed substantially to our knowledge. When the female is non-receptive, she is aggressive towards males that approach her, swatting at them, and uttering a stuttering call which may be answered by the males. Wrogemann (1975) provided a broad outline of the processes in operation around the time that the female comes into oestrus. In the wild, more often than not, this is the only time that the females associate with other adult cheetahs. During pro-oestrus, a male may approach her close enough to test her reproductive condition by smelling her vagina, and may, when thoroughly excited, mock charge the female which will reciprocate. At this stage copious urine spraying on the part of the male may occur, which also engages, more frequently than normally, in scraping up small mounds of earth with his back legs and urinating or defecating on top of them. After about seven to 14 days of this initial period, the female comes into oestrus and is receptive, and male inter-aggression reaches a peak. The female cheetah in oestrus induces copulation by lordosis and the male approaches her from behind. In the wild oestrus seldom lasts more than two days (Pettifer, 1981b).

It has been found that to stimulate breeding in captivity the males and females should be kept separate throughout the year and, when a female comes into oestrus, a male should be given access to her.

Pseudo pregnancies are known in captive cheetahs, the females after the 90–95 days of gestation period showing slight lateral swellings and discharge from the vagina and they may actually go into labour without being pregnant. Much remains to be learnt about this anomaly.

Cubs are born in the shelter of tall grass or in underbush and are hidden very cunningly. Litters number an average of four

(range 3–6, n=8) (Pettifer, 1981b). Sixty-seven litters born in captivity had a mean of 3,43 cubs (S.D. 1,3; range 1–8). Of the 230 cubs in the litters, 99 were male and 94 female, the other 37 were not identified (Meltzer, pers. comm.). The female eats the afterbirth after removing the foetal membrane with her teeth. With a mass of 250 g to 300 g at birth, the cubs are altricial, born blind and defenceless. Their eyes open on about the 10th to 12th day and are initially dark gold in colour, clearing to light gold as they grow older. By the age of about three weeks they can walk around and at six weeks are capable of following their mother. During the early part of their lives the female frequently moves them to a new hiding place, carrying them one by one by the scruff of the neck. The upper and lower canine teeth erupt at about three weeks and cheetahs are unique among the felids in having three cusps (Broom, 1949). The full set of milk teeth has erupted by the time they are about six weeks old. The milk set is replaced by the permanent set from about eight months old and they are fully equipped with their permanent teeth at nine months old.

The cubs start to wean at about five or six weeks old, when the female allows them to tear at the carcass of her kill which she may drag back to them. They are fully weaned at about three months old. By the age of eight to 12 months old the cubs may initiate hunts and make kills on their own (Eaton, 1970a).

Up to the age of about three months the cub's back is covered with a mantle of long bluish-grey or smoky coloured hair, 70 to 80 mm in length, which conceals the tiny spots on the pelage underneath. This affords them a measure of camouflage in the early stages of their life when they are prone to predation.

When the cubs eventually leave the female they may remain together as a group or move off singly, the break-up of the family being an abrupt transition from family life to independence. The mother thereafter begins to raise another litter (Schaller, 1972b).

The young females do not become sexually mature until they are from 21 to 24 months old.

## Genus *Panthera* Oken, 1816

The name *Panthera* was first proposed by Oken (1816), but in 1956 the International Commission on Zoological Nomenclature rejected this name. However, mammalogists have continued to use it and now any other name would create confusion. Therefore, Morrison-Scott (1965) proposed the retention of *Panthera* which has led to differences of opinion amongst taxonomists, but it remains in use.

The two great African cats occurring in the Subregion, the lion, *Panthera leo*, and the leopard, *P. pardus*, differ from representatives of the genera *Felis* and *Acinonyx* in a character of the hyoidean apparatus. This apparatus consists of a chain of small bones, called collectively the suspensorium which passes from the ear bullae on either side to further small bones at the root of the tongue and encloses the top of the windpipe. In most cats the suspensorium, except at its cartilaginous extremities, is fully ossified and thus the larynx is held firmly to the base of the skull and limited in its movement. In *Panthera*, however, the suspensorium remains unossified and elastic, allowing the larynx freedom of movement. The result is that members of the genus *Panthera* can vocalise much more loudly than members of the other two genera (Fig. XXXI.2).

Key to the species (Meester et al., 1986)
1. Body with distinct rosettes or spots; no tuft on end of tail; males without mane; smaller, total skull length about 175–260 mm; sagittal crest, mastoid process and paroccipital process not prominent
... *pardus*

Body unicoloured, lacking spots or rosettes; end of tail tufted, males normally with mane on head and neck; larger, total skull length 250–460 mm; sagittal crest, mastoid process and paroccipital process prominent
... *leo*

No. 248
# *Panthera pardus* (Linnaeus, 1758)

## Leopard
## Luiperd
Plate 19

### Colloquial Name
The name is derived from the Greek name for a leopard, *panther.*

### Taxonomic Notes
Smithers (1971) listed 13 subspecies from the continent of Africa, only one, *P. p. melanotica* (Günther, 1885) occurring in the Subregion. Dobroruka (1966) regarded it as a melanistic mutation, not a subspecies. This is unfortunate as the type is a melanistic form which was collected in the Grahamstown district of the Cape Province. However, it antedates *P. p. shortridgei* Pocock, 1932 by some 14 years. The great variation in colour aberrations and markings of leopards has long been recognised. Sportsmen assert that the woodland leopard is small and dark compared with its larger counterpart from more open country, but it is difficult to judge the validity of these arguments, because size is affected by nutrition.

### Description
The largest spotted cat in Africa hardly requires description. Measurements of skins cannot be used as a criterion of size as they can be manipulated in processing to far exceed the size of the live individual. The largest leopard so far measured in the flesh was 2,92 m from tip of snout to tip of tail (Best & Best, 1977) and any individual over 2,3 m can be accounted as very large. The average mass for a fully grown male is about 60 kg, and for a female about 32 kg (Table 248.1).

No two leopards are alike, either in the markings or the ground colour, but in general they tend to have black spots on the limbs, flanks, hindquarters and head, with rosettes on the remainder of the body. These rosettes take an infinite variety of forms, but generally consist of a broken circle of irregular, roughly circular pattern of black, which may enclose a black spot or spots. An example of the variation that is found is illustrated by eight adult skins in Allen (1922–1925).

The tail, which is over half the length of the head and body, is spotted or rosetted on top and, corresponding with the lighter colour of the under parts of the body, lighter in colour underneath, usually white or off-white. The guard hair is shortest on the face and head where it is a bare 3–4 mm long, about 10 mm on the top of the shoulders and 15 mm on the hindquarters. Increasing in length on the flanks, it may reach a length of 25–30 mm on the under parts. On the back it has a harsh feel, but the hair on the under parts is silky and softer. The light-coloured hair on the under parts of the tail may reach a length of 30 mm and is particularly thick and woolly towards the black tip. The underfur is dense and slightly shorter than the guard hair; the individual hairs are fine and wavy.

Leopards, like all cats, have five digits on the front feet and four on the hind which are equipped with strong, very sharp, curved claws, protractile at will (Fig. XXXI.1) and which, in a medium-sized specimen, measure up to 30 mm across the curve. The claw of the first digit on the front feet, the dew claw, lies to the back of the plantar pad, and is put to good use in holding large prey. The claws and first digits on the front feet do not mark in the spoor (Fig. 248.1).

The rounded ears appear small for the size of the individual, the insides with a profuse covering of long, fine, light coloured hair. The white whiskers are particularly long and there are usually two or three extra long hairs in the
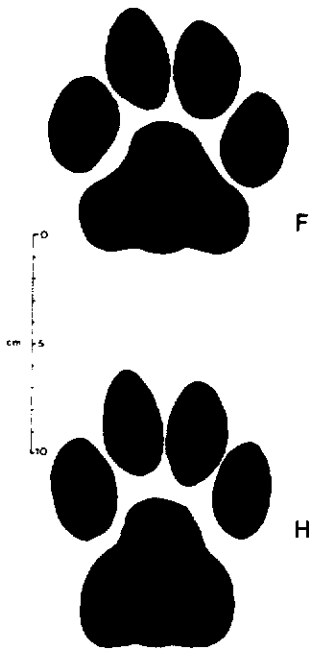
Fig. 248.1. Spoor: leopard, P. pardus.
F. Right forefoot H. Right hind foot.

eyebrows, both features serving to assist the individual in avoiding obstructions when moving in the darkness.

## Table 248.1

Overall measurements (mm) and mass (kg) of leopards, P. pardus, (a) taken on safari hunts at Matetsi, Zimbabwe (P. Johnstone, in litt.), (b) captured during an ecological research project in the Waterberg, Transvaal (Grimbeek, pers. comm.) and (c) a series from the Cape Province (Stuart, 1981)

(a)

|  | Males | | | Females | | |
|---|---|---|---|---|---|---|
|  | $\bar{x}$ | n | Range | $\bar{x}$ | n | Range |
| TL | 2110 | 13 | 2010–2360 | 1850 | 7 | 1780–1880 |
| Mass | 59,7 | 13 | 51,8–71,3 | 31,5 | 7 | 28,2–34,9 |

(b)

|  | | | | | | |
|---|---|---|---|---|---|---|
| Mass | 58,8 | 5 | 52,8–64,1 | 34,9 | 6 | 29,2–41,0 |

(c)

|  | Males | | | Females | | |
|---|---|---|---|---|---|---|
|  | $\bar{x}$ | n | Range | $\bar{x}$ | n | Range |
| TL | (1785) | | | (1707) | | |
| HB | 1107 | 21 | 920–1250 | 1030 | 8 | 950–1050 |
| T | 678 | 20 | 510–800 | 677 | 8 | 640–740 |
| Hf s/u | 219 | 20 | 190–252 | 206 | 7 | 190–220 |
| E | 73 | 20 | 65–100 | 70 | 7 | 65–72 |
| Mass | 30,9 | 27 | 20,0–45,0 | 21,2 | 9 | 17,0–26,0 |
| TL skull | 219 | 21 | 195–248 | 200 | 9 | 190–210 |

## Skull (Fig. 248.2)

Males are generally bigger and heavier than the females and their skulls therefore are correspondingly larger. In addition male skulls have a distinct sagittal crest, represented in females at the maximum development by a low ridge. When viewed from above the postorbital constriction in males is narrower than the interorbital; in females this relationship is reversed.

The whole skull is massively built. The zygomatic arches are broad and heavy, to accommodate the powerful masseter muscles, and swing outward at the back, albeit to a lesser extent than in the smaller felids, to give room for the temporalis muscles which, together with the masseters, provide for the powerful action of the lower jaw. In profile the skull is highest just above the eye orbits, sloping off more sharply to the nasals than to the supraoccipital crest and being much less domed than in the cheetah. The lower jaw is heavily built with a broad high coronoid process giving an ample attachment for the temporalis muscles. The posterior end of the lower jaw is deeply excavated to allow a broad attachment of the masseters. The glenoid articulation allows just sufficient side-to-side action of the lower jaw to ensure the efficient cutting action of the carnassials.

The dental formula is:

$$I_3^3 \ C_1^1 \ P_2^3 \ M_1^1 = 30$$

The upper second premolars, which are absent in some of the smaller felids, are usually present in the leopard. The outer incisors are slightly larger than the remainder. The canines are sharp-pointed, heavily built and slightly flattened on the inner sides. The cheekteeth, which include the carnassials, are clearly adapted to slicing. The upper first molars are tiny and hardly functional.
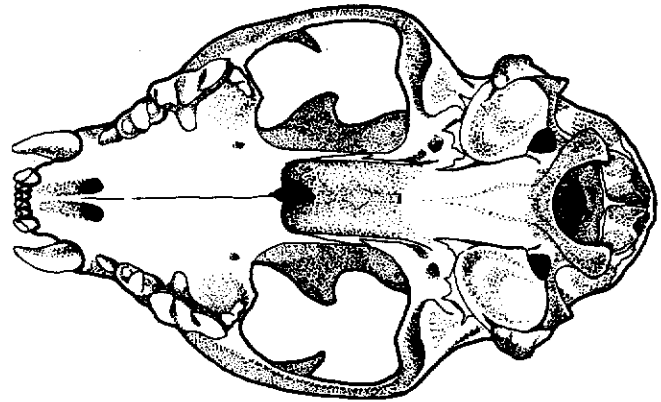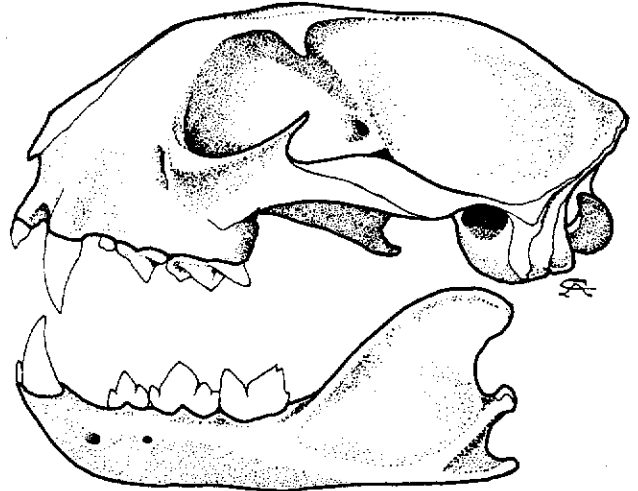


Fig. 248.2. Skull: leopard, P. pardus.
TL Skull 185 mm

## Distribution

The leopard has a wider distributional range than any of the larger felids, occurring from the southern parts of the African continent through the Middle East to the Far East, northwards to Siberia and south to Sri Lanka and Malaysia.

### North Africa

Leopards are rare in the Moyen and Haut Atlas Mountains in Morocco and their extension eastwards through Algeria to Tunisia. In Algeria they probably now occur only in the Akfadou National Park. They may occur on the Libyan plateau in northwestern Egypt, but there are no recent records from other parts of this country.

### South of the Sahara, excluding the Southern African Subregion

Recorded from southwestern Mauritania, they occur widely throughout West Africa, although material records are few. They occur in Senegal, from where P. p. leopardus (Schreber 1777) was described; Guinea Bissau; Sierra Leone; Liberia; Nigeria, Cameroun and Gabon. Further east they are recorded from the southeastern and east central parts of the Sudan. They occur in Ethiopia and have a wide distribution

in **Somalia**. They occur throughout **Uganda; Kenya; Tanzania; Zaire** and the **Congo Republic**. They are widespread in **Angola; Zambia; Malawi** and north of the Zambezi River in **Mozambique**.

*Southern African Subregion*

They are widespread in **Namibia**, except in the coastal desert. They extend eastwards throughout **Botswana**. The situation in **Zimbabwe** is disturbed by the intensive farming and ranching development of the central plateau from which they have been eradicated in many parts. They still occur locally, however, where there are extensive areas of broken terrain and throughout the remainder of the country. They are found south of the Zambezi River in **Mozambique**.

In **Natal** they occur in the northeast of the province, and reports have been received of sporadic sightings from the Drakensberg Mountains. In the **Transvaal** they are found throughout, except on the Highveld grassland areas of the southern part of the province. They occur sporadically in the **Orange Free State**. In the **Cape Province** they occur in the mountainous areas along the south coast from about the King William's Town district westwards, and in the northern and northwestern parts of the province.
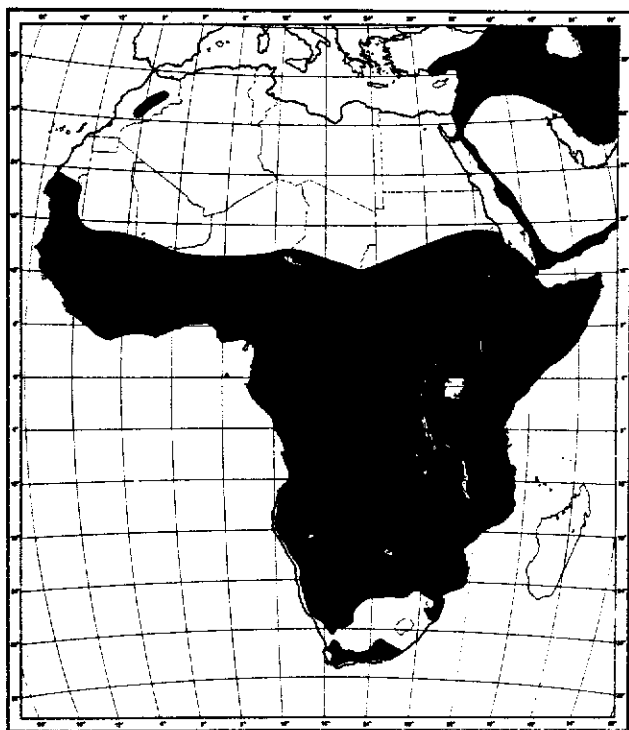


### Habitat

Leopards have a wide habitat tolerance and while generally associated with areas of rocky koppies, rocky hills, mountain ranges and forest, they also occur in semi-desert. In desert areas they utilise watercourses and rocky outcrops where sufficient prey animals occur. While they are independent of water supplies as they rely for their moisture requirements on their prey, they will drink regularly when water is available.

Cover to lie up in safely during daylight hours and from which to hunt is an important requirement. In areas of intense development, providing there is adjacent cover of rocky hills or forest, they manage to persist even in the face of intensive control. They are found from sea level to over 2 000 m and they occur in areas of mean annual rainfall of less than 100 mm to 1 200 mm.

### Habits

Leopards are solitary animals, except during the mating season or when a female is accompanied by juveniles. Primarily nocturnal, they may be seen moving during daylight hours, particularly in National Parks and in remote undisturbed areas. During the heat of the day they lie up in

dense cover, in the shade of rocks, in caves or occasionally spreadeagled on the thick branches of trees, particularly those in which they have hoisted kills. In semi-desert areas such as the Kalahari, where shade is scarce, they use holes in the ground, such as disused aardvark burrows. In the early morning they have the habit of lying out in the sun on vantage points such as rocks and rocky ledges, which give a wide view of the surrounding terrain. While predominantly terrestrial, they are accomplished tree climbers and negotiate steep rocky areas with agility. They are expert swimmers and take to water readily. During the formation of Lake Kariba leopards remained on the small islands while a food supply was still available, then swam to others, over distances of up to 900 m (Child, 1968a).

Leopards are secretive animals and difficult to contact; moreover they normally are silent. Their most characteristic vocalisation is a hoarse rasping cough, repeated at intervals. Often it is answered if another individual is in the vicinity and may be repeated between them as they move. In encounters between territorial males, grunting and growling reach a high level of intensity. In captivity they may growl under stress, and purr loudly during or after feeding.

Both males and females scent-mark by spraying urine. Female home ranges tend to be segregated and smaller than those of the males which may overlap the range of more than one female. When overlapping occurs in male ranges they tend to confine their activities to the parts little used by the other (Moss, 1976).

Leopards are territorial in that both males and females defend territories against conspecifics of the same sex (Hamilton, 1976; Bertram, 1982). The former recorded a number of fights between territorial males resulting from accidental encounters and, in one case, deliberate interception. He pointed out, however, that fights only develop after normal avoidance behaviour has failed to prevent these encounters. Le Roux & Skinner (1989) reported the death of a female by throttling, in an encounter with a female conspecific.

In a study of leopards in the Stellenbosch mountains, Cape Province, Norton & Lawson (1985) found some ecological separation between leopards and caracals, *Felis caracal*; the leopards preferred the high mountain *fynbos* areas, whereas the caracals kept to the foothills. They found home ranges for an adult male and female leopard to be 388 and 487 km² respectively, which was of the same order as that given for leopards in the Kalahari Gemsbok National Park of about 400 km² by Bothma & le Riche (1984). On the other hand, in a study of three adult male leopards in the Cedarberg mountains, home range sizes were calculated as 40, 44 and 69 km², with varying amounts of overlap (Norton & Henley, 1987). Smith (1977) gave home ranges of 10 to 19 km² for Matobo Hills National Park, Zimbabwe. Le Roux & Skinner (1989), in an intensive study of a single female in the Sabi Sand Game Reserve, eastern Transvaal, found she had a home range of 33 km². The size may well depend on the type of terrain and the availability of food.

Leopards move at a slow, casual walk. If disturbed, they bound away in a bouncing gallop which soon gives way to a fast trot which carries them quickly out of sight as they make for the nearest cover. Unlike cheetahs, they are stalkers and pouncers, not chasers, and do not maintain fast movement except over limited distances. When stalking, the leopard crouches, the body held close to the ground, the tail horizontal, and while their acute night sight is used primarily to locate the prey, hearing also plays a part. All their senses are well developed, in particular their sight and hearing. The use of the former is demonstrated by their use of high vantage points on which to lie up during the early morning and sometimes in the late evening so that they can keep the surrounding terrain in clear view. Both Kruuk & Turner (1967) and Bothma (pers. comm.) have observed leopards, lying up in this way, sight reedbuck and springbok, and slink off to the stalk and make successful kills.

