THE PANTHERS AND OUNCES OF ASIA

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(With Plates I-VI)

INTRODUCTION

In this paper on the Panthers or Leopards of Asia I have followed the same lines as those adopted in my paper upon Tigers (*Journ. Bombay Nat. Hist. Soc.* xxxiii, No. 3, pp. 505-41, 1929).

The terms 'panther' and 'leopard' are used somewhat indiscriminately and inconsistently as synonyms. Leopard is the name by which the animal is commonly known amongst English-speaking people in Europe, America and Africa; but I have given preference to the term panther because I have been told it is more usually employed by Indian sportsmen.

In the tables of skull-measurements the same dimensions have been taken as in the case of the tigers, with the omission of the occiput. The *total length* is taken from the tip of the occipital crest to the tip of the premaxillæ; the *condylo-basal length* (*Cond. bas.*) from the edge of the occipital condyle to the same point above the upper incisors; the *zygomatic width* (*Zygom.*) is across the cheek bones; of the *nasals* the length from the middle line behind to the tip of the processes bounding the nostrils and the width across these processes are given. In the case of the *teeth*, the total length of the upper and lower flesh-teeth (*upper* and *lower carnal.*) and the width of the canine from back to front close to the socket (*upper canine*) are recorded.

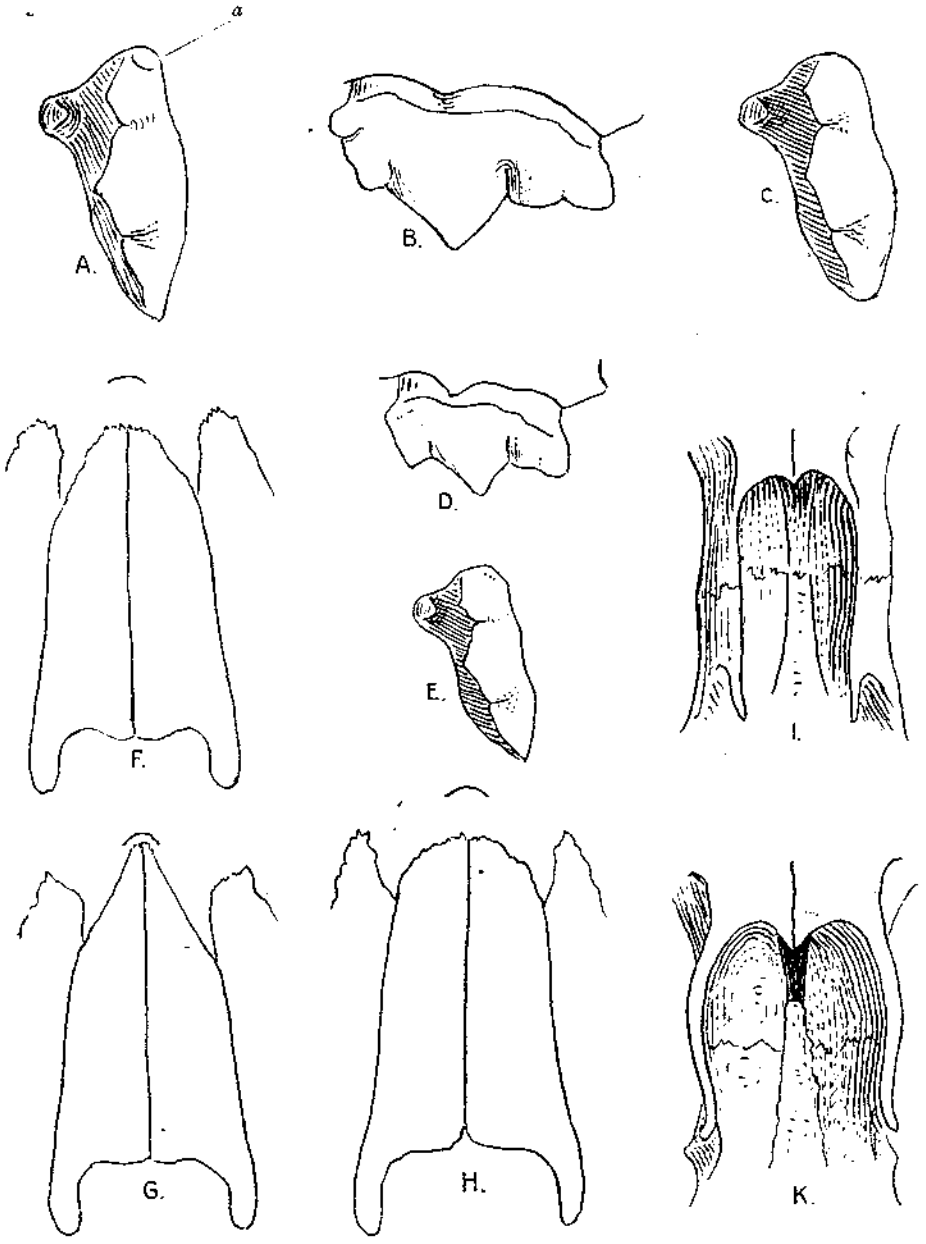
It is the custom amongst zoologists to record all measurements of skulls, and even of skins, by the metric system. But in deference to Indian sportsmen and naturalists for whom the paper is mainly written I have used English inches for the skins and skulls as in the paper on Tigers, the only change being the substitution of decimal for vulgar fractions. For the teeth, however, millimetres, of which twenty-five go to the English inch, have been employed as more suitable for small structures.

