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Abstract: Biological account of the cheetah in "Mammals of the South African Subregion".

Mammals of the S. A. Subregion J D Skinner & R H N Smithers

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

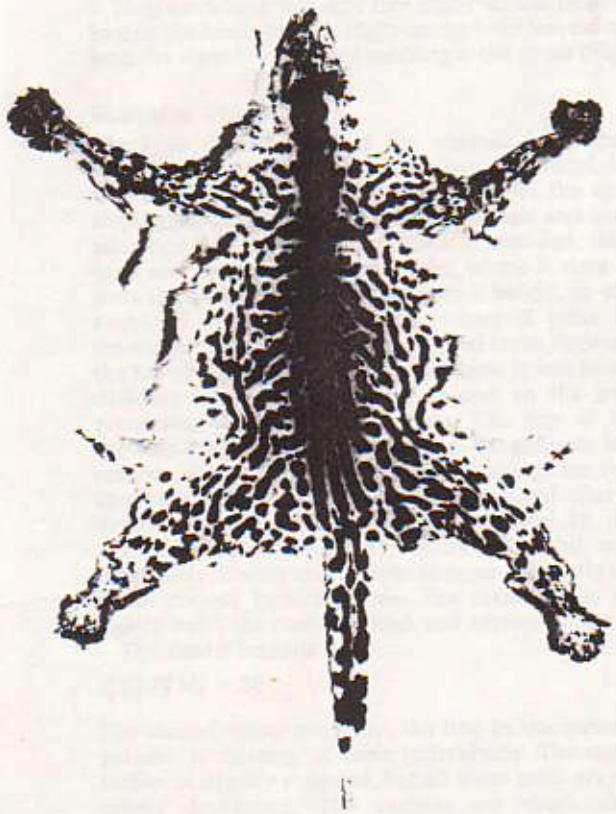

Fig. 247.1. Photograph of the type skin of the "king cheetah", *Acinonyx rex* Pocock, 1927 from Macheke, Zimbabwe. This skin no longer exists (Photo R.H.N. Smithers).

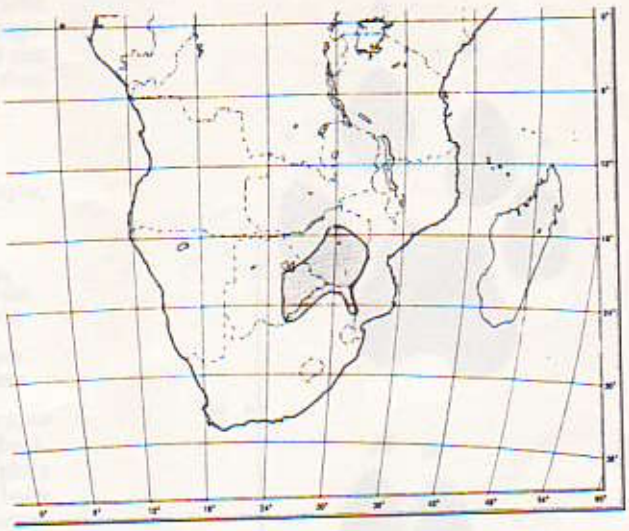

Fig. 247.2. Area within the Southern African Subregion within which there are material and visual records of the "king cheetah".

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

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		
	$\bar{x}$	n	Range	$\bar{x}$	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).

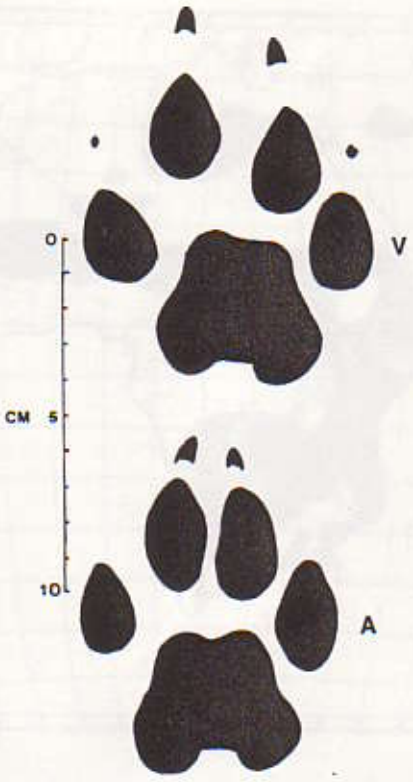

Fig. 247.4. Spoor: cheetah, *A. jubatus*.
F. Right forefoot H. Right hind foot.

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 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 overemphasis 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**.

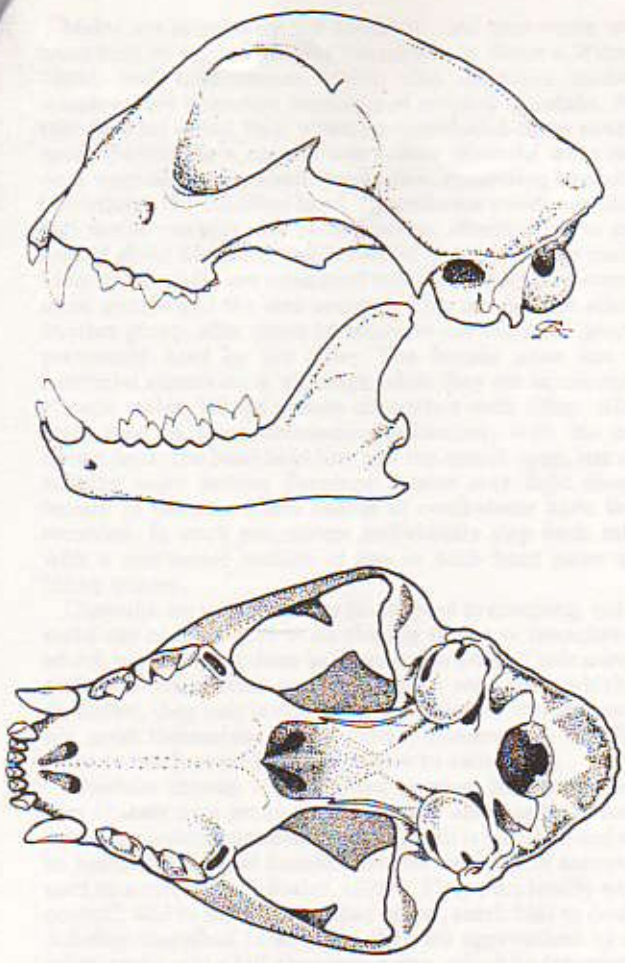

Fig. 247.5 Skull: cheetah, *A. jubatus*
TL skull 175 mm

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 km^2 (range 69,5–85,9) for three females and 48,8 km^2 for two males, excluding random excursions far outside these areas. In Namibia, Morsbach (in Stuart & Wilson, 1988) gave a mean of 1 500 km^2 for females and 800 km^2 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