### Food

Leopards tend to prey on animals less than 70 kg in mass, but will take whatever is available within their home range. Kills occur after a painstaking stalk, a relatively short chase (less than 30 m) and throttling, although occasionally a bite

is directed towards the back of the head. Thus in the Sabi Sand Game Reserve 23 species were taken (Table 248.2), with impala predominating while, in the adjacent more heterogeneous Kruger National Park, 31 species were taken, but impala (78%) still predominated (Pienaar, 1969b) as they did in the adjoining Timbavati Game Reserve (Hirst, 1969). Elsewhere, in the Matobo Hills, Zimbabwe, Grobler & Wilson (1972) showed from scat analyses that dassies among the smaller prey, and klipspringer among the larger, had the highest percentage occurrence. Norton et al. (1986) found similar results from scat analyses of leopards in the Cedarberg Mountains, Cape Province: their small antelope included klipspringers, vaalribbok and Cape grysbok, and a smaller number of records of steenbok and duiker. Feral pigs, Sus scrofa, ranked high in the Wemmershoek area, and birds, hares, rodents, reptiles, insects, plant material and baboon remains were traced in scats.

## Table 248.2

Numbers of each prey species killed by leopards (n=127) at Sabi Sand Game Reserve (July 1982—July 1984) and from scat analayses (n=17) (November 1983—January 1984) (Le Roux & Skinner, 1989)

| Species | Scat analysis (%) | No. of kills recorded (%) |
| --- | --- | --- |
| Warthog, Phacochoerus aethiopicus | | 5 |
| Grey duiker, Sylvicapra grimmia | 2(12) | 15(12) |
| Steenbok, Raphicerus campestris | | 2 |
| Impala, Aepyceros melampus | 12(70) | 65(51) |
| Kudu, Tragelaphus strepsiceros | | 4 |
| Bushbuck, T. scriptus | | 5 |
| Waterbuck, Kobus ellipsiprymnus | | 1 |
| Baboon, Papio ursinus | | 2 |
| Vervet monkey, Cercopithecus pygerythrus | | 7 |
| Pangolin, Manis temminckii | | 1 |
| Scrub hare, Lepus saxatilis | | 1 |
| Tree squirrel, Paraxerus cepapi | | 3 |
| Cane rat, Thryonomys swinderianus | 1 | — |
| Unidentified rodent | 1 | — |
| Civet, Civettictis civetta | | 2 |
| Genet, Genetta genetta | | 2 |
| Banded mongoose, Mungos mungo | | 1 |
| Dwarf mongoose, Helogale parvula | | 1 |
| Aardvark, Orycteropus afer | | 2 |
| Knob-billed duck, Sarkidiornis melanotos | | 1 |
| Francolin, Pternistis afer | | 1 |
| Tortoise, Geochelone pardalis | | 1 |
| Peter's spitting cobra, Naja mossambica | | 1 |
| Leguaan, Varanus exanthematicus | | 3 |

In the Transvaal Lowveld, a female leopard kills one animal (10 kg) every 12 days (Le Roux & Skinner, 1989). In Kenya, Hamilton (1976, 1981) recorded one kill every 13 days for both males and females. In the Kalahari, Bothma & le Riche (1982) found that males kill every three days and females with cubs twice as frequently. Only small to medium-sized prey are killed, mainly bat-eared foxes, duikers and gemsbok calves, and occasionally aardwolves and porcupines. The quills of the latter may pierce their internal organs or paws so that they are unable to hunt properly and become emaciated (Jobaert, 1960). Although larger ungulates are occasionally taken, these are the exception rather than the rule. For example, Schaller (1972b) found that of 11 wildebeest kills, 10 were calves and one a yearling.

They occasionally appear to have food preferences. Fey (1964) recorded an individual that specialised in bushpigs, even where other species were available, and Estes (1967) observed one which killed 11 jackals within three weeks. Leopards' liking for domestic dogs is well known and Estes (1967) suggested that small canids, where plentiful, may be preferred. Fey (1964) recorded a leopard, confined to a small island in Lake Kariba and with impala and duiker available, taking to a diet of fish, Tilapia sp., perhaps the same individual which, when translocated to the Kafue National Park, was observed taking catfish, Clarias sp (Mitchell et al., 1965). Apart from mammals and fish, leopards take birds of any size from turtle doves to ostriches; francolin and guinea fowl are recorded regularly. They will also take reptiles (Grobler & Wilson, 1972), although these are not a common item in their diet. In the absence of their normal prey they

become adept domestic livestock raiders, taking calves, sheep, goats and poultry, and as a consequence are subject to control measures to the level of their local extermination.

Turnbull-Kemp (1967) listed 28 records of leopards as man-eaters, the majority being adults in good condition, not aged or infirm, and still perfectly capable of taking their normal prey. Wounded, cornered or suddenly disturbed, leopards can become exceedingly dangerous and there are many cases, especially among hunters, of people being seriously hurt and sometimes being killed by leopards.

Both Estes (1967) and Bothma (pers. comm.) have watched them using watercourses or dunes to bring them close to prey. Kingdon (1977) recorded the use of vehicles or even dust-devils as screens in stalking.

Smaller prey such as mice and birds are killed by swatting with the paw and are eaten on the spot. Larger prey are held in the embrace, the claws extended, full use being made of the powerful dew claws. Jobaert (1960) stated that prey are disembowelled and they bury the entrails under the earth or leaves. With porcupines or dassies the stomach and entrails are not eaten but are not necessarily buried. These appear to be distasteful to leopards, perhaps owing to the aromatic properties of the herbs which the dassies eat or the astringent properties of the bulbs dug up by porcupines.

Leopards may kill more than they immediately require. Where they live in areas frequented by other large predators, food is stored in the branches of trees; where other large predators are absent, food is left on the ground (Brain, 1981). In both cases the leopard returns to eat later, even after they have become putrid. In semi-desert areas such as the Kalahari where trees are scarce they have been known to cache their prey in holes.

Kruuk (1972a) recorded spotted hyaenas appropriating leopard kills, but also a case where a leopard appropriated a carcass from a hyaena, which in turn had taken it from a cheetah. Kingdon (1977) recorded wild dogs unsuccessfully attempting to deprive a leopard of its kill. In both these cases the leopard avoided further dispute by taking its kill up a tree. Caching of a heavy carcass several metres up a tree requires great strength. Hamilton (1976) recorded this process with a young giraffe estimated to have a mass of nearly 100 kg. When moving carcasses the leopard first straddles them, lifting them with the powerful jaws and neck muscles, sometimes clear off the ground, then carries them off. Birds such as guinea fowl and small well-furred mammals will be assiduously plucked before eating. The leopard shows obvious distaste for fur or feathers which adhere to its mouth and gets rid of them by vigorous head-shaking.

Not all the hunts for prey are successful. An incident was witnessed in the Hwange Game Reserve where a leopard, lying up near a water hole, attempted to attack a young baboon in a troop that was drinking. It was mobbed immediately by the troop, from which it fled to take refuge high in a tree. The noise created by the troop was sufficient in itself to deter the predator from further aggression. While individual baboons climbed to threaten it in the tree, the remainder sat around on the ground, defying it to descend. It remained there for two hours and only came down after sunset when the troop had departed. Normally leopards will only attack stragglers in a troop of baboons, avoiding the main body (Smithers, 1983). Norton et al. (1986) found baboon hairs in only two percent of the leopard scats they examined from the mountain areas. Leopards will scavenge from carcasses where these are available.

### Reproduction

There is no evidence of seasonality in the reproductive pattern (Le Roux & Skinner, 1989). Leopards become sexually mature from about two and a half to four years old.

During courtship the pair remains in close association and copulation takes place about every 15 minutes through the night (Ilani, pers. comm.). Cubs are born after a gestation period of about 106 days (n=2) in caves, sheltered places among rocks, hollow trees or in holes in the ground, with an interval between births of 17 months (n=3). Le Roux & Skinner (1989) found that the mean number of cubs per litter was 2,2 (n=5). In the early stages of their lives the mother moves them to new shelters every two or three days. They

are blind at birth and have a mass of 50 to 60 g; the eyes open on the sixth to 10th day. Although presented with meat at 65 days of age, they only start eating at 72 days and suckling ceases after 101 days. From then until 9,5 months the cubs are led to the kill, but after that age they accompany the mother on the hunt and, at 11 months, kill their first impala. They attain independence at about 12,5 months, siblings remaining together for a further 2–3 months. Turnbull-Kemp (1967) observed motherly tuition whereby the cubs are allowed to accompany her on a hunt but remain behind, in response to a vocal signal, as she moves in to the kill. Schaller (1972b) reported that, long after they have become independent, affectionate reunions between mother and offspring may take place. Van Lawick (1977) also observed similar reunions, as well as play between members of the litter. When moving with cubs the mother's tail is curved up towards the tip, revealing its white underside which may act as a guide to the young in tall grass (Bertram, 1978). Females have two pairs of abdominal mammae.

## No. 249

*Panthera leo*   (Linnaeus, 1758)

## Lion

## Leeu

Plate 19

## Colloquial Name

The name lion originates from the Greek name for the species, *leon*.

## Taxonomic Notes

The lion was originally described by Linnaeus from a specimen from North Africa, a more precise locality, Constantine, Algeria, being later designated by Allen (1924). Over the intervening years well over 20 subspecies have been described from various parts of the continent. Some of these were based on specimens from zoological gardens, which have striking effects on skull shape (Hollister, 1917), rendering such specimens taxonomically valueless. Here the lion is considered to be a monotypic species, following Ellerman *et al.* (1953).

## Description

The lion is the largest of the African carnivores, males standing up to 1,25 m at the shoulder. Smuts (1982) weighed and measured 344 individuals of all ages over a four-year period in the Kruger National Park and found that the average mass was greater in these than in corresponding groups further north in Africa. They grow rapidly during the first three years of their lives, growth thereafter slowing down, the females now being almost adult. The mass of the largest male was 225 kg, the mean being about 190 kg, the largest female 152 kg, the mean about 126 kg. Males reach their maximum weight by about seven years old, females at about five to six years old, tending to decline in weight thereafter.

The colour of the body in adults is generally unicolour sandy or tawny on the upper parts and flanks and white on the under parts. Some adults retain the rosettes and spots that are characteristic of young lions to a lesser or greater degree, even into their later years. The backs of the rounded ears are black and contrast sharply with the colour of the body. The tail, which is just over half the length of the head and body, has a well developed tuft of long tawny, dark or sometimes black hair on the tip, which conceals a horny spur. In contrast to other species of Carnivora, for example the leopard, *P. pardus*, melanistic forms of the lion are extremely rare. On the other hand very pale-coloured individuals are known from Kaokoland in the western parts of the Subregion, as are some specimens from southwestern Botswana. Individuals from the Timbavati Private Game Re-

serve in the eastern Transvaal are nearly white and have earned the title of the "white lions of Timbavati" (McBride, 1981). Examples of these white lions, which are not albinos, are now housed in the National Zoological Gardens, Pretoria and the Johannesburg Zoological Gardens. They represent one of two possible mutations known as chinchilla or acromelanic albinism which, like albinism, are known to arise from the same gene locus in the individual's chromosomes. They are not as rare as formerly thought, Smuts (1982) recording several others from the Kruger National Park and from Timbavati.

The hair on the face, the upper parts of the body, the flanks and the tail, excluding the tip, is short, while that on the under parts is softer and longer. Just behind the shoulder on the upper parts of the body the stance of the hair changes direction, forming a whorl on either side and there is a similar reversal of direction of the hair on the upper parts in the lumbar region which, when it meets the backwards directed hair about the mid-dorsal region, forms a short transverse crest of upstanding hair.

Adult males have a mane of long hair, up to about 160 mm in length, on the sides of the face and top of the head which extends onto the shoulders, around the neck and for a short distance down the spine. In subadults this mane is sandy, yellowish or tawny, but in some, with advancing age, it becomes black. Black-maned adult lions are not uncommon in the Subregion and occur alongside adults with tawny manes. Close examination of the hair on these black-maned individuals shows that the bulk of the hair is a very dark brown, profusely mixed with black hairs, giving the mane a black appearance. In black-maned lions the fringe of hair surrounding the face is yellowish or tawny. A black mane gives these individuals a strikingly dignified appearance. Adult maneless males are known to occur but are not common. The mane serves as a sexual signal to the females and distinguishes them at great distances (Bertram, 1978). It also serves to protect the head and neck when fighting. In addition to the mane, some adult males have tufts of long hair on the elbows and an extension of the mane in the form of a band of long hair on the chest, extending to the anterior part of the abdomen.

Lions have long whitish whiskers arranged in parallel rows on the sides of the upper lip. Each whisker arises from a black spot, but the top row of spots have no accompanying whiskers. Rudnai (1973a) found that it was possible to recognise individuals by the arrangement of these spots, as in no two lions were they arranged in exactly the same way.

They have five digits on the front feet, four on the hind feet. Each digit is armed with an extremely sharp, highly curved, laterally compressed, retractile claw. The first digit on the front feet is set well back of the other four and does not mark in the spoor (Fig. 249.1).

## Skull (Fig. 249.2)

In profile the skull is comparatively flat on top compared with a leopard, the highest point being on the broad flat shelf between the postorbital process from where it slopes off very gradually forwards to the nasals and rather more abruptly back to the supraoccipital crest. In relation to the size of the skull the braincase is surprisingly small, lacking the pear-shaped outward bulge seen in the leopard. The bone structure is massive and a cleaned skull may have a mass of over 3 kg. The zygomatic arches are particularly broad and heavily built to provide a firm attachment for the masseter muscles and swing outward at the back to allow ample room for the massive temporalis muscles which together with the masseters actuate the powerful action of the lower jaw. The supraoccipital crest is more than just a flange, being reinforced ventrally to form a thick bony structure projecting far back from the occipital condyles. The high sagittal crest provides extra attachment for the temporalis muscles and may extend for a height of some 25–30 mm from the braincase, where it joins the supraoccipital crest. The postorbital processes are incomplete, the rostrum broad.

The massive lower jaw is deeply hollowed out posteriorly to provide for the attachment of the masseter muscles. The coronoid process is high and coarsely roughened towards the top to give firm attachment to the temporalis muscles.
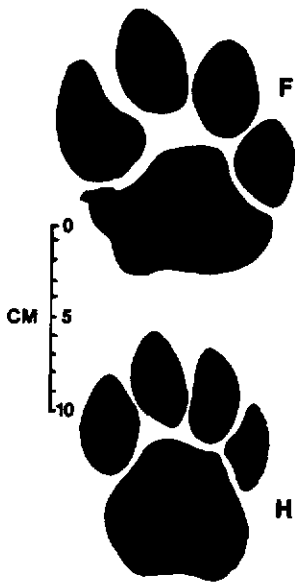
Fig. 249.1. Spoor: lion, *P. leo.*
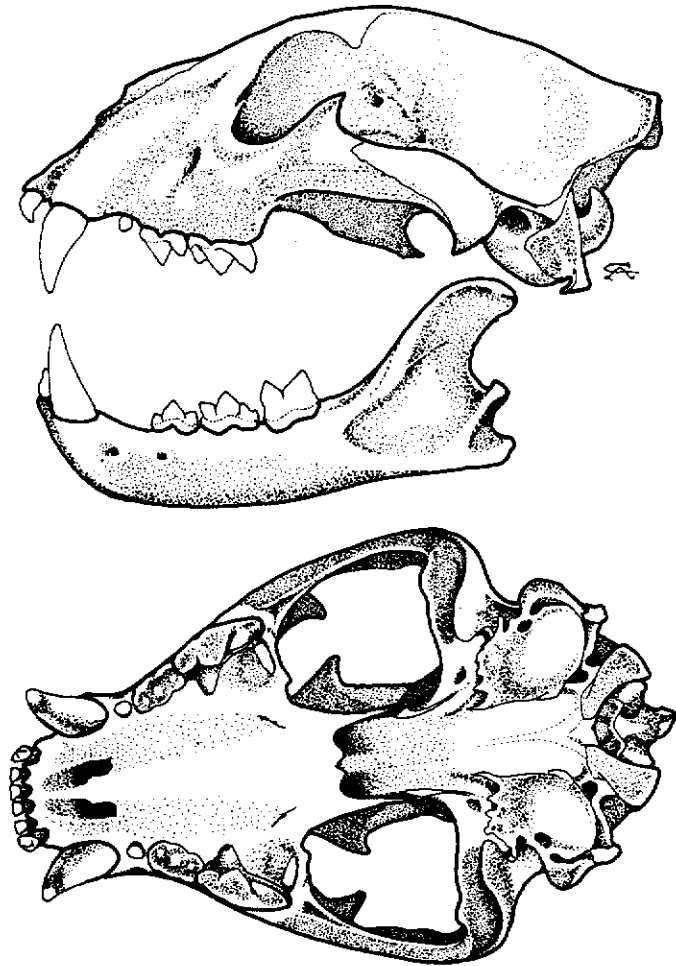F. Right forefoot H. Right hind foot.



Fig. 249.2. Skull: lion, *P. leo.*
TL Skull 370 mm.

The dental formula is:

$$I\frac{3}{3} C\frac{1}{1} P\frac{3}{2} M\frac{1}{1} = 30$$

The upper outer incisors are considerably larger than the remainder. These are rounded, heavily built and recurved towards the points. The canines are heavy and sharp and slightly flattened on their inner sides. The second upper premolar is small and rounded and rises to a central point.

The other two upper cheekteeth are adapted to cutting; the whole length of the upper fourth premolar has a sharp cutting edge and the first upper molar is tiny.

The outer incisors in the lower jaw are larger than the remainder, but do not reach the development of the upper. The canines are recurved. The cheekteeth are all adapted to cutting. The first lower molar has a sharp edge which, occluding on the back half of the fourth upper premolar, serves to keep the edges of these two teeth continually sharpened. The huge canines and canine-like upper outer incisors are adaptations to the holding of heavy prey and the delivery of the strangling, killing bite. The remainder of the teeth are adapted to slicing up the food. The small upper first molars, set at an angle to the cheekteeth, become worn on their front edges and while they may assist in keeping tough food from sliding backwards during the process of slicing, they have little or no grinding ability.

## Distribution

There is probably no other species whose distributional range has shrunk over historical times to the extent shown by the lion. At one time they occurred widely in Europe, over much of Asia and the continent of Africa. Today extinct in Europe, the last remaining individuals were exterminated in Greece about AD 100 and they persisted in Palestine until about the 12th century. The Asian population is represented today by about 190 individuals living on the Gir Peninsula, in northwestern India. This population has declined from about 300 in 1953 to present levels, which were given by a census in 1970 (Red Data Book, IUCN).

The situation is similar on the Continent of Africa where they are now extinct in North Africa, disappearing from Tunisia and Algeria about 1891 and from Morocco in 1920. In the Southern African Subregion the shrinkage in their distributional range is well documented in the historical record. From the time of Kolb (1719), who stated that they were not uncommon near Cape Town, they gradually disappeared, in the face of man's encroachment, from most of the Cape Province during the 1860's and from the greater part of Natal, excluding the northeast, shortly thereafter. Today, apart from areas into which they have been reintroduced, they only occur in some National Parks and Game Reserves in the Republic of South Africa.