My remarks regarding the inadequacy of specimens of skins and skulls of tigers apply equally to panthers and need not be repeated.

THE KINSHIP BETWEEN PANTHERS AND TIGERS

(Pl. I)

In the paper on Tigers, above referred to, I gave reasons for separating the lion, tiger, panther and jaguar from the rest of the Felidæ under the name *Panthera*, of which the panther is the typical



A, B. Upper carnassial tooth, with anterior tubercle (*a*) of Tiger from Nepal.
C. The same, without tubercle, of Tiger from the Central Provinces.
D, E. The same of Panther from Kashmir.
F, G, H. Nasal bones of Panthers from Daltonganj, Pekin and Annam.
I, K. Mesopterygoid fossa of Panthers from Dharwar and Kashmir.
(All figures natural size.)

species or geno-type; and in refutation of the claim upheld by some modern authors that the differences between the lion and the tiger justify their ascription to distinct genera, named *Leo* and *Tigris* respectively, I insisted upon the tolerably close affinity between them and showed that many of their alleged differences in cranial characters have no foundation in fact, being much too variable to be diagnostic.

It now remains to be seen if there are any good reasons for regarding the tiger and panther as different genera, a view held by the Russian zoologist, Satunin, (*Mitth. Kauk. Mus.* IV, pp. 24-5, 1909), who enumerated three distinguishing characters in the skull, as follows :— (1) In the tiger the nasal bones considerably overlap the summit of the maxillæ; in the panther the summits of the four bones are approximately on a level. (2) In the tiger the infraorbital foramen, the hole on the cheek just below the eye, is oval; in the panther it is circular. (3) In the tiger the upper carnassial tooth has a small supplementary cusp on the front of its outer edge, its antero-external angle; in the panther's upper carnassial this cusp is absent.