As lions are great wanderers they may be expected to turn up from time to time in areas where for many years they were unknown, often far from their present limits of distribution. There are many examples of this in the Subregion. Coetzee (*in litt.*) reported that every two or three years lions appear in the vicinity of Windhoek, Namibia, and vagrants still wander onto the Zimbabwe plateau, killing cattle and then vanishing, even though they were extirpated there many years ago. In 1965 a female and a juvenile penetrated to the outskirts of Gwelo and in 1971 at least two reached the periurban areas of Harare. They are not resident in the eastern parts of Zimbabwe, but nevertheless regularly cross over from Mozambique. They occasionally turn up near Louis Trichardt in the northern Transvaal and an individual turned up near Heidelberg, Transvaal, within recent years.
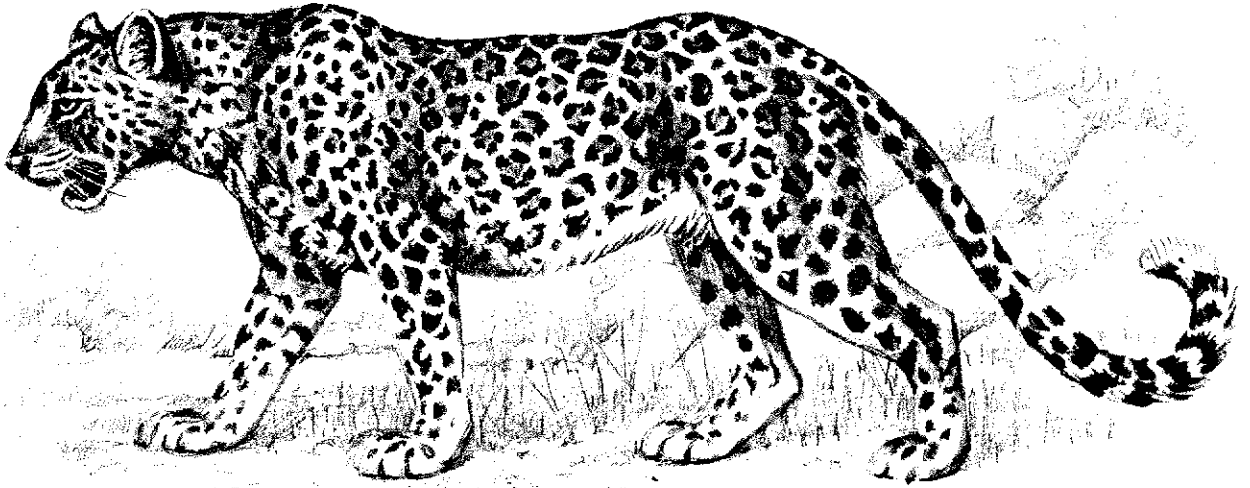
**Plate 19**

247. Cheetah, *Acinonyx jubatus*
     Jagluiperd
248. Leopard, *Panthera pardus*
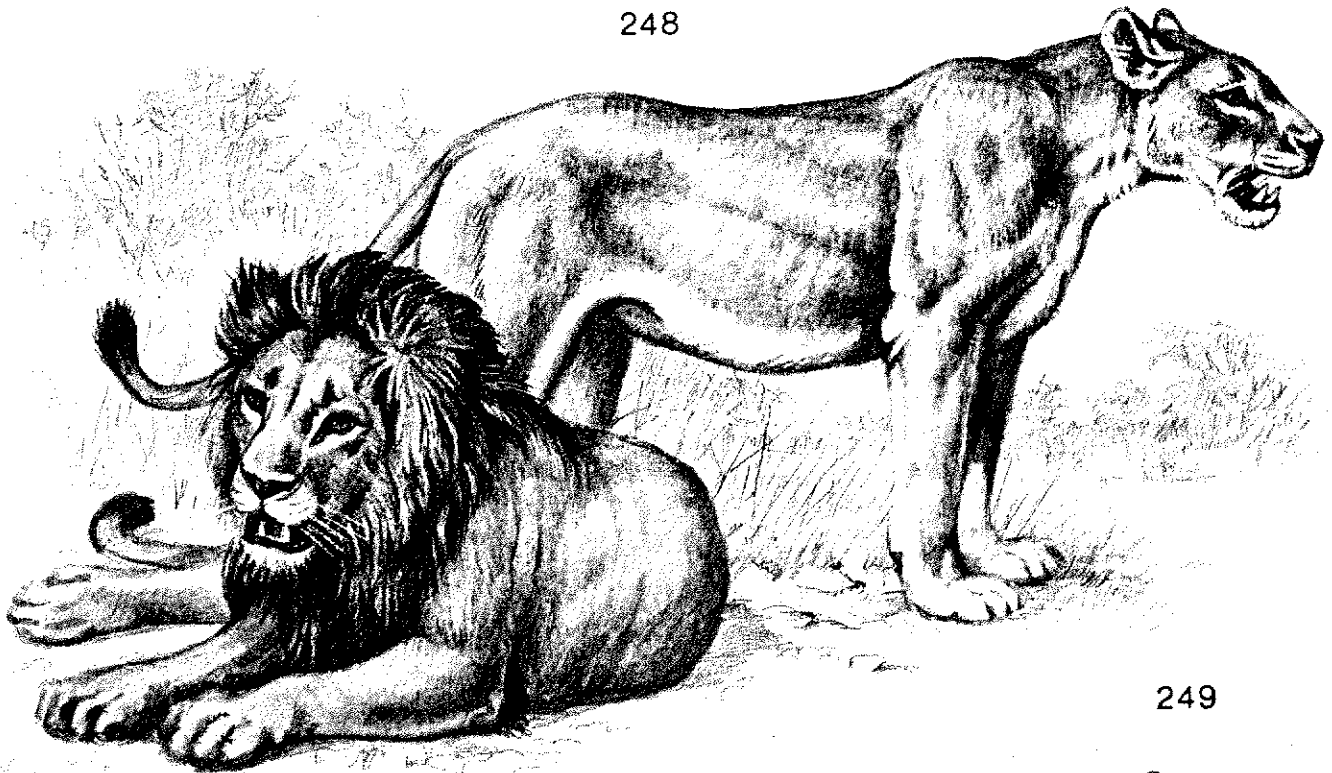     Luiperd
249. Lion, *Panthera leo*
     Leeu

PLATE 19

247

248

249

Dick Findlay.
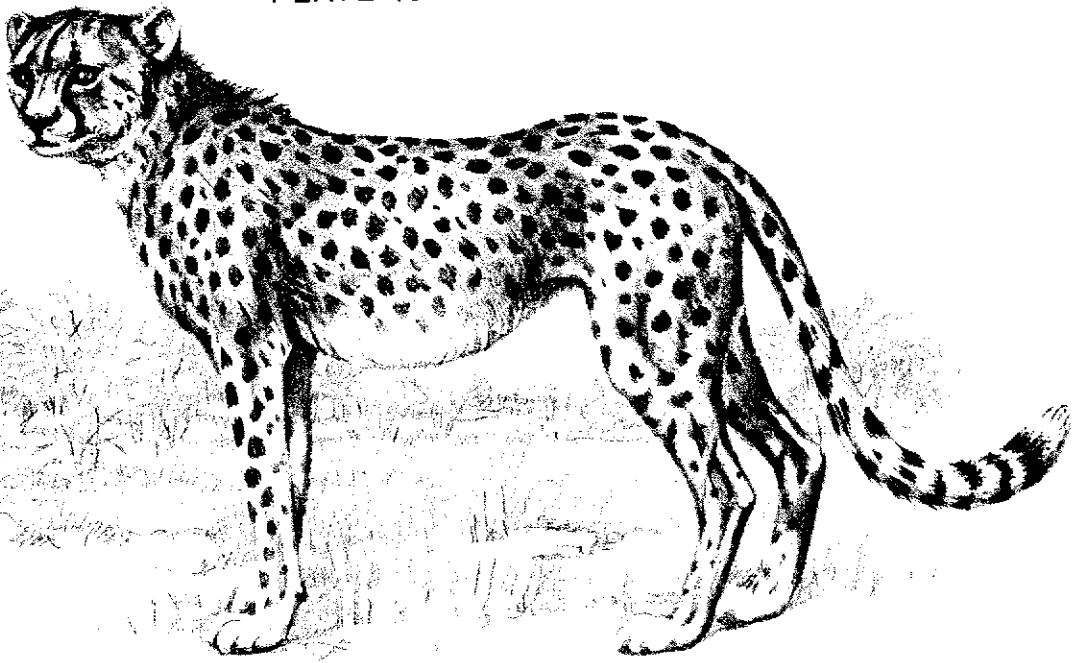
*South of the Sahara, excluding the Southern African Subregion*

They still occur along the Senegal River in **Senegal** and in **Mali** on the Niger River. They are found in the northern parts of **Sierra Leone** and eastwards of this in the Sahel and Sudan zones and in parts of the Guinea Savannas to **Ethiopia**. They are found throughout most of **Somalia**. They occur in northern, eastern and southern **Zaire**. They are widespread in **Uganda, Kenya** and **Tanzania**. The situation in **Angola** is not so clear, for there are few records, but it appears that they still occur throughout the country, even in the desert areas in the southwest. They occur widely in **Zambia** and north of the Zambezi River in **Mozambique**.

*Southern African Subregion*

In **Namibia** they are widespread in the northern and northeastern parts, including Etosha National Park, and are also found in Kaokoland and along the Namib Desert coast. They are widespread in **Botswana**, except in a narrow sector in the west and in the more highly developed parts of the east. In **Zimbabwe** they are absent from the central plateau except as vagrants, otherwise they occur widely throughout. In **Mozambique** south of the Zambezi River, they occur widely, except along the Zimbabwe border in the west, in the eastern Inhambane District and not south of about 24 °S except as vagrants from the Kruger National Park. In the **Transvaal** resident populations are confined to the larger conservation areas in the east, which include the Kruger National Park, with vagrants wandering in from time to time in the northern and northwestern parts of the province. Today the only resident population in the Cape Province is in the Kalahari Gemsbok National Park, from where, occasionally, wanderers make their way into adjacent parts of the province and Namibia. In 1958 a single wanderer made its way southward into the Umfolozi-Hluhluwe-Corridor area in **Natal** and with reintroduction of the species thereafter, there is now a flourishing population in this sector. This today marks their most southerly limits of distribution on the continent.
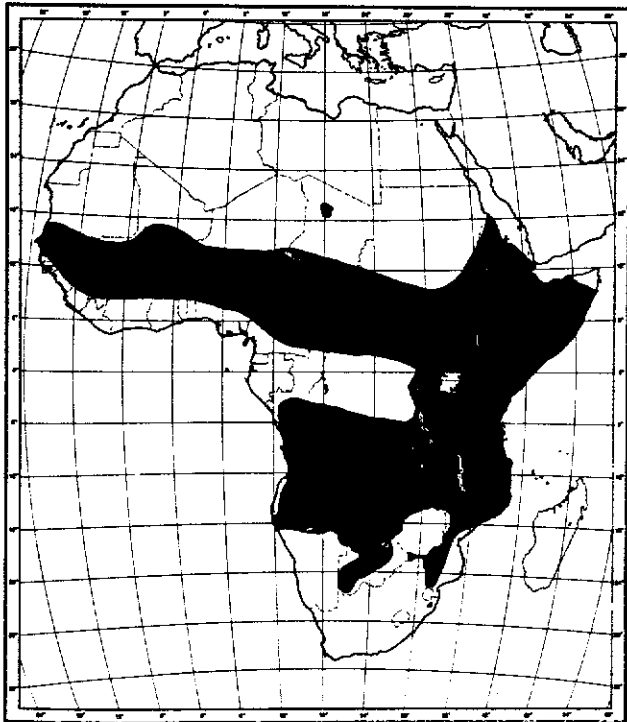


**Habitat**

Lions have a wide habitat tolerance, the only association in which they generally are not found being forest. This is demonstrated by their absence from the forests of West Africa and the Congo basin in Zaire. They will penetrate deep into desert, where there are avenues of watercourses, and are common in semi-desert areas such as in parts of the Sahelian Zone of West Africa or the Kalahari in Botswana. Where water is available they will drink regularly, espec-

ially after feeding, but they are by no means dependent on this and they can subsist for long periods without it, getting their moisture requirements from their prey.

Probably the most important requirements are that their habitat should provide an ample supply of food in the form of medium and large-sized game animals, which form their principal food, some shade in which to lie up during the heat of the day and the barest of cover to facilitate stalking of prey.

**Habits**

Lions are predominantly nocturnal, with a tendency to be active around sunrise and towards sunset, yet quite frequently they are observed moving or hunting during daylight hours. They are averse to exerting themselves during the heat of the day, when they loll about or sleep in the shade, usually in compact groups. Although they are a terrestrial species they are good climbers and during these resting periods will sometimes drape themselves along branches of trees to take advantage of cool breezes or perhaps to avoid flies (Fosbrooke, 1963), or dangerous animals (Makacha, 1969). Authorities who have studied lions have found them lethargic, their lives consisting of short periods of intense activity when hunting or exhibiting aggression, with longer periods of slow movement or relaxation. In spite of their apparent obliviousness to events around them during resting periods, they can become aggressive quickly if suddenly and unduly disturbed.

The social structure of lions has been the subject of close study by authorities such as Guggisberg (1961), Schaller (1968, 1969), Schaller & Lowther (1969), Bertram (1978) and others. They are the only felids that are distinctly social, living and hunting in prides, which may number from a few individuals to up to 30 or more. In the Kruger National Park, Smuts (1976, 1982) found that 12 was the mean number, with a maximum of 21. On average there were two adult males per pride, the range being one to five. Although Child (in *litt.*) in Botswana noted that the prides were smaller, never numbering over six, more recently Patterson (1988) in the Mashatu Game Reserve in eastern Botswana observed that under optimum conditions one pride increased to 16 individuals, with two resident males, but poaching and a reduction of large prey due to drought tended to suppress this number. Van Orsdol et al. (1985) concluded that food supply during the lean season was the major determinant of pride size.

Lions hunt in areas where prey is concentrated, and the cover poor, so it is to their advantage to co-operate in hunting. Prides occupy home ranges which may vary greatly in size depending on local conditions or the availability of food. Schaller (1972a), working in an area which covered both woodland and plains, found that there was an overlap in home ranges, whereas Bertram (1978), working in the woodland only, found that home ranges were largely exclusive and, as they were actively defended, merited the term territories. In Schaller's situation the explanation seemed to be that there was local movement of the prey species between the two associations, which was followed by the prides. Smuts (1982) found that the home range of a pride in the Kruger National Park averaged 25 km$^2$ and in the Mashatu Game Reserve, Patterson (1988) gave an area of 72 km$^2$. Van Orsdol et al. (1985) found that there is a strong negative correlation between home range size and the abundance of prey during the season of least abundance.

Lionesses form the nucleus of the society. Adults spend the whole of their lives within their home range and rarely move out of it. Prides may include several males, one of which is dominant, a role also adopted by one of the females. The members of a pride do not necessarily all move together within the territory, but individually or collectively they all make use of it. Prides may split up into subgroups which tend to operate in different parts of the territory, joining up amicably from time to time, but exhibiting hostility to encroachment by subgroups of other prides from adjacent territories. Like so many other situations in nature there are exceptions to these general rules. Bertram (1978), for example, recorded that an adult lioness with a radio collar, which had for two years occupied a territory with her companions,

suddenly left it and was found some eight kilometres from its boundary. She returned from her wanderings the following day. Again some lions tend to be nomadic, not occupying established territories. These are confined to males ousted from prides, as well as subadult males and females. Smuts (1976), in the Kruger National Park, followed the movements of the females and young of a pride, which were following herds of zebra and wildebeest, for a distance of 45 km. He also recorded the movements of solitary subadult males and adult females, one of the latter up to 70 km. Bertram (1978) stated that fewer cubs from these nomadic prides reach maturity due to a lack of the security afforded by a territory. Nomadic lions are also in poor condition (Melton et al., 1987). These prides tend to follow the movements of their prey and are more tolerant of strangers than members of prides holding territories. Lion territories are not defined precisely, zones between them being less intensively used than the remainder. Lions tend to avoid encounters where they can do so, relying on roaring, scent-marking and patrolling to demonstrate their right to the territory so as to warn others off it. Schaller (1972a) pointed out that if trespassers are discovered they usually flee back to the safety of their own territory on being threatened, the discoverer appearing reluctant to catch the intruders, preferring simply to see them off. Sometimes it may develop into a snarling, swatting match, but serious injury to either party is rare.

However, fights between rival males are much more serious and may result in the death of combatants. These take place when one or two groups of males attempt to take over a pride by ousting the male already in possession (Bertram, 1978). In these encounters the heavy mane assists in protecting the neck from the raking claws of the adversary. Between prides there is some interchange of males, the arrival of a new male or males having far-reaching effects on issues such as cub survival (see **Reproduction**). On occasion a single male can dominate two prides (Estes, 1967; Makacha, 1969; Patterson, 1988).

In the Etosha National Park, Orford, Perrin & Berry (1988) found an average emigration/mortality of pride lions to be 17% and the annual loss of lionesses from the three prides was 7%. The mean number of adults recorded in these prides was 1,5 males and 4,8 lionesses. Smuts et al. (1978) stated that the average tenure of males in a pride is two years, but Orford et al. (1988) found that, of 10 instances known to them, three died in their prides, while five were still in their prides after being there for a minimum of four years. This may be a result of the low density in Etosha.

Before the start of a hunt or when returning to rest after it, members of prides indulge in what Rudnai (1973a) called "contagious activities" such as yawning, grooming, defecating or urinating, which means that if indulged in by one member, the rest often follow suit. Communal roaring too may follow the start given by an individual member.

## Food

Lions feed on a wide range of mammals from mice to buffalo, birds up to the size of an ostrich, as well as reptiles and even insects. Pienaar (1969b) listed no less than 37 species of prey in the Kruger National Park. Smuts (1982) calculated that on the average edible weight of each prey animal and knowing the frequency at which they occurred in stomach contents, giraffe were supplying 43% of the food, wildebeest 23%, zebra 15%, impala 6%, buffalo 4%, waterbuck 4%, warthog 2%, kudu 2% and miscellaneous small mammals 1% each. An adult male lion was found to have 30 kg of impala meat, skin and bones in its stomach. In addition they are known on occasion to tackle young elephants and hippopotamus, and Pienaar (1969b) recorded the severe mauling, resulting in death, of an adult white rhinoceros. Their principal foods, however, depend on what is available, falling generally within a range of species with a mass of between 50 and 300 kg. In the Mashatu Game Reserve, Botswana, Patterson (1988) observed lions to feed on baby elephants, adult eland bulls as well as the grazers such as wildebeest and zebra and predominantly impala; on one occasion he saw a pride surround a troop of baboons, several juveniles of which were captured by the pride before the troop made its escape.

In the Chobe National Park, McBride (1982) recorded 120 kills, 89% of which were made during the hours of darkness. Buffalo comprised the major part of the kill sample (46,7%) of which three-quarters were of young or sub-adults. Wildebeest and zebra constituted 21,7% of their kills, half of which were young, and the remaining 30% of kills comprised giraffe, kudu, waterbuck, sable, impala, tsessebe, two baby elephants, six springhaas, an aardvark and two steenbok lambs.

In the Kalahari Gemsbok National Park, Eloff (1964) found that small animals and juvenile antelopes made up 50% of the diet, porcupines ranking high, together with gemsbok, red hartebeest and springbok.

Lions will take carrion even when it is putrid and they are not adverse to eating fish when these can be obtained easily in drying up pools. Pienaar (1969b) also listed termites and locusts as being taken on occasion and recorded the killing and eating of spotted hyaenas, leopards, cheetahs, jackals, civets, honey badgers, caracals and even crocodiles. In the Skeleton Coast Park, Namibia, Bridgeford (1985) recorded 14 instances of their eating Cape fur seals, Arctocephalus pusillus; carcasses were dragged on average 1 100 m from the beach—also a characteristic of these lions with gemsbok kills much further inland.

Lions hunt predominantly at night and are much more successful when a hunt is joined in by all members of a pride. There is a measure of disagreement among authorities who have studied lions in the field as to whether there is in fact a co-ordinated and deliberate plan of attack (Guggisberg, 1961; Schaller, 1972a) or whether each member is working on its own and taking maximum advantage from the developing situation (Kruuk & Turner, 1967). Whatever the answer may be, Schaller (1972a) noted that 30% of stalks were successful when members of the pride took part, against 17–19% when only a single individual was involved. Hunting behaviour has been shown to vary with cover availability, prey availability and prey body size (Van Orsdol, 1984). During nocturnal hunting the amount of moonlight affects hunting success independently of factors such as hunting group size—hunting success during moonlight hours is significantly less than when no moonlight is present (Van Orsdol, 1984). Lions are expert stalkers and will make use of the barest cover to close in on their prey. In stalking, the head and body are held low to the ground, their eyes fixed on the intended victim as they move towards it slowly and purposefully. If the prey shows signs of nervousness they will freeze motionless until it relaxes and continues feeding before they move forward again. Most chases are short, not over 100–200 m, the aim being to get as close to the prey as will allow for a spring onto its back, without having to make the final sprint. It has been estimated, however, that in the final short sprint to catch they may cover 100 m in six seconds. During the whole process of hunting, lions remain silent, although they may roar after the kill is made.

The attack may be delivered at the rump or shoulders of the prey, the sheer weight of the aggressor, in the case of medium-sized prey, bringing the prey to the ground, when it is seized by the throat and killed by strangulation. With larger prey the lion aims to land sideways on the shoulder or rump of its victim. In the former case sometimes one paw clutches the muzzle, forcing the head sideways, so that in falling the neck may be broken. As soon as the prey is down it is seized by the throat and sometimes by the muzzle to effect strangulation.

Lions will stun readily with the paw and eat small prey found fortuitously. They will deal with the young of small antelope hiding up in the grass in this manner. They also will dig out and eat adult warthogs from shallow burrows.

An interesting variation of the more normal method of killing large prey is recorded by Eloff (1964) where, in the Kalahari, they leap upon the hindquarters, their weight, together with an upward jerk of the victim's hindquarters, breaking the back at the junction of the last lumbar vertebrae.

Lions may take their meat at the site of the kill or they may drag it to the nearest cover. Normally the belly is ripped open and the stomach and intestines pulled out. These may be covered with sticks or grass (Bertram, 1978) or sand (Eloff,

1977), but often the intestines are eaten after being drawn through the incisor teeth so as to squeeze out the contents.

The males take little part in the hunt, leaving this to the females, but are quick to take part in feeding once the kill is made, lionesses having to wait until the pride male has eaten his fill. He may be more tolerant of cubs sharing his meal.

Lions are opportunists and a hungry pride will keep a watch for vultures descending to the kills of other predators and will readily follow this up rather than exert themselves to make their own kills. Spotted hyaenas are often robbed of their kills by lions. However, the presence of a male in the pride is an important factor in interaction with clans of spotted hyaenas, *Crocuta crocuta*. In the Chobe National Park prides of females lost 20% of their food to hyaenas and a further 17% to unrelated lions, although hyaenas had to outnumber lionesses by 3/4:1 to drive them off their kill. For hyaenas losses to lions were balanced by gains from lionesses (Cooper, 1990b). A solitary lion at a kill is at a disadvantage in this situation for if it leaves the kill, it is likely to be taken over by other predators.

During or after a meal lions will wander to the nearest water for a drink. Food passes through the stomach and intestine quickly and lions are able to take a second meal not long after gorging themselves.

In the absence of their normal prey, lions can become problem animals and can cause grave losses to cattle and small stock. They can become "man eaters" and the individuals involved are not always old and decrepit individuals. It is said (Goodwin, 1953) that they do not return to the remains of a human meal.

## Reproduction

Smuts (1982) found that in the Kruger National Park male lions become sexually mature at 26 months old although they do not get the opportunity to mate until they are about five years old. The females become pregnant for the first time at about 43 months old and continue to breed until they are quite old, producing a litter every two years. Females may reproduce up to an age of about 15 years but usually not thereafter (Rudnai, 1973a). Although mating may take place at any time throughout the year, Smuts (1982) found that, in the Kruger National Park, a large proportion of the cubs was born between February and April which is related to the period during which the prey species have their young.

Courtship in lions may be initiated by either member of the pair, who remain in close association during this period, the male following the female at all times and resting with her. The female usually invites copulation by lordosis. Although at this time the proximity of other male members of the same pride may be tolerated, strange lions are driven off. In northern Botswana a mating pair was observed copulating about every 15 minutes over a period of several hours and in East Africa, Rudnai (1973a) recorded copulation every 17 minutes, the process continuing through the night. During periods between copulation members of the pair will lie down next to each other or walk together for short distances until the next mating, which may last up to about a minute. If the female does not respond to the facial demonstration of the male he may gently stroke her with his tongue on the shoulder, neck or back and the female may respond. Towards the end of the period of copulation the male may gently neckbite the female. During copulation the female may purr loudly. Unlike other carnivores there is very little aggressive behaviour during this period; the snarl which the male may emit is ritualised and the neckbite is symbolic. Rudnai (1973a) noted that the majority of matings do not result in pregnancy. Of 14 mating periods observed by her in the wild, only four appeared to result in fertilisation.

Rudnai (1973b) found that the level of nutrition of the female influences her fertility. Smuts (1976) believed that the number in litters was regulated by the availability of food.

Zuckerman (1953), from observations in captivity, gave the gestation period as 110 days.

Lionesses are polyoestrus, oestrus lasting from about four to 16 days, the period between oestruses varying from a few days to over a year. They have a post partum oestrus, but do not conceive if the litter survives, but if it is lost a new litter may be produced within four months (Rudnai, 1973a).

For purposes of parturition the females leave their pride and remain separated from it until the cubs are four to eight weeks old. Litters average 2,6 in number (n=19), with a range of one to four, but up to six have been recorded (Rudnai, 1973a; Patterson, 1988). The sex ratio at birth is parity, the mass at birth about 1,5 kg.

The female with her cubs rejoins the pride when the cubs are four to eight weeks old, but only if cubs already established with the pride are not more than three months old. The reason for this is that any female in milk will suckle cubs and members of the younger litter would suffer in competition with other cubs if they were much larger. The cubs suckle regularly for the first six to seven months of their lives, the frequency declining thereafter. They remain with their mothers for 21 to 24 months (Rudnai, 1973a); Schaller (1972b) gave this period as 30 months for cubs in Serengeti, East Africa.

Cub mortality is high. Stevenson-Hamilton (1934) gave a survival rate for the Kruger National Park of 50%, and 40% seems to apply to the Mashatu Game Reserve, Botswana (Patterson, 1988) and the Etosha National Park, Namibia (Orford et al., 1988). In the Kruger National Park, Smuts (1982) noted that cub mortality increased when food was in short supply or when there was insufficient cover for the cubs to hide in while the females were out hunting. Moreover, prides without males in constant attendance failed to rear any cubs.

Eloff (1980) stated that in the Kalahari, with its harsh environment and where lions fed predominantly on small-sized prey, which was consumed largely by the adults, leaving little for the cubs, and where the adults have to travel long distances to secure food, cub mortality was very high. In this sector he stated that starvation is apparently the principal cause of cub mortality, followed by their abandonment, disease and predation.

## Genus *Felis*  Linnaeus, 1758

This genus, in its widest sense, covers the majority of the living species of the subfamily Felinae, which includes the genera *Acinonyx*, *Panthera* and *Felis*.

The genus is represented in the Subregion by four indigenous species: the caracal, *F. caracal* Schreber, 1776; the African wild cat, *F. lybica* Forster, 1780; the small spotted cat, *F. nigripes* Burchell, 1824; the serval, *F. serval* Schreber, 1776 and a single introduced species, the domestic cat, *F. catus* Linnaeus, 1758.

There remains a difference of opinion regarding the status of the African wild cat, *Felis lybica*. Haltenorth (1953) suggested that it was conspecific with the older named European wild cat, *F. silvestris* Schreber, 1777 and, within recent years, there is a growing tendency among authors to accept this view. Ellerman et al. (1953), while admitting that African members of the species are very closely allied to *F. silvestris*, nevertheless retained the name *F. lybica* for the African wild cat. There is no conclusive evidence available to support either view and the treatment given to the problem depends largely on individual opinion. In this work for the reasons given under *Felis lybica* (**Taxonomic Notes**) they are considered to be separate species.

The Egyptians were certainly among the first people to domesticate the African wild cat, *F. lybica*, records of this going back to at least 2000 B.C. Some archaeologists hold that the domestication of this species dates from the First Dynasty, about 3000 B.C. (Zeuner, 1963). The cat became worshipped universally by the Egyptians to the extent that, when their cats died, the owners would go into mourning by shaving their eyebrows. The cats were mummified and buried in special consecrated places set aside for this purpose. If their owners were wealthy they had bronze mummy cases made for them and they were buried with them in their tombs. Herodotus related that when a house was on fire they were more anxious to save their cats than their property (Zeuner, 1963). It was a very serious offence to kill a cat, as Greek and Roman visitors to Egypt found out to their cost when they accidentally did so. From paintings and hiero-

glyphics, it appears that this cat was ginger-coloured, with long legs and ears, and a long, ringed tail. The numbers of mummified cats in cat cemeteries were so enormous that, during the latter part of the 19th century and first few years of the 20th century, they were recovered and their remains sold as fertiliser, 19 tons of which were exported to England (Morrison-Scott, 1951).

The domestic cat, *Felis catus*, on which Linnaeus (1758) based his species, is now represented by a wide variety of forms, which originated from selection by man, and has a cosmopolitan distribution. They have accompanied their owners to the furthest corners of the earth to be disposed of to new owners or, of their own volition, chosen new ownership or become feral in new lands.

Domestic cats are catholic in their ecological demands and are versatile enough to settle and breed in the wild in a wide variety of environments, from the harsh conditions of sub-Antarctic islands to tropical and sub-tropical parts of the world. As a feral species they are established widely in the Southern African Subregion, including Marion Island.

By the beginning of the Christian era domesticated cats were kept regularly by the Romans and were carried by them to the outermost parts of their empire, including England.

The dental formula of the Felinae is:

$$I\frac{3}{3}\ C\frac{1}{1}\ P\frac{3}{2}\ M\frac{1}{1} = 30 \text{ or}$$

$$I\frac{3}{3}\ C\frac{1}{1}\ P\frac{2}{2}\ M\frac{1}{1} = 28$$

The teeth are highly specialised to capturing, holding and killing live prey and to slicing up flesh. The canines are long and sharp and the outermost incisor teeth enlarged to assist the canines in holding. There is a gap between the canines and the cheekteeth, the post-canine gap, whose purpose is to free the canine teeth for deep penetration. The cheekteeth are all adapted to cutting, the upper fourth premolar tooth, with three cusps set in line, bearing on the first lower molar with its two blade-like cusps, forming a highly efficient carnassial shear for chopping up the food. In all members of the Subfamily there are occasional aberrations in the dental formula affecting the premolar teeth.

Key to the indigenous species (Meester et al., 1986)

1. Ears elongate and tufted at tips with long black hair; body unicoloured, tawny or reddish; greatest skull length about 109–150 mm (Subgenus *Caracal*)

... *caracal*

Ears not elongate nor heavily tufted; body colour spotted or barred

... 2

2. Ears large and broad, 82–99 mm long; larger, greatest skull length 101–135 mm; body distinctly spotted (Subgenus *Leptailurus*)

... *serval*

Ears smaller, less than 80 mm long; smaller, greatest skull length normally less than 100 mm, occasionally up to 112 mm (Subgenus *Felis*)

... 3

3. Tail less than half of head and body length; bullae enlarged; body distinctly spotted; smaller, greatest skull length less than 87 mm

... *nigripes*

Tail more than half of head and body length; bullae less enlarged; body spotting indistinct; larger, greatest skull length normally 81–100 mm, occasionally up to 112 mm

... *lybica*

No. 250

*Felis caracal*   (Schreber, 1776)

Caracal
Rooikat
Plate 20

## Colloquial Name

In published papers the caracal is persistently referred to as the lynx which is unfortunate, for European and New World lynxes are externally very different, being spotted and barred. The Turkish name for caracal is "garah-gulak" or "black ear" which presumably has become caracal in English, and its translation is singularly appropriate, for the characteristic features of the caracal are the black backs to the tufted ears, which contrast with the unicoloured body. The Afrikaans *rooikat* is descriptive.

## Taxonomic Notes

The caracal, *F. caracal*, although it has a wide distribution beyond the confines of the African Continent, was first officially known from a specimen illustrated and described by Schreber in 1776 from Table Mountain. Schreber's plate has the caption "*Felis caracal* Buff.", thus acknowledging Buffon's prior knowledge of the species, which he had illustrated, and to which he had applied the name caracal. However, Schreber did not accredit his illustration to Buffon, as he usually did when copying from his work, because in fact he was using as his model a specimen from "Vorgebirge", Cape of Good Hope.

Meester et al. (1986) recognised two subspecies from the Subregion: *F. c. damarensis* from Namibia, northern Cape Province, southern Botswana and southern and central Angola, and the nominate form, *F. c. caracal*, from the remainder of the species' range in the Subregion.

## Description

Caracals are built robustly and adult males have a mass of up to 17 kg, females 11,5 kg. Caracals are short in the limbs, and they stand some 0,4–0,45 m at the shoulder. Their tails are short, only some 27% of the total length or 36% of the length of the head and body (Table 250.1).

## Table 250.1

Measurements (mm) and mass (kg) of caracals, *F. caracal*, from (a) Botswana and Zimbabwe (Smithers, 1983), and (b) & (c) the Cape Province (Stuart, 1977; Pringle & Pringle, 1979)

(a)

| | Males | | | Females | | |
|---|---|---|---|---|---|---|
| | x̄ | n | Range | x̄ | n | Range |
| TL | 1116 | 6 | 1065–1226 | 1062 | 3 | 1020–1110 |
| T | 298 | 6 | 255–320 | 288 | 3 | 275–305 |
| Hf s/u | 209 | 6 | 200–225 | 188 | 3 | 185–190 |
| E | 84 | 6 | 80–87 | 83 | 3 | 81–86 |
| Mass | 13,8 | 6 | 11,5–17,0 | 11,9 | 3 | 10,9–11,5 |

(b)

| | | | | | | |
|---|---|---|---|---|---|---|
| TL | 868 | 97 | 750–1080 | 819 | 94 | 710–1029 |
| T | 264 | 99 | 210–340 | 252 | 101 | 180–315 |
| Hf s/u | 193 | 101 | 170 | 180 | 101 | 160–208 |
| E | 0 | 98 | 65–92 | 76 | 100 | 60–94 |
| Mass | 12,9 | 77 | 7,2–19,0 | 10,0 | 63 | 7,0–15,9 |

(c)

| | | | | | | |
|---|---|---|---|---|---|---|
| TL | 1170 | 46 | 102–127 | 1093 | 32 | 99–119 |
| Mass | 14,53 | 46 | 8,6–20,0 | 10,98 | 32 | 8,6–14,5 |

The unicolour coat, which is usually grizzled with silvery-white, is thick and soft in the longer winter coat and is shorter and slightly harsher in the summer coat. The colour varies from a pale light reddish in specimens from arid semi-desert areas to sandy-brown or even brick-red in areas of higher rainfall. There is a tendency for material from the southern part of their range in the Subregion to have a greyer rather than a silvery appearance because of the more liberal admixture of guard hair with darker annulations. In all cases the colour is darker down the mid-back; the tip of the tail often has a higher admixture of black hairs, giving it a dark appearance. Below and between the eyes, around the mouth and on the chin the hair is white.

The hair of the guard coat which in winter skins is up to 30 mm long, in summer half this length, is pale in colour at the base, some of the hair with broad whitish annulations near the tips, others with dark brown or black tips. The preponderance of either of these types imparts either a silvery-white colour to the coat or a darker colour. There are indications of a distinct moult commencing with the onset of

the hot weather about October/November. In the winter coat the underfur is thick, the individual hairs wavy and only slightly shorter than those of the guard coat, their colour is lighter than the overall colour of the coat. In the summer coat the underfur is sparse, in some specimens almost imperceptible.

Above and at the level of the inner side of the eyes and the base of the whiskers there is a darker patch on either side and the hair darkens in a line from the forehead to near the nostrils, with a black band between the inner edges of the eyes to the nostrils. The under parts are white from the chest to the belly, the chest spotted, the spots the same colour as the upper parts but lighter in colour. The pointed ears are black on the back with a sprinkling of white hairs, the hair inside the ears white. The long ear tufts are black with some long white hairs. The insides of the limbs are white with indistinct spotting or barring.

The paws are noticeably large, with five digits on the front and four on the back feet. The first digits on the forefeet, the "dew claws", are situated so far back from the other digits that they do not touch the ground and do not mark in the spoor, but are armed with particularly strong, heavily built claws (Fig. 250.1). The claws are creamy-white in colour. Those on the front feet are sharp, characteristically feline and about 24 mm over the curve; those on the back feet are not so sharply curved, more sectorial and about 36 mm across the curve. Both sets are fully protractible. Characteristic features are the unicolour pelage, the long tufts of hair on the tips of the ears which are black at the back, and the short tail.
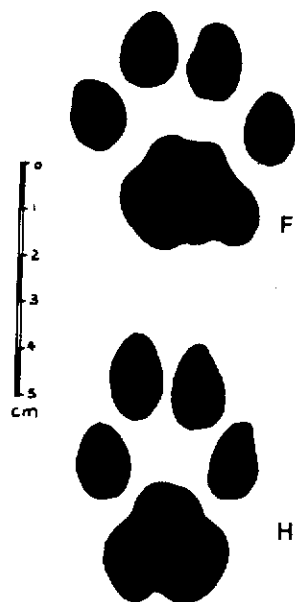


Fig. 250.1. Spoor: caracal, *F. caracal*.
F. Right forefoot H. Right hind foot.

## Skull (Fig. 250.2)

In profile the skull is high and rounded, the highest point about the interorbital constriction from which, posteriorly, it falls away gradually to the supraoccipital crest and, anteriorly, sharply to the short blunt rostrum. The ear bullae are large, reflecting the keen sense of hearing of the species. The supraoccipital crest is well developed and, in older individuals, is joined at right angles by a sagittal crest which continues forward across the top of the cranium giving an extra surface of attachment for the temporalis muscles.

The lower jaw is stoutly built, the coronoid process tall and narrow, giving extra leverage to the temporalis muscles in closing the jaw, the process ridged to give additional hold to the muscle attachments.

The zygoma is thick and heavy, providing substantial attachment for the masseter muscles. The glenoid articulation is elongated transversely, giving a strong hinge joint which, however, allows for sufficient lateral movement to

allow the blades of the carnassial shear to slide past each other accurately.

The dental formula is:

$$I\frac{3}{3}\,C\frac{1}{1}\,P\frac{2}{2} = 24$$

$$I\frac{3}{3}\,C\frac{1}{1}\,P\frac{3}{2}\,M\frac{1}{1} = 30$$

In a sample of 50 skulls $p^2$ was present in only 16%. Permanent dentition was complete at 10 months (Stuart, 1982a). The second upper premolar teeth are usually absent, unlike the serval in which they are usually present, albeit peg-like and poorly developed. The upper molar teeth are minute. The canine teeth are heavy and sharp, in an adult measuring up to 20 mm from the jawbone to the tip, and are well adapted, with their backing of powerful masseter and temporalis muscles, to deliver the killing bite. As is common in felids the teeth of the carnassial shear, consisting of the fourth premolar in the upper jaw and the first molar in the lower, are fully adapted to cutting. The teeth in the lower jaw show no adaptation to crushing, as is found in the canids. In common with other felids the food is sliced into pieces and swallowed without any degree of mastication.
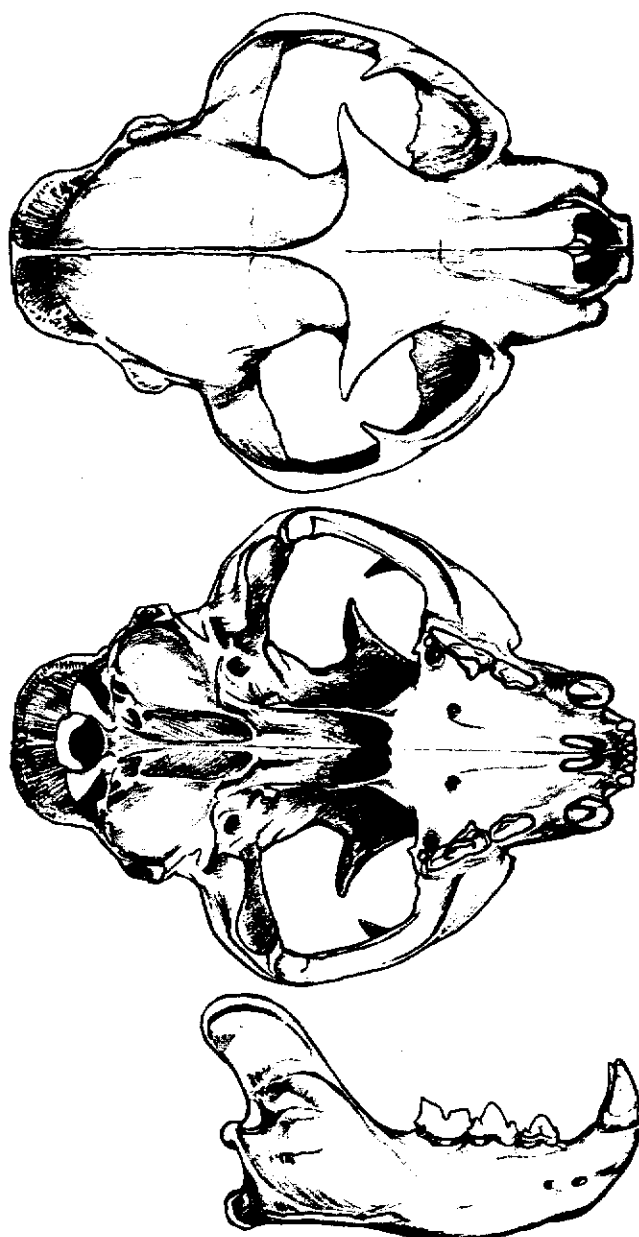


Fig. 250.2. Skull: caracal, *F. caracal*.
TL Skull 150 mm.

## Distribution

In parts of their range (Cape Province) caracals are widespread and common and, as they have become problem

animals, there are many records of their occurrence. Stuart (1982a) recorded that over the years 1931–1952 an average of 2 219 individuals per year were killed in control operations in the Karoo, Cape Province. In other parts, however, they are considered sparse but this may be on account of their being nocturnal and highly secretive.