I will take these characters in order and show that not one of them holds good. (1) In my paper on Tigers I pointed out that, although as a rule, in this species, the nasal bones considerably overlap the maxillæ, they do not always do so, sometimes only exceeding them very slightly, as in the skull of a tigress from Mergui, or indeed not at all as in the skull of a tiger from Sumatra. The bones also vary in panthers, although as a rule they are approximately equal. For instance, the nasals fall slightly short of the maxillæ in a female skull from Daltonganj in Bengal and in one from Annam; but markedly exceed them in a skull from Pekin and are a little longer in all the Javan skulls I have seen (Pl. I, figs. F, G, H). Finally, it may be added that de Blainville (*Osteogr.* atlas II, Pl. VIII, 1839-64), figured the skulls of a male and female panther from Barbary in both of which the nasals pass beyond the maxillæ. They only do so to a comparatively small extent in the male; but in the female they surpass them perhaps quite as much as in typical tigers. (2) Examination of a series of skulls of tigers and panthers shows that the shape of the infra-orbital foramen is much too variable in both species for it to be used as a distinguishing feature. (3) The supplementary antero-external cusp on the upper carnassial in tigers may be conspicuously present, indistinctly defined or entirely absent. On Pl. I, figs. A, B, C, I give drawings of this tooth in the skulls of tigers from Nepal, with the cusp tolerably well developed, and from the Central Provinces in which there is no trace of it. Its incidence is curious. Usually it is present and larger or smaller as the case may be; but in several skulls from Central India it is obsolete, as it is in the typical skull of the Chinese race and also in the Javan race. In the Caucasian and Persian race it is as large as in any; and no doubt Satunin drew his conclusion regarding it solely from Caucasian material. In adult panthers it may be described as absent (Pl. I, figs. D, E), although a vestige of it is not uncommonly just detectable by touch if not by sight; but in the unworn, newly erupted

tooth it is frequently at all events present. But clearly its variability in tigers alone excludes it even as a specific character between these animals and panthers.

One or two additional cranial differences alleged to exist must also be dismissed. Blanford, who quite correctly, in my opinion, assigned tigers and panthers to the same genus, stated, for instance, that in the tiger the lower surface of the mandible is nearly straight to near the posterior angle, then slightly concave, so that the skull, with the lower jaw attached, rests firmly on a flat surface, whilst the posterior portion of the skull nowhere touches that surface. In the panther, on the contrary, he adds, the lower jaw is convex beneath and the skull, when placed on a flat surface with the mandible attached, almost always rests with its hinder portion on that surface. This last character was recently cited by Mr. Prater in corroboration of his view that the skull of a tiger shot by Mr. Limouzin near Ootacamund was a big panther's. But, as I pointed out in my paper, the back of the skull in tigers frequently rests on a flat surface. In adult male skulls it is elevated, but in skulls of young males and tigresses the occiput is often in contact with the surface. So, too, in panthers' skulls. In adult male skulls the occiput is generally raised to a slight extent. In the skull of an oldish male from Kashmir it is raised, indeed, almost half an inch. In females and young males, on the contrary, the condyles or mastoids of the occiput touch the surface. In the case of the mandible, the general straightness of the lower edge is tolerably constant in tigers; but the shape of this edge is very variable in panthers. Sometimes it is convex in the middle with the chin raised, so that the skull 'rocks' as in lions; at other times the chin and the posterior angles are alike in contact with the surface, so that the skull rests as steadily as in tigers. These variations depend upon the effects on the skull of the development of the jaw-muscles and are mainly matters of age and sex.

The cranial differences, indeed, between the two animals are comparatively slight and merely of specific value; the panther's skull being smaller and having smaller teeth. The differences in size are very marked when the skulls of male tigers are compared with those of male panthers and of tigresses with female panthers; but the skulls of the biggest male Indian panthers are almost as big as those of the tigresses from the Sunda Islands. And the same applies to bodily size. The differences in pattern and voice are well-known; and panthers never appear to grow the fringes on the cheeks possessed by most tigers. They also have longer tails and appear to be relatively longer in the body and lower on the leg, differences which are no doubt correlated with arboreal habits.

The identity between Panthers and Leopards

Literature relating to this animal contains much controversial matter, dating from the days of Buffon, Cuvier and Temminck, regarding the existence of two distinct types described as Le Panthère (*Felis pardus*) and Le Léopard (*Felis leopardus*), the panther and the leopard of English writers. But there was much

disagreement as to the characters of the two owing in a measure to conclusions being drawn from different data supplied by skins or living animals or even skulls from various countries. Some relied upon the size of the spots or the length of the tail and general build, and Temminck thought he had discovered an important and constant difference in the shape and dimensions of the skull; but in support of his contention he figured the skulls of a male and female of the Javan race as representing respectively Le Léopard and Le Panthère.

It would be waste of time and space to attempt to epitomise the diverse opinions on this point with reference to the leopards of Africa and Asia which the authors of the early part of the nineteenth century discussed, since all modern zoologists are agreed that it is not a question now of two kinds of leopards inhabiting those continents but of several; and discussion has shifted to a decision as to how many there are and what their correct names may be.

But in India, it appears, the two terms, panther and leopard, are still in use. From conversations with sportsmen, I have, however, been quite unable to discover any unanimity in their application. None now believes, as Sykes believed a century ago (*Proc. Zool. Soc.*, 1830, p. 102), that two distinct species exist in India; but many, I suspect, employ the terms in a general way as Jerdon employed them in 1867 (*Mammals of India*, p. 97) in his non-committal summary of the views of Blyth, Walter Elliot and others. The upshot of his remarks is that there is a larger, paler, more boldly spotted, closer coated variety, the panther, which is seldom found in dense forest but occurs in the ravines of rocky hills and more open country generally, and a smaller, darker, less boldly spotted, fuller coated variety, the leopard, which is found in forested districts.

There is no doubt that some Indian writers of long ago confused the two sexes, as Temminck did, because we find one of the diagnostic features of the panther to be the cranial characters of the male; but Jerdon's opinion no doubt was that the two varieties are environmental races. My own opinion on the matter, based on the material I have seen, is this. When, if it ever comes about, panthers or leopards are collected on the scale on which squirrels, mice, shrews and other animals have been collected by the Mammal Survey of India, with accurate records of dates, localities and habitats, it will be found that, not two only, but several local or environmental races occur in British India. At the present time there is sufficient material in the way of skins to suggest the truth of this opinion; but a hopelessly insufficient amount to establish or refute it. And the question will remain unsettled so long as sportsmen's interests in panthers are restricted to shooting them as dog-eaters, to keeping their skins as rugs, or to adding an inch to their recorded dimensions.