*Extralimital*

They are recorded from the **Sinai Peninsula; Israel; Jordan; Syria**; southeastern **Turkey; Arabia; Aden**; the **Trucial States; Kuwait; Iraq; Iran; Turkmenskaya** (east of the Caspian Sea); **Afghanistan; Pakistan** and **India.**

*North Africa*

They occur in **Morocco** in the regions between the Anti Atlas and High Atlas Mountains and the coast, and south of the western end of the High Atlas in Ifni; eastward in the coastal area and foothills, in **Algeria** and **Tunisia; Libya** and **Egypt** and south to the **Sudan.**

*South of the Sahara, excluding the Southern African Subregion*

They occur from southern **Mauritania; Senegal; Guinea Bissau; Guinea** and eastwards to the **Sudan; Ethiopia** and **Somalia**; in the Sahel, Sudan and occasionally in parts of the Guinea savannas. South of this there are records from **Uganda, Kenya, Tanzania, Angola, Zambia**, and **Malawi**; and in **Mozambique** they occur in the northeastern sector, north of the Zambezi River.

*Southern African Subregion*

They occur widely in **Namibia, Botswana, Zimbabwe** and **Mozambique**, south of the Zambezi River, but appear to be absent from the southeast. They occur widely in the **Transvaal, Orange Free State** and southeastern parts of **Natal** along the Drakensberg escarpment. In Natal, Rowe-Rowe (1978a) recorded their introduction into the Itala Nature Reserve in 1976, where they have been re-sighted subsequently. They have a wide distribution in the **Cape Province.**
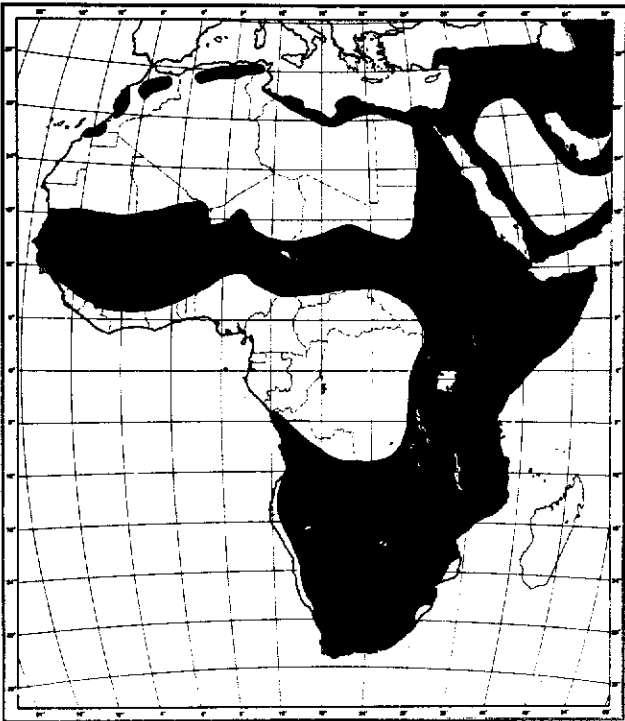


**Habitat**

The caracal can tolerate arid conditions and occurs in the Subregion in semi-desert and karroid areas. They are associated with open country and open savanna woodland, more especially with open vleis and open grassland within this association, even where cover is minimal, consisting of widely scattered clumps of *Acacia* and solitary stands of high grass. They are absent from forested areas in the

Subregion. They occur from sea-level to an altitude of 1 700 m.

**Habits**

They are solitary and predominantly nocturnal, even in undisturbed areas. It is exceptional to find caracals moving during daylight hours. Stevenson-Hamilton (1912) recorded seeing an individual in the Transvaal at 08h00 and Skinner (unpubl.) observed one at 17h00 in summer after rain near Mara. Smithers (1971) saw individuals in Zimbabwe at 15h00 and 16h00 and in Botswana just after sundown at 18h30. Shortridge (1934) believed they hunt by day in cool or cloudy weather and other authors (Maberly, 1963; Williams, 1967) agree they are to some extent diurnal. Normally terrestrial, they are adept tree climbers, making full use of the powerful dew claws in this pursuit. When hunting, they are predominantly terrestrial. Individuals associate to mate, thereafter going their own ways. Of 40 sightings in the wild, all were of single individuals (Smithers, 1983). Moolman (1986a,b) showed that in the Cape Mountain Zebra National Park and its vicinity female home ranges overlapped slightly and varied in size from 3,9 km² to 6,5 km², those of the males, which were widely overlapping, from 5,1 km² to 30,6 km²; male home ranges overlapped those of the females. In the eastern Karoo near Robertson, Stuart (1982a) found three females had slightly overlapping home ranges of 11,8 to 26,7 km², another in the coastal sandveld, a home range of 11,9 km². The only male he tracked in the Karoo had a home range of 48,0 km².

Because of their nocturnal and secretive habits, there is a paucity of field observations. Caught in a spotlight, they make off at speed for the nearest cover, not stopping to look back until they have put a substantial distance between themselves and the observer. Even in daylight their remarkable powers of concealing themselves in meagre cover leads to their being easily overlooked.

Smithers (1983) observed that a captive female's actions when playing are characteristic of the adults' when hunting, when given small birds tossing them in the air and leaping after them and catching them in mid-air. Their speed surpasses that of most cats (Pocock, 1939). In killing, prey are despatched either with preferably a throat bite or a bite in the nape of the neck (Grobler, 1981; Stuart, 1982a; Moolman, 1986). In killing hares, the captive caracal would bite them on the nape of the neck and if they still showed signs of life, she would throw herself on the ground and rake the prey with her back feet.

**Food**

Most information on the prey of caracals emanates from the Cape Province (Table 250.2). The caracal is a hunter killer, generally averse to taking carrion, although they have been recorded doing so (Skinner, 1979; Stuart 1982a). They live predominantly on small and medium-sized prey including the young of larger antelopes, birds and small-sized mammals.

**Table 250.2**

Prey species of caracals, *Felis caracal*, in the Cape Province (from Stuart, 1982a)

| Species | 246 stomachs analysed (Karoo, Sandveld and Bedford) | | 248 stomachs analysed (Karoo, Robertson) | |
|---|---|---|---|---|
| | No. | % | No. | % |
| *Raphiceros melanotis* (Grysbok) | 34 | 10,5 | – | – |
| *Sylvicapra grimmia* (Common duiker) | 21 | 6,5 | 15 | 4,8 |
| *Raphiceros campestris* (Steenbok) | 8 | 2,5 | 8 | 2,6 |
| *Tragelaphus scriptus* (Bushbuck) | 7 | 2,1 | – | – |
| *Redunca fulvorufula* (Mountain reedbuck) | 4 | 1,2 | – | – |

| Species | 246 stomachs analysed (Karoo, Sandveld and Bedford) | | 248 stomachs analysed (Karoo, Robertson) | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Cephalophus monticola (Blue duiker) | 4 | 1,2 | – | – |
| Oreotragus oreotragus (Klipspringer) | 1 | 0,3 | 7 | 2,3 |
| Pelea capreolus (Grey rhebok) | 1 | 0,3 | 4 | 1,3 |
| Ovis aries (Domestic sheep) | 68 | 21,0 | 28 | 9,0 |
| Capra hircus (Domestic goat) | 22 | 6,8 | 24 | 7,8 |
| Unidentified ungulate | 22 | 6,8 | – | – |
| Rhabdomys pumilio (Four-striped mouse) | 11 | 3,4 | 17 | 5,5 |
| Aethomys namaquensis (Namaqua rock rat) | 1 | 0,3 | 57 | 18,4 |
| Pedetes capensis (Springhaas) | 3 | 0,9 | 16 | 5,2 |
| Cryptomys hottentotus (Common mole rat) | 2 | 0,6 | 4 | 1,3 |
| Bathyergus suillus (Dune mole rat) | 2 | 0,6 | 1 | 0,3 |
| Unidentified rodent | 12 | 3,7 | 60 | 19,3 |
| Procavia capensis (Rock hyrax) | 22 | 6,8 | 28 | 9,0 |
| Lepus spp (Hares and rabbits) | 17 | 5,2 | 16 | 5,2 |
| Chrysochloris asiatica (Cape golden mole) | 1 | 0,3 | – | – |
| Crocidura spp (Shrews) | 2 | 0,6 | – | – |
| Galerella pulverulenta (Small grey mongoose) | 8 | 2,5 | 5 | 1,6 |
| Ictonyx striatus (Polecat) | 2 | 0,6 | – | – |
| Cynictis penicillata (Yellow mongoose) | 2 | 0,6 | – | – |
| Atilax paludinosus (Water mongoose) | 1 | 0,3 | 4 | 1,3 |
| Genetta spp (Genets) | 1 | 0,3 | – | – |
| Felis caracal (Caracal, kittens) | 3 | 0,9 | – | – |
| Otomys unisulcatus (Karoo rat) | – | – | 57 | 18,4 |
| Otomys irroratus (Vlei rat) | – | – | 16 | 5,2 |
| Tatera afra (Cape gerbil) | – | – | 4 | 1,3 |
| Hystrix africae australis (Porcupine) | – | – | 1 | 0,3 |
| Small birds (Prinia size) | 7 | 2,1 | 16 | 5,2 |
| Medium birds (Pigeon size) | 10 | 3,2 | 16 | 5,2 |
| Game birds | 7 | 2,1 | 16 | 5,2 |
| Fish | 1 | 0,3 | – | – |

Grobler's (1981) analysis of scats from the Mountain Zebra National Park showed that 93,8% of prey were mammals cf. Moolman's (1986) figure of 94,9% cf. Stuart's (1982a) figure from stomachs of 94,8%, the remaining 6,2%, 4,3% and 5,2% in each case being birds, while Grobler found reptile remains in two scats and Moolman reptiles in 0,8%. In adjacent Karoo farming areas, Moolman (1986b) found a similar picture, 96,9% mammals and 2,1% birds, but 22,9% of the mammals were domestic sheep and goats whose hair was not present in caracal scats from the adjacent National Park. Similarly in stomachs from caracals taken in farming areas, Stuart (1982a) found in the Karoo 27,8% and 16,8% contained hair of small domestic livestock (Table 250.3); Pringle & Pringle (1979) in the eastern Cape Province, 55% and Bester (1982) in the Orange Free State 43%. In half the stomachs Bester (1982) analysed, taken during predator control, remains of wild mammals only occurred, and these were dominated by springhaas, P. capensis (76%) and mountain reedbuck, R. fulvorufula (82%). Comparing scat analysis of caracals with those of Felis lybica and Panthera pardus from the eastern Robertson Karoo, Stuart (1982a) found 93% rodents, 3% shrews, 17% birds, 11% reptiles and 30% invertebrate remains in F. lybica scats and 68% antelope, 32% hyrax and 4% bird remains in P. pardus scats. Palmer & Fairall (1988) from scat analysis from caracals in

the Karoo National Park, found that grey rhebok, P. capreolus, occurred in 28%, hyrax, P. capensis in 22%, Lagomorphs in 19% and rodents in 39%, with Praomys natalensis (13%) and Aethomys namaquensis (11%) being most prominent. Arthropoda remains were found in 17% of scats.

In nine stomach contents from Botswana (Smithers, 1971) mammals had a percentage occurrence of 89%, birds 33% and reptiles 11%. No vegetable matter of any sort was observed in the sample. The largest mammal was an impala, A. melampus, probably a juvenile, other species being springhaas, Pedetes capensis; hares, Lepus spp; and murids, including gerbils, Tatera spp, and the Namaqua gerbil, Desmodillus auricularis; pouched mice, Saccostomus campestris; pygmy mice, Mus spp; multimammate mice, Mastomys spp; and the remains of a goat, Capra hircus. Aves included a grey lourie, Crinifer concolor, a red-billed francolin, Francolinus adspersus, and a button quail, Turnix sylvatica. Reptiles were represented by a black-lined plated lizard, Gerrhosaurus nigrolineatus.

Skinner (1979) recorded mass killing by two caracals in the Cape Province. Overnight they killed 22 sheep, eating part of the buttock of one only. The sheep were killed by biting on the nape of the neck. Mass killings by the smaller cats is a rare occurrence, although it is recorded for leopards, Panthera pardus (Kruuk, 1972) and lions, P. leo (Schaller, 1972a).

Mean daily food intake for captive adult caracals has been estimated at 586 g by Grobler (1981) and 500 g for males and 316 g for females by Moolman (1986b).

## Reproduction

Litters have been recorded in all months of the year, with births peaking between October and February (Stuart & Wilson, 1988). Spermatogenesis is aseasonal and mean length of the oestrous cycle is 14 days (n=15) (Bernard & Stuart, 1987), oestrus lasts 1,8 days (range 1–3; n=7) and copulation lasts 3,8 minutes (range 1,5–8; n=12). The mean gestation period is 79 days (range 78–81; n=5) (Stuart, 1982a). Stuart (1982a) found a mean of 2,2 foetuses (n=22) in gravid females.

Caracals appear to litter down in substantial cover, including in particular disused aardvark holes. The young are born blind, the eyes opening on the 9th or 10th day (Rosevear, 1974). Smithers (1983) found that in a captive female at the age of nine days the black facial markings were pronounced and at 11 days she first started to clean herself; the first sounds of the bird-like twittering were heard on the 12th day. Although the ears were not fully erected, the ear tufts were 10 mm long by the 21st day, the ears fully erected by the 30th day.

Bernard & Stuart (1987) found the youngest captive males to fertilise females were 12,5 and 14 months old and the youngest females to conceive were 14 and 15 months old. Longevity in captivity is recorded as just over 16 years.

No. 251

*Felis lybica*  Forster, 1780

## African wild cat
## Vaalboskat

Plate 20

## Colloquial Name

The African wild cat, F. lybica, differs from the European wild cat, F. silvestris, but there is still some disagreement about the genetic basis for this.

## Taxonomic Notes

The African wild cat, F. *lybica*, interbreeds with the domestic cat, *Felis catus*, where they come into contact. Two features of the African wild cat, F. *lybica*, mark them as distinct from domestic cats, features which are at least partially lost in the progeny, when they interbreed. The first is the rich red colour of the back of the ears. In crosses this red colour may be totally lost, or it may remain to a much lesser degree towards the base of the ears. The second and more striking feature is in the length of the legs. The African wild cat, F. *lybica*, has long slender legs. When they sit upright, the long front legs raise the body into a near vertical position, a posture impossible to the domestic cat or the crosses. Today it is becoming increasingly difficult to find pure-bred African wild cats anywhere near settled areas. The process of hybridisation with domestic cats is a continuing one and, with the increasing human settlement, pure-bred African wild cats may no longer exist, rendering the species vulnerable (Smithers, 1986).

Meester et al. (1986) listed two subspecies for the Subregion: *Felis l. cafra* Desmarest, 1822 and F. *l. griselda* Thomas, 1926. Smithers (1971) gave the distribution of these two subspecies, which have a wide zone of intergradation: F. *l. cafra* occurring in the southern and eastern parts of the Republic of South Africa, north to eastern Zimbabwe and central and southern Mozambique; F. *l. griselda*, the remainder of the species' range in the Subregion. This is based on the general lighter, sandier colour of F. *l. griselda*, which is associated with the drier western part of the Subregion, as opposed to the darker colour of F. *l. cafra*, from the better watered southern and eastern areas, a colour cline often seen in other small mammals.

Within the two subspecies there is considerable variation in colour and markings locally and care must be exercised in assessing characters as, wherever there is contact with domestic cats, interbreeding occurs.

## Description

While there is a general similarity in the marking on the bodies and tails of the two subspecies which occur in the Southern African Subregion, in colour they are very different. The sandier coloured F. *l. griselda* blends well with the sandier coloured conditions ruling in the arid areas, thus gaining a selective advantage. The overall colour of F. *l. griselda* is light sandy, the forehead darker, with an indistinct darker band down the mid-back from the forehead to the base of the tail. The tail is darker than the body, owing to a more profuse admixture of black banded hairs; the upper part has four or five black bands, on a ground colour of greyish white, and a black tip. On the flanks, from the shoulder to the thighs, they have a series of about six indistinct, sometimes barely visible, reddish vertical bands which extend from the dark dorsal band to the under parts. The front legs are distinctly marked with a series of four or five broken black bands on the upper parts and normally two broad black bands on the lower, which contrast distinctly with the lighter colour of the under parts of these limbs. On the back legs there are a series of narrow black or reddish-black bands on the thighs, the remainder of the upper parts of these limbs being light sandy colour, lighter than the body colour. Both the fore and hind feet underneath are jet black.

The chin and throat are white; the chest is white, washed with pale rufous; the lower chest and belly are pale reddish, lighter or near white towards the anus. The throat has one or two encircling reddish bands; the back of the ears are rich reddish.

In F. *l. cafra* the colour is dark grey or iron-grey overall, the markings similar to F. *l. griselda*, but black or grey-black instead of red. The back of the ears and throat band are dark red. Males are normally larger and heavier than females (Table 251.1).

### Table 251.1

Measurements (mm) and mass (kg) of a sample of African wild cats, F. *l. griselda*, from (a) Botswana (Smithers, 1971) and F. *l. cafra* from (b) the Cape Province (Stuart, 1981)

(a)

|  | Males | | | Females | | |
|---|---|---|---|---|---|---|
|  | x̄ | n | Range | x̄ | n | Range |
| TL | 920 | 32 | 850–1005 | 886 | 27 | 820–947 |
| T | 344 | 32 | 320–375 | 336 | 27 | 310–370 |
| Hf s/u | 153 | 34 | 135–170 | 147 | 27 | 138–158 |
| E | 70 | 34 | 64–79 | 68 | 27 | 62–73 |
| Mass | 5,1 | 32 | 3,8–6,4 | 4,2 | 26 | 3,2–5,5 |

(b)

|  | Males | | | Females | | |
|---|---|---|---|---|---|---|
|  | x̄ | n | Range | x̄ | n | Range |
| TL | (906) | | | (845) | | |
| HB | 601 | 21 | 545–665 | 550 | 15 | 460–620 |
| T | 305 | 21 | 275–360 | 295 | 16 | 250–355 |
| Hf s/u | 138 | 21 | 120–150 | 133 | 14 | 120–150 |
| E | 62 | 20 | 55–70 | 64 | 15 | 55–72 |
| Mass | 4,9 | 10 | 4,0–6,2 | 3,7 | 10 | 2,4–5,0 |

As with all subspecies there is a wide zone of intergradation of colour in the area where their distributional ranges approach each other, within which it is difficult, if not impossible, to assign the specimens to one subspecies or another.

Both subspecies have tails that are between 50% and 60% of the length of the head and body. The tails are ringed with black towards the tips, which are broadly black. The feet are hairy below, except on the pads, the hair black or very dark brown. They have five digits on the front feet and four on the back, the first digits on the front feet set far back from the other four and, therefore, not marking in the spoor (Fig. 251.1).
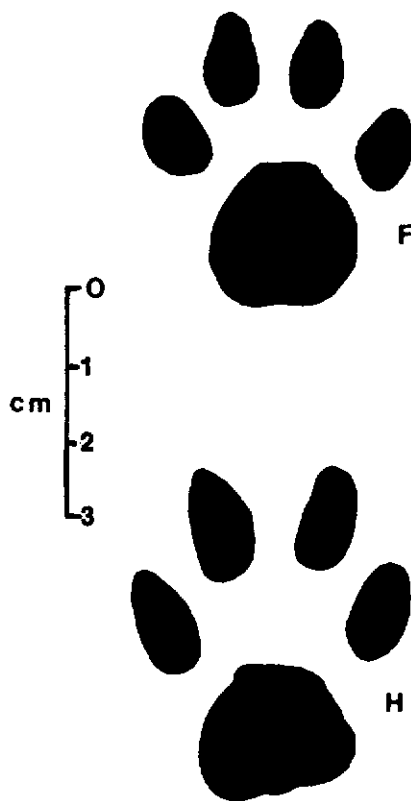


Fig. 251.1. Spoor: African wild cat, F. *lybica*.
F. Right forefoot H. Right hind foot.

## Skull (Fig. 251.2)

The skull is high, arched and comparatively lightly built. In front it falls away sharply to the incisors, reflecting the short muzzle of the species. The zygoma is thick and heavily built, providing substantial attachments for the masseter muscles and, bowed out from the sides of the skull, gives ample space for the well developed temporalis muscles. The supraoccipital crest, which lies at the back of the skull, is wide and

strong and from it a short sagittal crest runs at right angles over the back part of the braincase. In some felids, this sagittal crest continues forward over most of the braincase, giving additional anchorage for the fibres of attachment of the temporalis muscle which activates the closing of the lower jaw. The postorbital processes are well developed above and below but do not join, although there may be a cartilagenous junction, which is lost in the cleaned skull.

The dental formula is:

$$I\frac{3}{3} C\frac{1}{1} P\frac{3}{2} M\frac{1}{1} = 30$$

The presence of the second premolar in the upper jaw is not constant and, in a sample of 137 adult wild cat skulls of both sexes, in 5,1% they were absent and in a further 2,2% occurred on one side only. In all cases, where they are present, they are small and peg-like. The carnassial shear is adapted to cutting up the prey once it has been killed. Almost the whole of the upper fourth premolar and the lower first molar, which occlude one on another, are provided with sharp edges which act as cutting blades for chopping up the toughest of prey. In addition the cutting edges on the first lower molar lie at an angle to each other which prevents tough prey slipping away. The canines are flattened, long and sharp, adapted to performing the killing bite by entering between the neck vertebrae of their prey, forcing these apart and severing the spinal column.

The bullae are large, reflecting the keen sense of hearing of the species. Corresponding with the slightly larger size of males, the total length of their skulls is slightly larger than in females. The length of the toothrow, measured from the front of the canine, at the junction with the bone, to the back of the molar in the upper jaw, and the breadth of the back of the palate measured between the bases of the upper first molars on either side of the upper jaw ($M^1$-$M^1$) show, however, little sexual difference (Table 251.2).

## Table 251.2

Average skull measurements (mm) of a series of African wild cats, F. lybica from (a) Zimbabwe (Smithers, 1983) and (b) the Cape Province (Stuart, 1981)

| | (a) | | | (b) | | |
|---|---|---|---|---|---|---|
| **Males** | | | | | | |
| | $\bar{x}$ | n | Range | $\bar{x}$ | n | Range |
| TL | 102,8 | 25 | 95,5–110,5 | 102,0 | 18 | 95,0–116,0 |
| Condylobasal length | 92,8 | 25 | 86,8–101,1 | | | |
| Length toothrow | 32,9 | 25 | 29,9–38,4 | | | |
| $M^1$-$M^1$ | 32,2 | 25 | 32,0–36,9 | | | |
| **Females** | | | | | | |
| TL | 98,5 | 28 | 93,6–107,2 | 96,0 | 7 | 90,0–103,0 |
| Condylobasal length | 88,4 | 28 | 83,3–96,6 | | | |
| Length toothrow | 31,6 | 28 | 28,9–33,9 | | | |
| $M^1$-$M^1$ | 33,0 | 28 | 30,0–36,0 | | | |



Fig. 251.2. Skull: African wild cat, F. lybica. TL Skull 100 mm.

## Distribution

The African wild cat, *Felis lybica*, has a wide distribution on the continent, being absent only in tropical and montane forest. Extralimitally, their distribution extends to the Sinai Peninsula, Arabia and countries bordering the eastern Mediterranean, eastwards to the plains of India. In many parts of their range they are the commonest small carnivore occurring.

## North Africa

Discontinuously distributed in **Western Sahara** and **Morocco**, they occur eastwards in **Algeria**; **Tunisia** and **Libya**; narrowly between the fringes of the Sahara and the Mediterranean coast, to **Egypt** and in northwestern **Niger** in the Aïr massif.

## South of the Sahara, excluding the Southern African Subregion

They occur in the **Sudan**, excluding the southeastern extension of the Sahara; **Ethiopia**; **Somalia**; **Kenya**; **Uganda**; **Tanzania**; **Zaïre**, excluding the forested areas of the Congo basin, and westwards in the Guinea and Sudan savannas and in part of the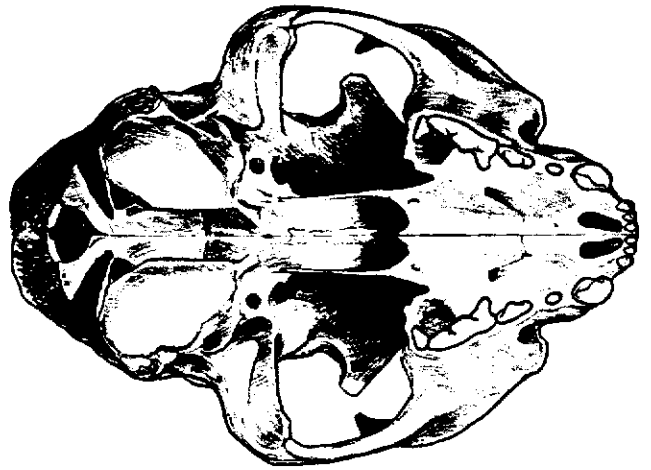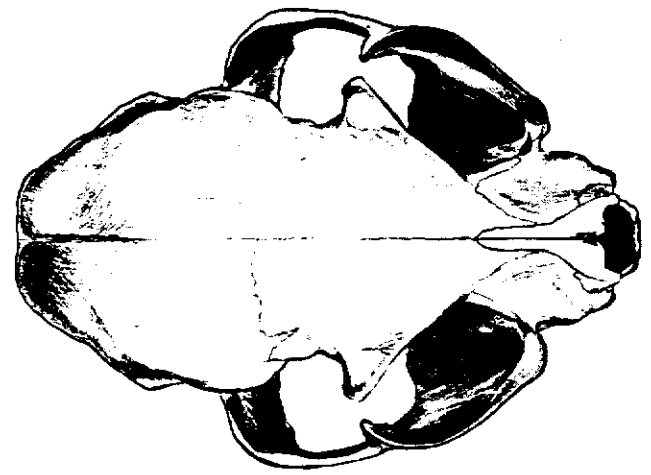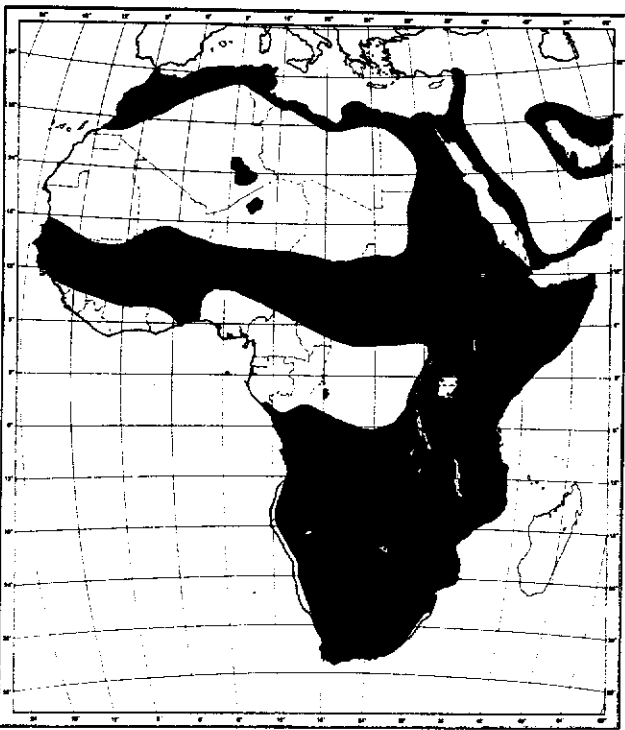 Sahel, to northern **Sierra Leone** and southern **Mauri-**tania. South of this they are recorded from **Angola; Zambia; Mozambique**, north of the Zambezi River and **Malawi**.

## Southern African Subregion

In **Namibia** they occur widely, except in the coastal Namib Desert; throughout **Botswana**; **Zimbabwe** and **Mozambique**, south of the Zambezi River. In the **Transvaal** and **Orange Free State** they occur throughout. In **Natal** they occur widely, but appear to be absent from the low lying, coastal regions; they are found throughout the **Cape Province**.

## Habitat

The African wild cat has a wide habitat tolerance. In the Subregion they occur at altitudes of between sea level and about 1 600 m. Their distribution on a continental basis follows the isohyet of mean annual rainfall of 100 mm quite closely, below which they normally do not occur except where river courses act as avenues into otherwise drier terrain, or where isolated mountains catch a slightly higher rainfall than the surrounding country (Sahara).

**Table 251.3**

Percentage occurrence of food items in a sample of 58 stomach contents of African wild cats, *F. lybica*, from Zimbabwe and 80 from Botswana (Smithers, 1971; Smithers & Wilson, 1979)

| Item | Percentage occurrence Zimbabwe | Botswana |
|---|---|---|
| Muridae | 72 | 74 |
| Aves | 21 | 10 |
| Insecta | 19 | 19 |
| Reptilia | 10 | 13 |
| Mammalia | 9 | 6 |
| Solifugae | 7 | 18 |
| Amphibia | 2 | 1 |
| Araneae | 2 | 1 |
| Myriapoda | 2 | 1 |
| Scorpiones | — | 2 |
| Wild fruit | 2 | 1 |

**Table 251.4**

Percentage occurrence of species of murids occurring in a sample of 58 stomachs of African wild cats, *F. lybica*, from Zimbabwe and 80 from Botswana (Smithers, 1971; Smithers & Wilson, 1979)

| Species | Percentage occurrence Zimbabwe | Botswana |
|---|---|---|
| Multimammate mice, *Mastomys* spp | 31 | 8 |
| Angoni vlei rat, *Otomys angoniensis* | 14 | — |
| Bushveld gerbil, *Tatera leucogaster* | 12 | 40* |
| Pouched mouse, *Saccostomus campestris* | 3 | 8 |
| Fat mouse, *Steatomys pratensis* | 3 | 5 |
| Pygmy mouse, *Mus minutoides* | 3 | 15 |
| House rat, *Rattus rattus* | 2 | — |
| Creek rat, *Pelomys fallax* | 2 | — |
| Namaqua rock mouse, *Aethomys namaquensis* | 2 | 3* |
| Hairy-footed gerbil, *Gerbillurus paeba* | — | 6 |
| Grey pygmy climbing mouse, *Dendromus melanotis* | — | 1 |

*Involves species other than those on the Zimbabwe list.

Throughout their range they require cover of some sort in the form of rocky hillsides, underbush, reedbeds or stands of tall grass in which to rest during the day. In open semi-desert country such as the Kalahari, they will use isolated stands of *Acacia* scrub or other bushes (Smithers, 1971). Where adequate cover of vegetation is not available in plains country, they will lie up in holes in the ground excavated by other species such as the antbear, *Orycteropus afer*, under the roots of trees, where the soil is eroded away, or in holes in termitaria. Riverine underbrush, thickly wooded kloofs, dense underbrush on termitaria, piles of rocks or debris thrown up by flooding have also been recorded, as well as agriculturally developed areas, where they use the shelter of standing crops such as maize and other high standing grain crops.

**Habits**

They are almost entirely nocturnal, and usually move late after sundown. An oestrous female may be attended by several males, otherwise wild cats are a solitary species. They have terrestrial habits, although they are adept at climbing trees under stress or when hunting. They are secretive and cunning and are difficult to trap. They are highly territorial and the territories, which are marked both by the males and females, are defended by both sexes. With two hand-reared, free-ranging *F. lybica* females, territorial instincts only became apparent some time after each had produced a litter (Smithers, 1983). Territories are assiduously urine-marked, each over-marking various points marked by the other. They "caterwaul" loudly at each other before an attack develops.

**Food**

Murids predominate in their diet as shown by analyses of the stomach contents of 58 specimens from Zimbabwe (Smithers & Wilson, 1979) and 80 from Botswana (Smithers, 1971) (Table 251.3); the eastern Robertson Karoo and Karoo National Park respectively (Stuart, 1982a; Palmer & Fairall, 1988). There are close similarities between the occurrence of the other items, except that birds are less well represented in the Botswana sample; hunting spiders, Solifugae, on the other hand, are better represented, reflecting their commoner occurrence in this semi-desert habitat as opposed to the higher rainfall areas in Zimbabwe.

Multimammate mice, *Mastomys* spp had by far the highest occurrence in Zimbabwe and were found in stomachs in every month of the year (Table 251.4). This reflects their wide habitat tolerance as the commonest murid species occurring in this savanna woodland habitat. As they do not occur in desert or semi-desert areas and as the latter association covers the largest part of Botswana, their occurrence in this sample is much lower. Angoni vlei rats, *Otomys angoniensis*, wander far from swampy areas to feed on the new flush of grasses, which constitute their main food, when they become available. All the occurrences of vlei rats in stomachs from Zimbabwe are from the months of March to July, indicating that the wild cats were catching these during the times when they were wandering out of their swampy habitat. The high occurrence of gerbils, *Tatera* spp, in the Botswana sample reflects their wide occurrence throughout. Two species, *T. leucogaster* and *T. brantsii* occur, but it was not at that time possible to specifically identify the material in stomachs. *T. brantsii* has a very limited distribution in Zimbabwe, the common and widespread species there being *T. leucogaster*. Both species are nocturnal and, therefore, available to the nocturnal wild cat. The house rat, *Rattus rattus*, is an introduced commensal and does not occur in the veld and, therefore, must be taken in the vicinity of homesteads, farm outbuildings and stores. So far it has not been shown to occur in Botswana but is well established in Zimbabwe. The wild cat is not averse to hunting close to human habitations as is shown by its predatory habits on poultry, at which times house rats become available to them.

The highest occurrence of birds in stomach contents in Zimbabwe was poultry in the form of ducks and chickens (Table 251.5). The largest wild bird in the two samples was a korhaan, *Laephotis* sp, but they are known to take species up to the size of a guineafowl, *Numida mitrata*.

## Table 251.5

Breakdown of species of the Aves occurring in a sample of 58 stomachs of African wild cats, F. lybica, from Zimbabwe and 80 from Botswana, showing the percentage occurrence (Smithers, 1971; Smithers & Wilson, 1979)

| Species | Percentage occurrence | |
|---|---|---|
| | Zimbabwe | Botswana |
| Poultry | 7 | — |
| Turtle dove, Streptopelia capicola | 3 | 3 |
| Button quail, Turnix sylvatica | 2 | 4 |
| Korhaan, Laephotis sp | 2 | 1 |
| Harlequin quail, Coturnix delegorguei | — | 1 |
| Quelea, Quelea quelea | 2 | 5 |
| Undet. weavers | 3 | — |

Most small carnivores eat reptiles and the wild cat is no exception. These are treated in the same way as murids and are chopped into sections without mastication, rendering their identification easier. The wide range of species represented is listed. They occur at 10% and 13% for the two areas (Table 251.6).

## Table 251.6

Species of Reptilia occurring in a sample of 58 stomachs of the African wild cat, F. lybica, from Zimbabwe (Smithers & Wilson, 1979) and 80 from Botswana (Smithers, 1971)

| Species | Zimbabwe | Botswana |
|---|---|---|
| **Sauria** | | |
| Many lined plated-lizard, Gerrhosaurus multilineatus | + | — |
| Black lined plated-lizard, G. nigrolineatus | + | + |
| Striped scrub-lizard, Nucras taeniolata | + | — |
| Common striped skink, Mabuya striata | + | — |
| Variable skink, M. varia | — | + |
| Sundevall's writhing skink, Lygosoma sundevallii | + | + |
| Percival's limbless skink, Acontias percivali | — | + |
| Sand lizard, Eremias sp | — | + |
| Worm lizard, Zygaspis quadrifrons | — | + |
| Whistling gecko, Ptenopus garrulus | — | + |
| **Serpentes** | | |
| Black templed cat snake, Crotaphopeltis hotamboeia | + | — |
| Schlegel's blind snake, Typhlops schlegelii | + | — |
| Puff adder, Bitis arietans | — | + |
| Pygmy sand snake, Psammophis angolensis | + | — |

Note: The Mozambique writhing skink, Lygosoma afer, was recognised in a stomach from Mozambique.

Apart from the murids already listed, other mammals had occurrences of 9% and 6%. In the Zimbabwe sample the scrub hare, Lepus saxatilis, and the red rock rabbit, Pronolagus spp, were both recorded, as well as an elephant shrew, Elephantulus sp, an unusual food item for small carnivores. In one stomach there were the remains of a very young, perhaps newly-born, grysbok, Raphicerus sharpei, or steenbok, R. campestris. The taking of the young of small antelopes has been recorded by Watson (1950), Maberly (1963) and Dorst & Dandelot (1970). They are not capable of taking adults.

Amphibia were represented in both samples by the bullfrog, Pyxicephalus adspersus, and Myriapoda by the centipede, Scolopendra morsitans.

Insects in both samples consisted predominantly of grasshoppers and crickets, but included Isoptera and, in Botswana, Lepidoptera in the form of the convolvulus hawk moth, Herse convolvuli, from the stomachs of two specimens taken at the Makgadikgadi Pan during an unprecedented hatch of these moths.

Sunspiders, Solifugae, which were much commoner in the Botswana sample, were recorded mainly from the warm wet months of the year, October to March, when they move widely at night and were in evidence, especially around camp lights, searching for their insect prey.

In the Zimbabwe sample the fruits of the jackal-berry, Diospyros mespiliformis, were found in two stomachs; these are commonly eaten by small carnivores.

During the last two years of the four year drought of 1962/65 in Botswana, when murid populations were at an unprecedented low level (Smithers, 1971), contents of 16 wild cat stomachs consisted of invertebrates, fruit and birds only. They are capable of switching their food requirements to what is available.

Their hunting technique is typically felid: the stalk, the crouch, accompanied by a settling of the back feet to get a good grip on the ground, and then the rush in to the kill. Capture of small mammals is achieved by the use of the claws of the front feet, the killing bite delivered with the blade-like canines on the neck of the prey, the vertebrae being forced apart and the spinal cord severed. With larger prey the individual may throw itself on its side, raking the prey with its back claws, until the killing bite becomes effective.

### Reproduction

Litters of two to five, averaging three, are born during summer from September to March, with occasional records outside this period, in holes in the ground, excavated by other species such as the antbear, Orycteropus afer, or the springhaas, Pedetes capensis. They do not dig themselves. Other situations recorded include crevices in rocks, under thick underbush, in tall grass stands and in the shelter of standing maize. No bedding material is used, although a litter found in a maize land had been born on top of a pile of fallen leaves and other debris which effectively insulated the young from the soil. A captive free-ranging female Felis lybica produced litters as follows (the number of kittens in the litters indicated in parentheses) (Smithers, 1983):

| 1966 | February | (1) | August | (2) | | |
|---|---|---|---|---|---|---|
| 1967 | June | (3) | October | (1) | | |
| 1968 | May | (3) | | | | |
| 1969 | February | (3) | June | (5) | October | (5) |

The male does not appear to assist in the rearing of the young, but when one female in captivity was rearing kittens, the other female would bring mice or birds to them when their mother was away. When the female with young was in the enclosure the "auntie" simply left the offering at the entrance gate.

A captive reared African wild cat crossed with a serval, F. serval, and produced several litters over a period of three years that reached maturity (Fig. 251.3). The kittens were in every case premature. The gestation period was 63 days as against 65 for the wild cat or 68–74 for the serval (Smithers, 1983).



Fig. 251.3. Hybrid F. lybica x F. serval bred by Mrs. M. Schmolke of Harare, Zimbabwe (Photo C.K. Brain).

No. 252

## Felis nigripes   Burchell, 1824

### Small spotted cat
### Klein gekolde kat

Plate 20

## Colloquial Name

The colloquial name black-footed cat is entrenched throughout the Subregion, which is unfortunate. First, only the under parts of the feet are black, the upper parts are never black. Secondly, African wild cats, *F. lybica*, are in many cases also black under the feet which has led to confusion between the two species.

*Miershooptier* has been used in Afrikaans; this is applied because of their high degree of association with termite mounds.

## Taxonomic Notes

There are two subspecies *F. n. nigripes* from the Kalahari and *F. n. thomasi* from the Karoo. With Shortridge's (1931a) description of the reddish-fawn *F. n. thomasi* and the pale, almost tawny specimens from Botswana, north and northwest of Kuruman, we can see clearly that the two subspecies do differ, at least in colour.

## Description

The small spotted cat is the smallest of the felids occurring in the Subregion, to which it is confined (Table 252.1).

## Table 252.1

Measurements (mm) and mass (kg) of a series of small spotted cats, *F. n. nigripes*, from Botswana (Smithers, 1971)

|  | Males | | | Females | | |
|---|---|---|---|---|---|---|
|  | $\bar{x}$ | n | Range | $\bar{x}$ | n | Range |
| TL | 579 | 5 | 540–631 | 513 | 3 | 495–530 |
| T | 177 | 5 | 164–198 | 153 | 3 | 126–170 |
| Hf s/u | 99 | 5 | 94–104 | 92 | 3 | 89–94 |
| E | 54 | 5 | 51–57 | 47 | 3 | 45–50 |
| Mass | 1,6 | 5 | 1,5–1,7 | 1,1 | 3 | 1,0–1,4 |

The body is marked with lines and spots, the background colour in the southern part of the range (*F. n. thomasi*) cinnamon-buff, in the northern (*F. n. nigripes*) lighter in colour, being tawny, in some specimens off-white. On the nape of the neck of those from the northern areas there are four black bands running on to the shoulder, these often broken into short lengths or spots. The outer two on either side swing over the shoulders and on to the flanks; the inner two break into spots or short bands down the middle of the back and continue to the base of the tail. In specimens from the south the four bands may be strongly developed and, originating on the forehead, the two central ones extend unbroken to the base of the tail.