The Distribution of Panthers

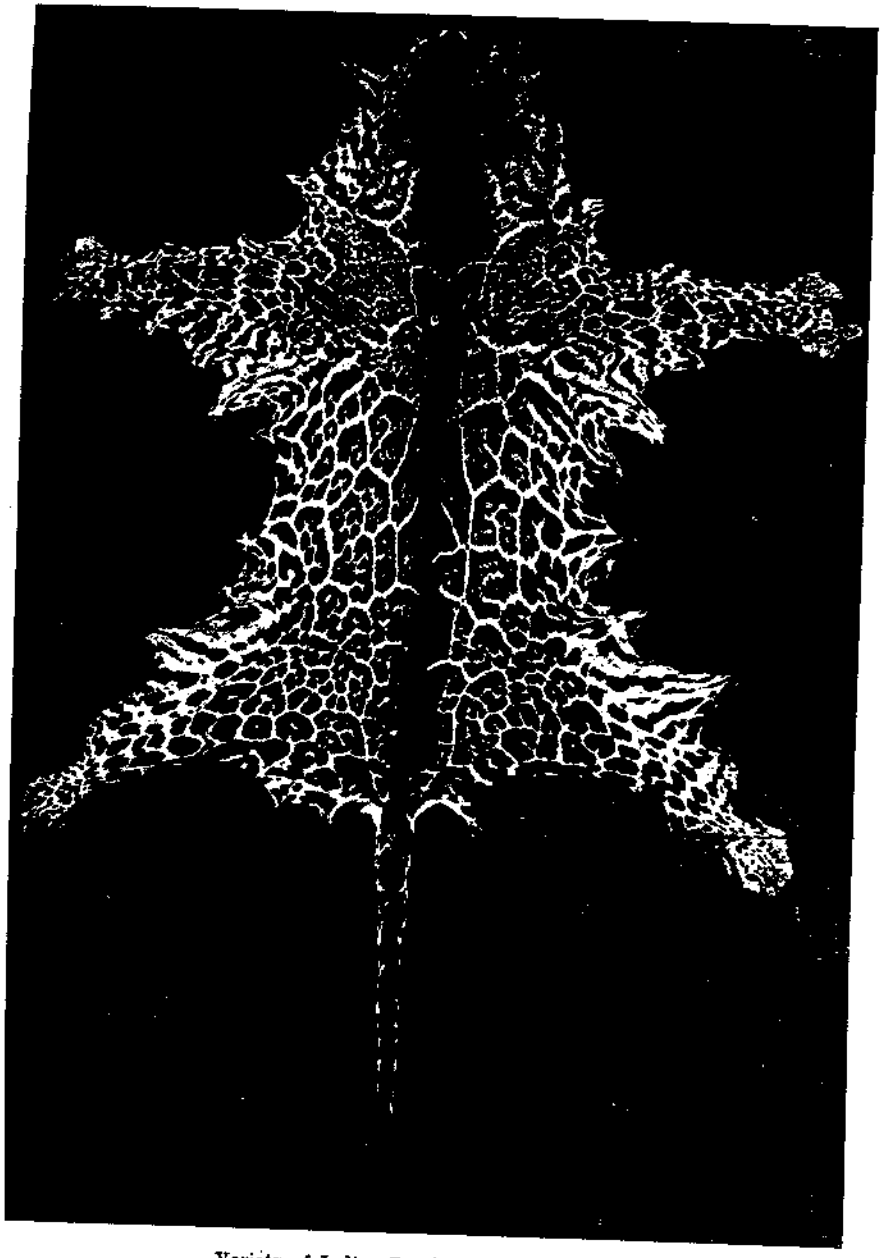
The distribution of panthers, or leopards, coinciding, as it does, with those of lions and tigers combined, and in places overlapping them, has many points of interest. Fossil remains have been found

in Central and Southern Europe; and from the close kinship between the panther of the old world and the jaguar of the new, it may be inferred that the common ancestor of the two lived at one time sufficiently far to the north to pass to N. America, when it was joined to Asia, by the route taken by wolves, foxes, wapitis, and other animals common to the two continents. In north-eastern Asia they survive at the present time in Manchuria and Korea and, it is alleged, in Amurland and Saghalien; but there are none, and probably never were any, in Japan. Extending throughout China they pass through Burma into the Malay Peninsula and thence into Java but not into Bali to the east of it. Their existence in Sumatra, whence they have been recorded, has been recently called in question. Their range, indeed, in the Sunda Islands suggests that they were later comers to that part of Asia than tigers which are plentiful in Sumatra and Bali. On the other hand their presence in Ceylon, where tigers are not found, points to their occupation of peninsular India at an earlier date than tigers. Perhaps they invaded India by two routes, south of the eastern and of the western ends of the Himalayas respectively. At all events they are found in Baluchistan, on the Persian Gulf and all over Asia Minor, everywhere overlapping the tiger in south-western Asia and even passing into Europe north of the Caucasus by the Aral Sea. Since they accompanied the lion and the hunting leopard into Africa, they may equally well have accompanied them, or even preceded them, into India from the west. But their occurrence alongside tigers in China, Burma and along the southern slopes of the Himalayas is equally suggestive of their entry into India by the eastern route as well.