In the southern subspecies, *F. n. thomasi*, the spots and bands are satiny black, and are defined more clearly; in the northern, *F. n. nigripes*, more washed out, less distinct and tinged rusty. In both, the limbs have a series of three broad transverse black bars on the upper parts and shorter narrow bars towards the feet, these sometimes taking the form of spots. The tail has the same background colour as the back and is indistinctly spotted to near the tip in both subspecies. The chin, chest and insides of the thighs are white in both subspecies; the remainder of the under parts is washed with buff in *F. n. thomasi*, pure white in *F. n. nigripes*, in both cases with black spots and bars.

A distinctive feature of *F. n. thomasi* is the three throat rings, which are black, narrowly edged with rufous; in *F. n. nigripes* they are reddish-brown or black, edged with reddish-brown or rufous. In some individuals only two rings are in evidence, the third ring indistinct or broken; in others it is barely distinguishable. The head is usually slightly darker than the remainder of the body, being suffused with dark, white-tipped hair. The hairs of the coat are about 25 mm to 30 mm long, grey at their bases and conform to the general colour of the upper parts throughout their length, except that some have white, others dark, subapical annulations and white or tawny tips. The hairs of the spots and bars are satiny black in *F. n. thomasi*, in *F. n. nigripes* brownish-black or tawny. The hairs of the dense underfur are fine, wavy and not as long as the guard hairs.

The tail is short, narrowly black-tipped and less than half the length of the body and head; the legs are relatively long. The backs of the ears are predominantly the same colour as the background of the upper parts, often darker. The under-

sides of all four feet are black, or very dark blackish-brown. The spoor is identical to that of *Felis lybica*, only about half the size (see Fig. 251.1).

## Skull (Fig. 252.1)

The skull of the small spotted cat is high and rounded, with a flatter section on top from the level of the eye orbits to the middle of the braincase, where it slopes off abruptly to the supraoccipital crest. In the front it slopes sharply from above the front of the eye orbits to the nasals, the rostrum being very short and broad. The zygomatic arches swing out widely at the back, their width at this point about 75% of the total length of the skull. The postorbital constriction is wide, about 40% of the total length of the skull. The postorbital bars are incomplete. The jugals, which form the anterior part of the zygomatic arch, are very broad in front and concave internally, where they support the very large eyeballs.

The dental formula is:

$$\text{I}\frac{3}{3} \text{ C}\frac{1}{1} \text{ P}\frac{3}{2} \text{ M}\frac{1}{1} = 30$$

The outer, upper incisors are only very slightly larger than the remainder, the canines very sharp and flattened on their inner sides. The upper second premolars are tiny, the fourth sectorial. The molars are tiny. The canines in the lower jaw curve evenly from the bases and are long and sharp. The first molar, which functions as the lower part of the carnassial shear, has sharp edges, the cusps set in a wide open V which prevents tough food sliding out while being cut.

The bullae are large and swollen, their total length about 25% of the total length of the skull; their width, at the widest point, about 18%.

The pattern of the teeth follows the characteristic felid arrangement in their adaptation to the killing bite, with long, sharp, blade-like canines, and in the sectorial action of the other teeth in slicing the food into sections suitable for swallowing.

## Distribution

The small spotted cat is confined in its distribution to the central parts of the Subregion, within the South West Arid Zone, with an extension eastwards to eastern Lesotho.

### Southern African Subregion

In **Botswana** they occur from just south of the Okavango Delta at about 20°S, throughout the southwestern parts of the country, but are not recorded in the eastern sector. In **Namibia** they are confined to the central and southern parts of the eastern areas of the country from about 20°S on the Botswana border, and narrowly southwards to where the Namibia border meets the Orange River, but not west of about 17°E. They may occur westwards of the present known limits in dry water courses which run in this direction from the escarpment, but no material exists at the moment to confirm this. They occur in the **Orange Free State**. There is a record from the eastern Injasuti Triplets peak in the Drakensberg in **Lesotho** at an altitude of 2 000 m on a snow covered ledge. They occur widely in the **Cape Province** from the west coast, near Bitterfontein, from several localities in the Calvinia and Ceres districts, and from Montagu, which suggests that they may occur over much of the interior, eastwards to the eastern parts of the Province. Surveys in the **Transvaal** (Rautenbach, 1978) show that they occur only marginally in the southwestern parts of the province, with a recent record of a roadkill from Marble Hall

## Plate 20

250. Caracal, *Felis caracal*
     Rooikat
251. African wild cat, *Felis lybica*
     Vaalboskat
252. Small spotted cat, *Felis nigripes*
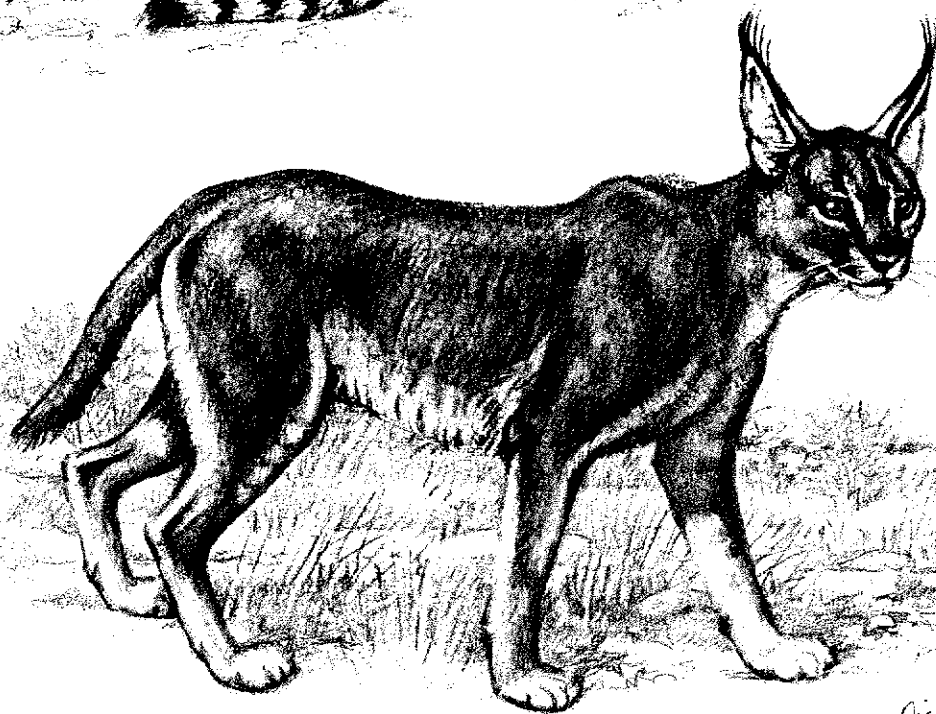     Klein gekolde kat
253. Serval, *Felis serval*
     Tierboskat

PLATE 20
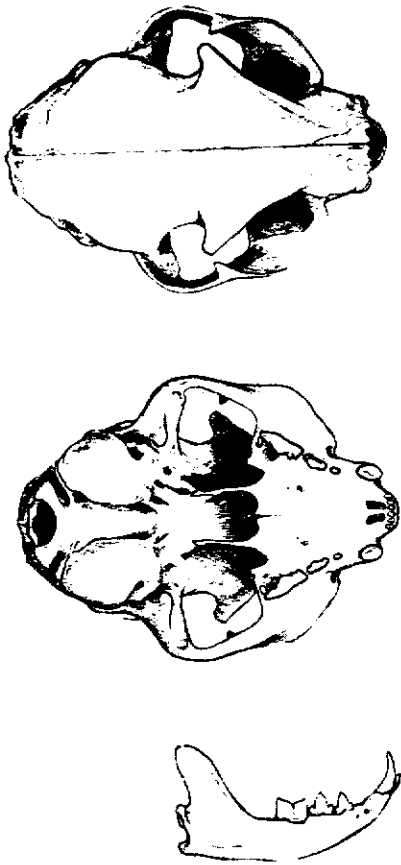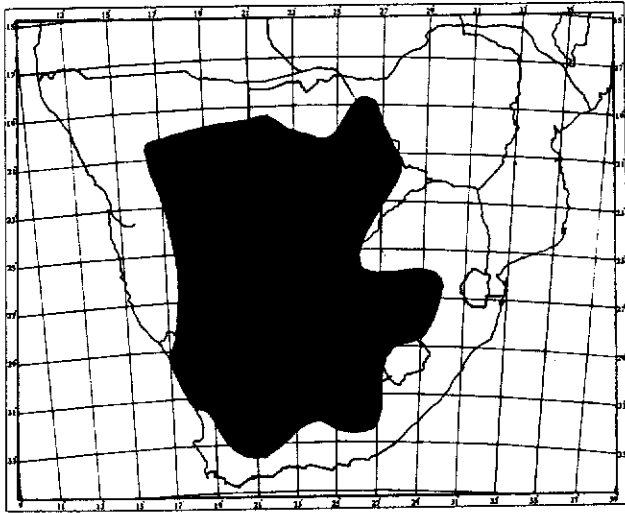
253

251

252

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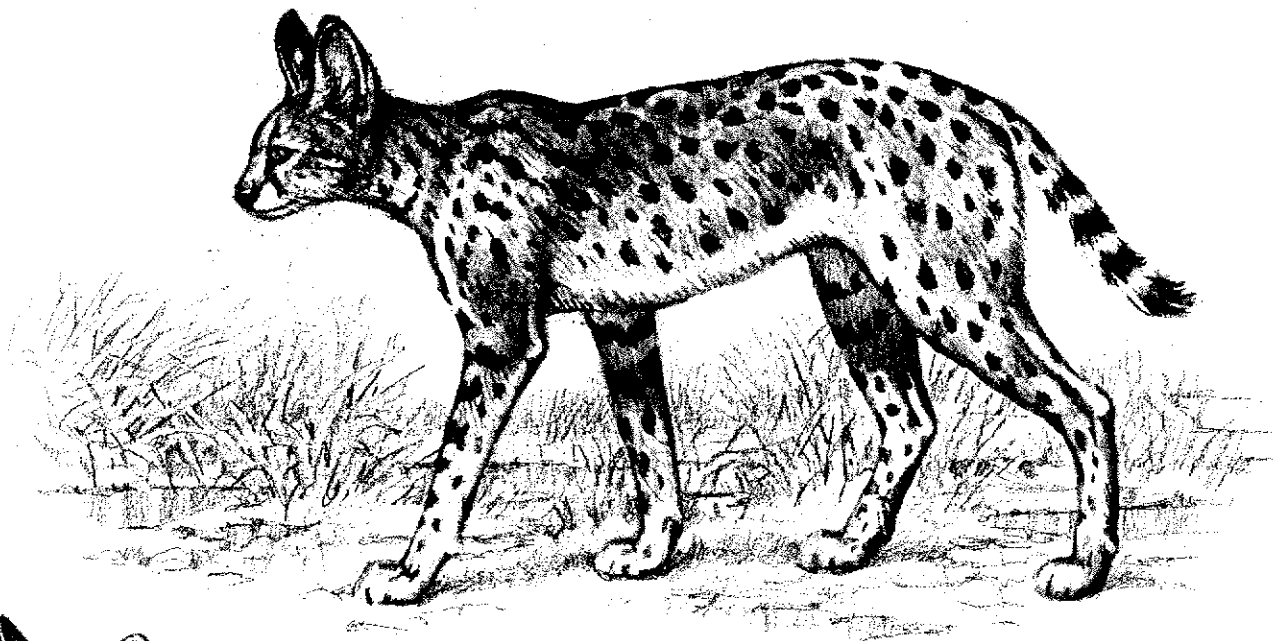
Dick Findlay

Fig. 252.1. Skull: small spotted cat, *F. nigripes*.
TL Skull 80 mm.



(Skinner, 1989, unpubl.), but no link as yet with the main population.

## Habitat

Throughout their range small spotted cats are associated with arid country with a mean annual rainfall of between about 100 to 500 mm, particularly with open habitat which provides some cover in the form of stands of tall grass or scrub bush to which they will retreat quickly if disturbed. They will also use disused springhaas or antbear holes or holes in termite mounds in which to lie up during daylight hours. They are independent of water but will drink occasionally when this is available.

## Habits

They are a nocturnal and highly secretive species, not being in evidence until some two hours after sunset. They are not common anywhere throughout their range, and very little has been published on their habits in the wild. If caught in the beam of dazzling lights at night their reaction is to slink off, only looking back to reveal their brightly shining eyes momentarily as they make for the nearest cover to hide. Most observations are of solitary individuals. For their size they are vicious and aggressive, intractable in captivity, quite unlike the African wild cat, which, reared under the same conditions, may show some independence, but lends itself more easily to domestication.

## Food

In a sample of seven stomach contents from Botswana (Table 252.2), murids had the highest percentage occurrence and included the grey pygmy climbing mouse, *Dendromus melanotis*; the pouched mouse, *Saccostomus campestris*; the Namaqua gerbil, *Gerbillurus paeba*, and gerbils, *Tatera* spp. Reptilia consisted of the remains of the spiny agama, *Agama hispida*. Arachnida consisted principally of hunting spiders, Solifugae, among which *Solpuga monteiroi* was well represented, together with the remains of small spiders, *Palystes* sp. Insects were principally small adult Coleoptera.

### Table 252.2

The percentage occurrence of various food items in seven stomach contents of the small spotted cat, *F. nigripes* from Botswana (Smithers, 1971)

| Food item | Percentage occurrence |
|---|---|
| Muridae | 57 |
| Arachnida | 43 |
| Macroscelididae | 14 |
| Reptilia | 14 |
| Insecta | 14 |
| Aves | 14 |

## Reproduction

Rautenbach (1978) recorded a female with two foetuses in November from the Transvaal and Visser (1977) stated that the gestation period is 67 to 68 days, litters of one to three kittens with a mass of 66 to 80 g being born in November or December. The eyes open 3–9 days after birth.

No. 253

*Felis serval*   Schreber, 1776

Serval
Tierboskat

Plate 20

## Colloquial Name

The English colloquial name is derived from the Portuguese for the European lynx, "lobo-cerval" (Rosevear, 1974). Forster (1781) in his description of the species from the Cape used the name "*Tyger bosch katten*", applied to the species by Kolb (1719). The Afrikaans name is a literal translation of this and is still widely used.

## Taxonomic Notes

Allen (1939) listed 17 subspecies from the continent, three of the small spotted *F. brachyura* and 14 of *F. serval*. Ellerman *et al.* (1953) considered the small spotted forms as merely pattern phases or mutants of the normal *F. serval*. This view has not been accepted universally up to the present time (Ansell, 1978). It is well known, however, that spotted cats, in particular, are prone to produce aberrant forms. To date, no small spotted forms corresponding to the extreme, as exemplified by *F. brachyura*, have been taken in the Subregion. Meester *et al.* (1986) relegated all the material from the Subregion to *F. s. serval*.

## Description

The serval is an elegant species, with its long legs and neck, small head, large ears and beautifully spotted and barred coat. One feature of the serval is the long, slimly built limbs

which give it a height at the shoulder of about 0,6 m. The serval's ears are particularly large, broad at the base with rounded tips, their size accentuated by the comparatively small head. The tail is short, about 40% of the length of the head and body (Table 253.1).

**Table 253.1**
Measurements (mm) and mass (kg) of servals, *F. serval*, from the Harare District, Zimbabwe (Smithers, 1978)

|  | Males | | | Females | | |
|---|---|---|---|---|---|---|
|  | x̄ | n | Range | x̄ | n | Range |
| TL | 1111 | 23 | 960–1205 | 1 097 | 23 | 970–1230 |
| T | 814 | 23 | 280–380 | 290 | 23 | 254–330 |
| Hf s/u | 193 | 23 | 180–205 | 182 | 23 | 165–194 |
| E | 91 | 23 | 83–97 | 86 | 23 | 80–97 |
| Mass | 11,13 | 20 | 8,63–13,53 | 9,67 | 23 | 8,63–11,80 |

The background colour of the upper parts varies greatly in individuals from a restricted area and may vary from off-white to a light golden-yellow, often with a broad darker band of yellow or golden-yellow down the mid-back, which sometimes is suffused with grey. The black bands and spots, which are so characteristic of the species, vary in width and size and there is a wide variety of combinations of marking and background colour within populations from relatively small areas. In spite of this the black markings of specimens from the Subregion conform to a recognisable pattern. Arising from between the ears a series of black bands extends down the neck, the outer two swinging outwards across the top of the shoulders on to the flanks. These two bands are usually distinct and unbroken on the neck, but tend to break up on the shoulders and flanks into short bars or spots. The inner two are usually less distinct, more broken up, and end behind the shoulders. Between them at shoulder level, a further two black bands arise, usually broken into short bars which continue to the base of the tail. The flanks are distinctly spotted, this continuing on to the upper parts of the limbs. The upper parts of the front limbs are encircled with two broad black bands; in some specimens the upper band in front breaks up into short bars or spots. The hind limbs are similarly banded, but only on their inner sides; these bands break into short bars or spots on the outer sides, in some individuals giving the impression of bands. The marking on the back of the ears is very characteristic, consisting of two black bands, one covering the tip, the other about half way down, with a pure white band between them; the front is covered with pure white hair.

The under parts are lighter in colour than the upper and in some specimens are pure white from the chin to the base of the tail, with a distinct black collar high up on the neck, black spotting lower down and black spots or bars on the chest and upper parts of the belly.

The tail has a series of black encircling bands or, in some specimens, irregular black markings that give the impression of bands. The tip is black, the ground colour similar to that of the upper parts.

The hair of the guard coat on the upper parts is soft and, while shorter on the head, about 10 mm, is fairly even in length over the remainder of the body at about 30 mm. The underfur is dense, wavy and shorter than the hairs of the guard coat and tends to have a tinge of grey at the base. Interspersed through the coat are numerous tactile hairs up to about 60 mm in length with pale bases and broad black tips. They have five digits on the front feet. The fifth digit, which carries the dew claw, is set far back from the other four and does not mark in the spoor. They have four digits on the hind feet (Fig. 253.1).

**Skull** (Fig. 253.2)
Compared with its close relative the caracal, the skull of the serval is lightly built, lacking the high sagittal crest and the flange-like supraoccipital crest which are features of the skull of the caracal. Typically feline in outline, the highest point is about the level of the postorbital bars. The front portion of the serval skull does not fall off so abruptly to the nasals as in the caracal, reflecting its more forward projecting muzzle. Even in old specimens with well worn teeth the sagittal crest only reaches the back of the braincase, continuing forward over the top of the skull as two low, barely
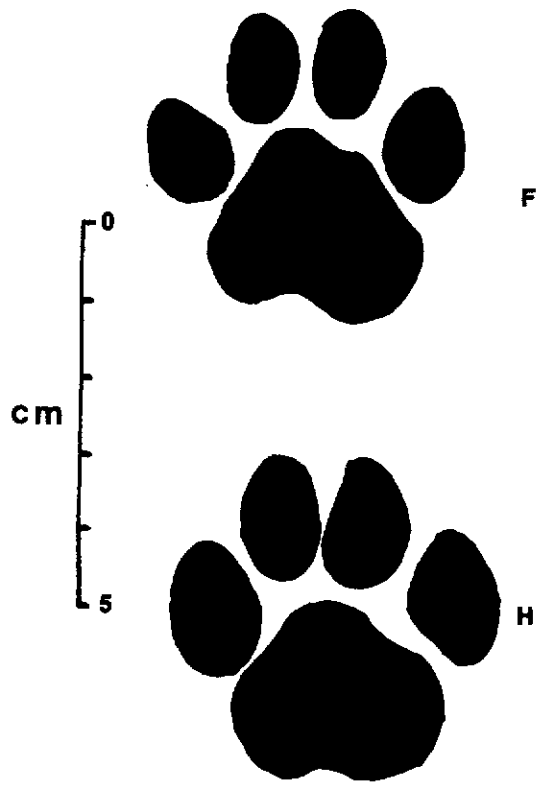


Fig. 253.1. Spoor: serval, *F. serval*.
F. Right forefoot H. Right hind foot.

discernible ridges, between which the bone is smooth and to a large extent devoid of muscle attachments. The braincase is broader and rounder than in the caracal; the zygomatic arches do not swing out so widely, their width about 60% of the total length of the skull as opposed to 75% in the case of the caracal. The postorbital constriction is broad, about 27% of the total length of the skull compared with 20% in the caracal. The postorbital bars are incomplete, even in old individuals.