Variations in colour and pattern of Panthers

(Pls. II and III)

The ground-colour of panthers varies normally to a slight extent individually in the same locality and very considerably in different habitats; that is to say, from grey in Seistan and Persia to almost rusty brown in Java. Of abnormal types of colôration black is the commonest. This phase arises from the invasion of the normally yellowish hairs by black or blackish-brown pigment, called melanin. But the intensity of the tint of this pigment is variable. Sometimes it is as deep as the black of the spots which can then only be seen under reflected light by reason of their superior sheen. But quite commonly on the belly it is dark brown so that the spots show up clearly on this area. Black panthers of this type are particularly plentiful in Java and the southern parts of the Malay peninsula. Northwards they have been recorded from Burma, the Shan States, Assam and Nepal and they are alleged to be not uncommon in Travancore and other parts of Southern India. Knox, indeed, referred to a Ceylonese specimen as 'a black tiger'. In the Central Provinces they are comparatively rare; but Dunbar Brander mentions one he saw at Melghat in 1913 which was of exceptional interest, the ground colour being dark chestnut and the spots



Variety of Indian Panther from Cuddapah.

distinctly visible. This specimen was apparently intermediate in tint between a typical black leopard and a normally coloured individual. In that respect it was, I believe, unique, for, as a rule, in Asiatic leopards melanism is a discontinuous variation, that is to say, the animal is either a definite melano or normally coloured and cubs of both types may occur in the same litter.

In Africa, so far as I am aware, black leopards of the kind described above are almost unknown, except in Abyssinia. But in that country the variation is not discontinuous, every intermediate stage between blackening of the spinal area alone to its extension all over the body and limbs being known.

Panthers also exhibit, but much less commonly, the opposite phenomenon, namely, failure to develop pigment which in extreme cases results in albinism. In the British Museum there are a few skins which may be described as semi-albino. One is a reddish skin from Hankow, presented by Mr. Poland, in which the pattern is very indistinct owing to its assimilation in tint to the ground colour. In another from Hazaribagh, presented by R. E. S. Thomas, the ground colour is paler than usual and the spots are tan. In a third from Rhodesia, presented by Dr. Walter Fisher, the spots are sepia or pale chocolate brown and the interspaces sandy. I have only seen one white leopard skin. This is in Mr. Poland's collection and is believed to have come from East Africa. Both the spots and the interspaces are colourless, the spots being visible only under reflected light. This animal was probably a pure albino with blue or pink eyes.

In the variations of colour above described panthers are very similar to tigers. But there is this curious difference. Black leopards are tolerably common; black tigers are very rare. Conversely, albino or semi-albino leopards are rare; but albino or semi-albino tigers are not so very uncommon at least in certain districts of India. There is, on the other hand, a very great difference between the two species in variation affecting the pattern. Tigers vary in the number, width, depth of tint and looping of their stripes. Leopards vary similarly in their spots; but in tigers there is nothing approaching the disintegration and fusion of the stripes such as occasionally occurs in the spots of leopards. So far as Asia is concerned, there are two very remarkable instances of this recorded from S. India. One of these is exhibited by the skin of a specimen shot by Mr. F. A. Coleridge at Putnam in Cuddapah and described and figured by Lydekker (*Proc. Zool. Soc.*, 1908, pp. 1-3, text fig. 1, Pl. II). The general colour is quite normal, the under side being white and the spaces between the spots tawny or yellowish buff; but the rosettes of the typical leopard are in the first place broken up into a multitude of solid spots and dots and more or less concentrated to form large blotches, variable in size and shape, each consisting of a number of dots and spots surrounded by a thickish black, mostly interrupted rim; and all over the flanks these blotches are surrounded and set off by a large-meshed network of narrow lines, paler than the ground tint of the blotches. The network nowhere crosses the spine but the blotches on the back touch or are continuous with a narrow, black, spinal stripe running

from the tail to the middle of the back and breaking up behind the shoulder into a number of narrow longitudinal black streaks which coalesce in front to form a black area running over the neck to the crown of the head. The limbs and tail are unusually heavily marked and the terminal third of the tail is black above. This skin excels that of the jaguar in the size and complexity of the blotches, the pattern recalling in a measure that of the so-called clouded leopard (Pl. II).