The dental formula is:

$$I\frac{3}{3} C\frac{1}{1} P\frac{3}{2} M\frac{1}{1} = 30$$

The small second upper premolar, which is the first tooth behind the canine and normally absent in the caracal, was present in all specimens examined. The upper fourth premolar, which forms the upper section of the carnassial shear, is adapted to cutting; the molar is small but slightly better developed than in the caracal. The coronoid process of the lower jaw never reaches the height and development seen in the caracal, reflecting the lack of need in the serval for the extra powerful jaw action required by the caracal in tackling much larger vertebrate food. Only the third and fourth premolars are found in the lower jaw, together with the first molar which has two high cusps with cutting edges, set in a wide V and which forms the lower component of the carnassial shear.

The ear bullae are well developed, reflecting the keen hearing of the species; their total length is about 22% of the length of the skull.

Viewed from above, a forward projection of the jugal and maxillary bones forms a very distinct rounded ridge overhanging the infraorbital foramen which, although present, is smaller than in the caracal.

**Distribution**
The serval has a wide distribution on the continent south of the Sahara, with a relict population in the mountainous areas from Morocco to Tunisia.

*North and northwestern Africa*
The serval still exists in **Morocco** (Lambert, 1967). It is a relict species in the humid forests of northern **Algeria**. They are recorded from **Tunisia**.
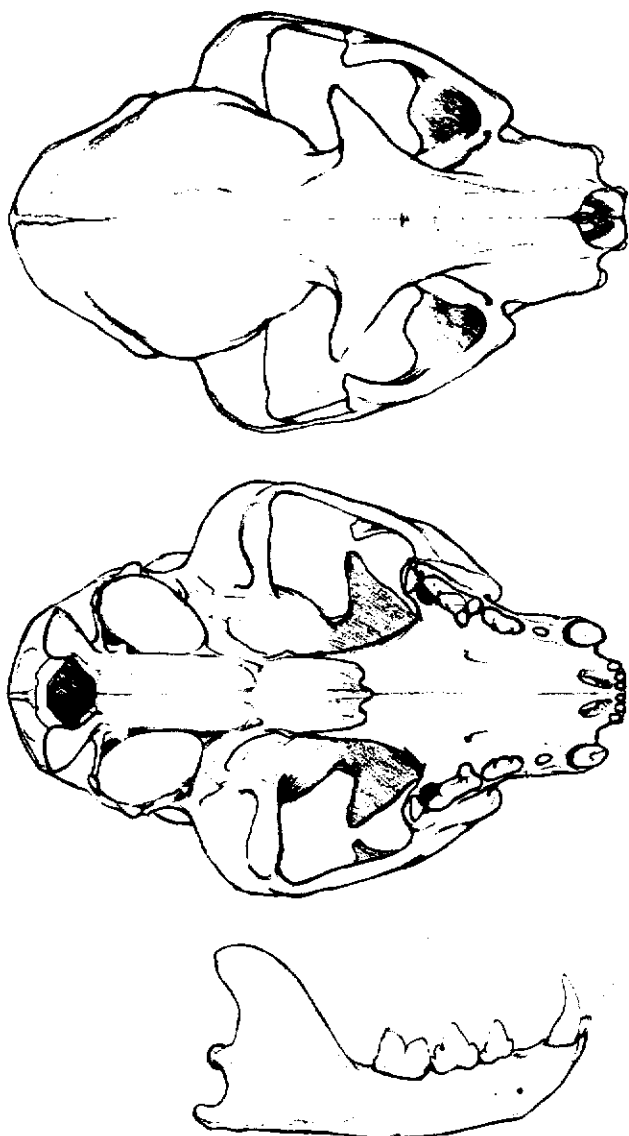
Fig. 253.2 Skull: serval, *F. serval*.
TL Skull 125 mm

bique, south of the Zambezi River. They are common in the eastern **Transvaal**, with fewer records westwards and none in the extreme southwestern parts of the province. They occur in the southern, western and northern parts of **Natal**, but not in the coastal areas. Three were released in the Tongaland Elephant Park in 1987 (Skinner, unpubl.). They are now accounted as rare in the **Cape Province**, where they at one time occurred at Port St Johns and near King William's Town, and a specimen was taken near East London and another near Aliwal North. Stuart (1977) recorded that two were trapped and released in the Tsitsikama National Park in that year. Their status is at present uncertain, but if they still occur it will be in a narrow coastal strip as far west as Tsitsikama, which is as far west as they are known to occur at present.
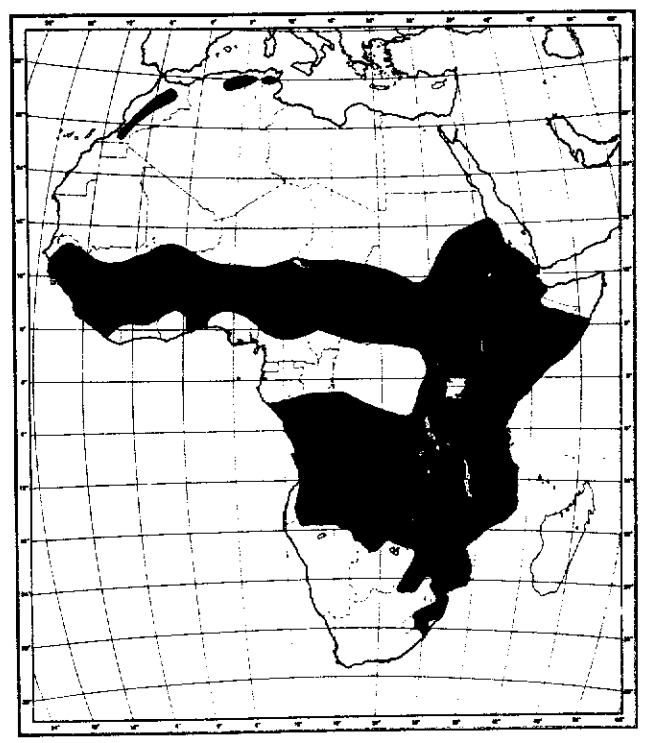


## South of the Sahara, excluding the Southern African Subregion

South of the Sahara they are much more widespread, being listed from most countries from Senegal in the west to Somalia in the east, and southwards to the Subregion. There are specimens in the British Museum (Nat. Hist.) from **Senegal** and they are recorded from **Mali, Guinea Bissau, Sierra Leone, Liberia, Ghana, Togo, Benin, Nigeria**, northern **Cameroun, Chad, Gabon** and the eastern sector of the **Central African Republic**. In the **Sudan** they are absent in the more arid parts of the country, but are found in the vicinity of the White and Blue Nile and in a number of other localities in the south of the country. They occur in **Ethiopia, Somalia, Uganda, Rwanda, Burundi**, northeastern **Zaire**, excluding the forested areas of the Congo basin; **Kenya**; widely in **Tanzania**; throughout **Mozambique**, north of the Zambezi river and in southern **Malawi**. They are widespread in **Zambia** and are recorded from a number of localities in **Angola** where they may occur throughout except in the desert areas.

## Southern African Subregion

In **Namibia** they occur narrowly in the northeast; in **Botswana** throughout the Okavango Delta, northeastwards to the Chobe River and its associated swamp areas and southwards along the Zimbabwe border to about 20°S, reappearing again in the northern Tuli Block farming area. In **Zimbabwe** they occur widely throughout, except in the southwest. They are widespread and common in **Mozam-**

## Habitat

Within their wide distributional range, servals are restricted by their habitat requirements. They do not occur in the South West Arid Zone which covers a large part of the southwestern parts of the Subregion. In Botswana and western Zimbabwe they are confined to areas where there is permanent water, becoming more widespread and common eastwards in the higher rainfall areas, the same situation ruling in the Transvaal.

Proximity to water is an essential requirement, coupled with the availability of adequate cover, whether in the form of stands of tall grass, underbush or reed beds, in which they lie up during the day (van Aarde & Skinner, 1986c).

## Habits

Servals are predominantly nocturnal, with limited activity occurring during early mornings and late afternoons, but diurnal activity is unusual (van Aarde & Skinner, 1986c). Normally solitary, pairs move and hunt together and females accompanied by juveniles up to 3 kg have been recorded, suggesting that the female and her offspring remain together for a considerable time. The male is not in evidence during this time.

Van Aarde & Skinner (1986c) found that two male servals foraged over distances of zero to 205 m per hour during the day and 90 to 463 m per hour during the night. Home ranges of these males overlapped considerably and were 2,08 and 2,70 km² respectively. Like other small carnivores they tend to use established paths or roads to reach their hunting areas, often preferring to use these even if they entail a longer journey, rather than a more direct route through rough country. In their search for vlei rats, *Otomys* spp, they will

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hunt in swampy areas, sometimes among aquatic grasses where the water is 50–80 mm deep, conditions avoided by other species such as the African wild cat. On being disturbed servals will make for the nearest stands of tall grass or reed beds or take to adjacent hillsides where there is good cover of underbush or tall grass. Under stress they will climb trees. Their long legs enable them to run fast over short distances and they are difficult to follow at night. When caught in the beam of a dazzling light, they tend to move off quickly to a considerable distance before pausing to look around.

Servals drop their scats fortuitously along roads or paths, usually choosing a patch of short grass or a depression. Having defecated, they make little or no effort to cover the scats, making no more than a few quick scratches with the back feet, which may not even powder the scat. No attempt is made to use the front feet, this behaviour being different from the African wild cat which excavates a depression and carefully covers the scats by scraping with the front feet. Although the scats may vary with the size of the individual, and be up to 20 mm in diameter, they are quite characteristic when dry, being light grey in colour, bound together with the hair of the rodents it has eaten, with a light grey powdery admixture which may be caused by the end products of the digestion of bones. Most bones are digested but often teeth can be recovered (*Otomys* spp, *Tatera* spp), and these can give useful clues to the prey involved.

## Food

In a sample of 65 stomachs from Zimbabwe murids had the highest percentage occurrence, being found in 97% of the stomachs (Table 253.2).

**Table 253.2**

Percentage occurrence of various food items in a sample of 65 stomachs of the serval, *F. serval*, from Zimbabwe (Smithers & Wilson, 1979)

| Food item | Percentage occurrence |
|---|---|
| Muridae | 97 |
| Aves | 15 |
| Reptilia | 12 |
| Mammalia | 6 |
| Insecta | 5 |
| Soricidae | 5 |
| Amphibia | 1 |

Two species, the Angoni vlei rat, *Otomys angoniensis*, and multimammate mouse, *Mastomys* spp, which are widespread and common throughout the distributional range of the serval in the Subregion, predominated (Table 253.3). The vlei rat lives in damp places along rivers and in and on the fringes of swamp where there is a cover of semi-aquatic grasses, sedges or reed beds.

**Table 253.3**

Percentage occurrence of various species of Muridae in the stomachs of 65 servals, *F. serval*, from Zimbabwe (Smithers & Wilson, 1979)

| Species | Percentage occurrence |
|---|---|
| *Otomys angoniensis*, Angoni vlei rat | 42 |
| *Mastomys* spp, Multimammate mouse | 42 |
| *Tatera* sp, Gerbil | 6 |
| *Mus minutoides*, Pygmy mouse | 6 |
| *Saccostomus campestris*, Pouched mouse | 4 |
| *Steatomys pratensis*, Fat mouse | 3 |
| *Aethomys chrysophilus*, Red veld rat | 3 |
| *Dendromus* sp, Climbing mouse | 1,4 |
| *Dasymys incomtus*, Water rat | 1,4 |
| *Pelomys fallax*, Creek rat | 1,4 |
| *Rattus rattus*, House rat | 1,4 |
| *Rhabdomys pumilio*, Striped mouse | 1,4 |

Birds ranked next after murids, but at a lower percentage occurrence of 15%. They consisted of small birds, weavers, *Ploceus* spp; bishop and widow birds, *Euplectes* spp; waxbills, *Estrilda* spp, and quelea, *Quelea quelea*. The occurrence of weavers, waxbills and quelea, which roost in reed

beds or in stands of tall grass in damp places, is again an indication of the type of terrain over which servals hunt. They are known to take domestic stock up to the size of peacocks (Smithers, 1983).

Reptiles ranked next at 12%, including three species of lizards and two of snakes (Table 253.4). In the stomach of a serval from Mozambique a yellow-throated plated lizard, *Gerrhosaurus flavigularis*, was recognised.

**Table 253.4**

Species of Reptilia found in a sample of 65 serval, *F. serval*, stomachs from Zimbabwe (Smithers & Wilson, 1979)

| Species | Number of occurrence |
|---|---|
| **Sauria** | |
| *Mabuya striata*, Common striped skink | 3 |
| *Chamaeleo dilepis*, Common flap-necked chameleon | 1 |
| *Lygosoma sundevallii*, Sundervall's writhing skink | 1 |
| | |
| **Serpentes** | |
| *Crotaphopeltis hotamboeia*, Herald snake | 2 |
| *Naja mossambica*, Mozambique spitting cobra | 1 |

Among miscellaneous mammals the scrub hare, *Lepus saxatilis*, occurred in two stomachs and the canerat, *Thryonomys swinderianus*, in one. Canerat quills were commonly observed in serval scats and it is thought that when analysis is carried out on a larger series of scats and stomach contents, they will be shown to be eaten more commonly than present information suggests, particularly as they occur in the type of habitat frequented by hunting servals. It is atypical for servals to take antelope.

Insects had a low occurrence at 5%, consisting mainly of grasshoppers and crickets, with an equal occurrence of shrews, *Crocidura* spp, an unusual food item for small carnivores, to which they are generally distasteful. Shrews also occur commonly in the damp habitat frequented by the serval and, therefore, are freely available to them. Amphibia in the form of the remains of a bull frog, *Pyxicephalus adspersus*, was found in one stomach. In killing mice they slap them with a downward blow of the front foot which effectively stuns or kills them.

## Reproduction

Of 20 litters born in captivity at the Zoological Gardens in Pretoria and Johannesberg, these were randomly distributed in eight months of the year (Van Dyk & Wilkinson, pers. comm.); litter size was 1,96 (S.D. 0,5), with a sex ratio not differing significantly from 1:1. Stevenson-Hamilton (1912) recorded young accompanying females in July, August and October in the eastern Transvaal.

In the wild gravid females have been taken from November to March, with a single record for July, indicating that the young are usually born during the middle or latter part of the warm, wet season. The gestation period is 68–72 days (Jones, 1952).

The mean number of foetuses is 2,5 (range 1–3; n=8); implantation is irregular. Foetuses are naked up to about 90 g, pigmentation of the skin clearly marking the location of the black spots and bars at about 150 g. When near full term the foetuses develop a covering of short, soft, woolly hair which shows the black markings, albeit indistinctly. The newborn young retain the soft, woolly coat. The background colour is greyer than in adults, the markings suffused and indistinct (Smithers, 1983).

The four records at present available show that the females litter down on the surface of the ground, either in thick clumps of high grass in open grassland, in underbush or in the cover of stands of maize (Smithers, 1983). If disturbed, females will carry off members of a litter one by one in their mouths. The juveniles certainly accompany the females for a considerable time for they have been collected from family parties at up to 3,4 kg. When a 3 kg juvenile was trapped, the female remained in attendance on it until closely approached.

Females have two pairs of abdominal and one pair of inguinal mammae.

## No. 254

*Felis catus*  Linnaeus, 1758

## Domestic cat
## Huiskat

### Colloquial Name

From earliest historical times man has had an affinity for cats. Through man's commercial and exploratory activities in which domestic cats have accompanied him, they now have a cosmopolitan distribution. The seas of the world which act as barriers to most animals, are not barriers to domestic cats who have travelled with their owners by ship, to be sold or to adopt new owners in strange lands. Domestic animals have no place in a work of this type unless they break away from domestication to establish themselves in the wild as a breeding species. This the domestic cat has done in many parts of the world including the Southern African Subregion and so qualifies for inclusion.

We do not know when the first domestic cats were brought to the Subregion, but it is certainly likely that the first Europeans who settled in the Cape were accompanied by cats or at least that they were introduced shortly thereafter. What is known is that they accompanied him sooner or later to wherever he has settled.

The domestic cat, being an exceedingly versatile creature, has in countless parts of the Subregion settled and become feral very successfully.

They have a very wide habitat tolerance and have established themselves in as diverse situations as in parts of the Kalahari in Botswana, around solitary trading stores, and at the other extreme on Marion Island in the sub-Antarctic.

On Marion Island the introduction of domestic cats to the island is well documented. Van Aarde & Robinson (1980) recorded that five cats were brought to the island in 1949 to control house mice, *Mus musculus*, which were proving a problem in the meteorological station. A survey conducted in 1973/74 (Anderson & Condy, 1974) showed that the cats had become feral and were widespread on the island below the 450 m contour. A fullscale survey was initiated in 1974 (van Aarde, 1977) which confirmed that they were widespread. Further study showed that the intrinsic rate of natural increase was 23,3% per year (van Aarde, 1978), with a population numbering 2 100 (van Aarde, 1979). By 1977 the population was estimated to be 3 409 (van Aarde & Skinner, 1981). Furthermore, far from feeding predominantly on the house mice, Mus musculus, which are common on the island, they were preying on a series of seven species of marine birds including petrels, prions and sheath-

bills which constituted a high percentage of their prey (Table 254.1).

### Table 254.1
Percentage occurrence of marine bird species in the prey remains of feral domestic cats on Marion Island (van Aarde, 1980a)

| Species | Percentage occurrence in prey remains |
| --- | --- |
| *Pachyptila salvini*, Salvin's prion | 60,05 |
| *Pterodroma mollis*, Soft-plumaged petrel | 9,40 |
| *Pterodroma macroptera*, Great-winged petrel | 10,05 |
| *Pterodroma brevirostris*, Kerguelen petrel | 12,04 |
| *Procellaria aequinoctialis*, White-chinned petrel | 0,74 |
| *Halobaena caerulea*, Blue petrel | 2,45 |
| *Chionis minor*, Lesser sheathbill | 0,82 |

The cats were seen to enter the burrows of the larger species and the birds became susceptible to predation when entering or leaving burrows or when courting. Distinct trails led from the cat lairs to burrow entrances. The common diving petrel, *Pelecanoides urinatrix*, which was at one time regarded as a common species on the island (Rand, 1954), by 1965/66 no longer nested on it (van Zinderen-Bakker, 1971).

This serious depletion of the avifauna led to an investigation of the population characteristics of the feral cats on the island with a view to the introduction of control measures (van Aarde, 1978; 1979; 1983; van Aarde & Skinner, 1981). A number of methods of control were tried, including trapping and hunting, but were proved to be ineffective. Trapping success was very low at 50 cats at 702,4 hours/cat and, under the conditions prevailing, hunting only succeeded in removing 190 cats over a period of three years.

In March 1977 feline panleucopaenia virus (cat flu) was introduced to the population. Ninety-six cats were trapped on the island, infected with the virus and released in various parts of the island. Monitoring in 1982 showed that numbers had decreased from 3 409 as estimated from the investigation in 1977 to an estimated 615, although this number probably was higher (van Rensburg, Skinner & van Aarde, 1987).

In a follow up operation in an endeavour to further reduce numbers, 16 hunters, divided into 8 teams of two each, shot 460 cats during the summer season of 1986/7 and this process will continue to the 1988/9 season (Bester, pers. comm.).

Van Aarde (1978) found that, on Marion Island, sexual maturity in feral domestic cats was attained at an age of about nine months old and litters were produced during the first season following their birth. The young were born during the summer months from August to March; no pregnant females were taken in the winter months from March to June.

Most of the cats on Marion Island were solitary, but van Aarde (1978) found that groups of two to five were observed throughout the year and the mean group size was 2,65 (n=79).

# XXXII. Family CANIDAE
## Foxes, wild dog and jackals

Members of this Family are found in a wild state over most of the world, with the exception of New Zealand, Australia, Antarctica and some oceanic islands. The dingo, *Canis dingo*, of Australia, apparently was introduced by visitors or settlers many centuries ago. Members occur in such diverse habits as the ice-bound Arctic to hot dry deserts such as the Sahara, the only association they tend to avoid being dense forest.

Members vary considerably in size but there is a general family resemblance between the species. The head is furnished with conspicuous erect ears. The muzzle is long and tapers to the naked black rhinarium, which encloses the

nostrils. They have long slender legs, an adaptation to their hunting methods, and bushy tails.

The skull is long and narrow, the braincase rounded (Fig. 259.1). The dental formula in all but the bat-eared fox, *Otocyon megalotis*, is:

$$I\frac{3}{3} \; C\frac{1}{1} \; P\frac{4}{4} \; M\frac{3}{3} = 42$$

The number of teeth in the bat-eared fox varies from 46 to 50 (see Text No. 255 Skull).

The Family is represented in the Subregion by three Subfamilies: the Caninae which includes the two jackals, the side-striped, *Canis adustus*, and the black-backed,