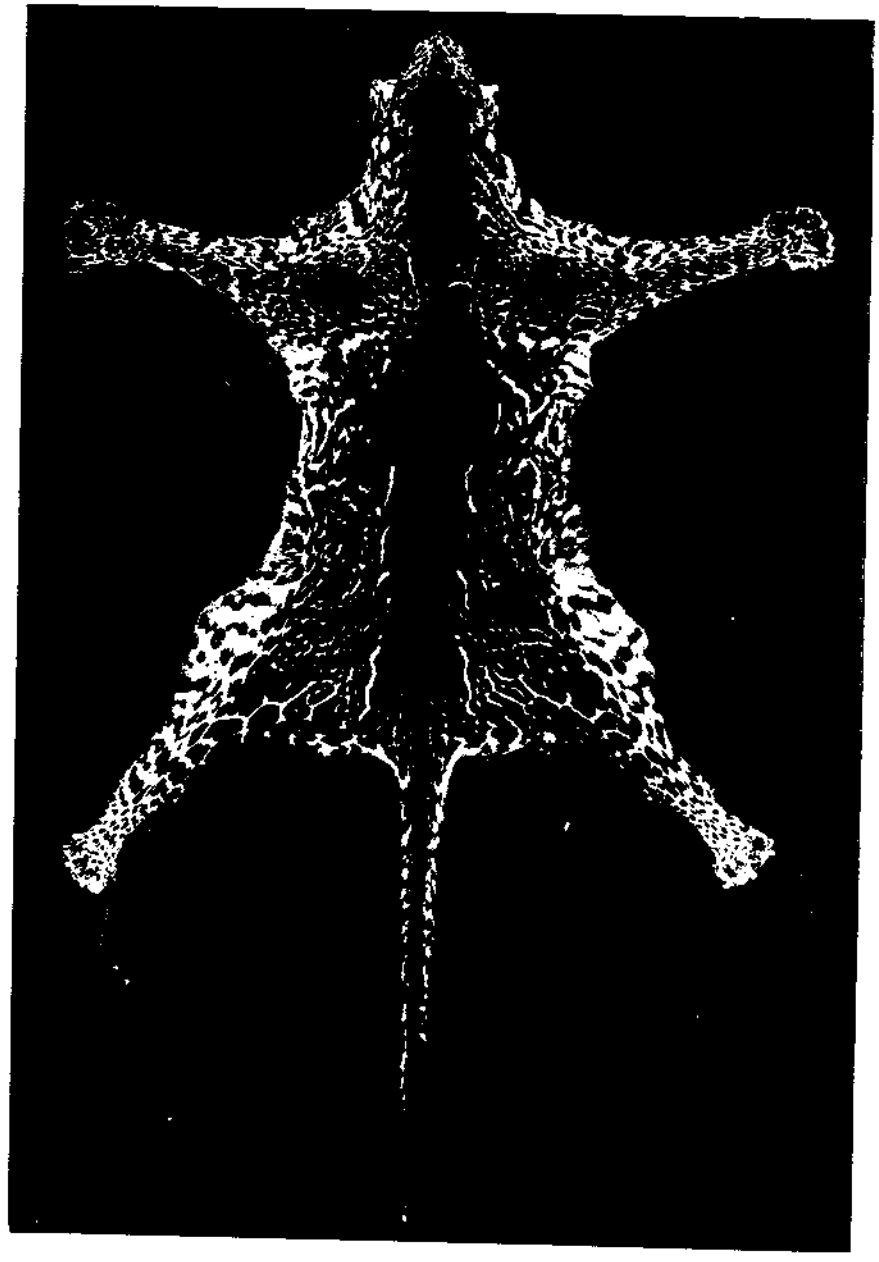
The second specimen, even more abnormal than the one just described, was shot in Southern Kanara and was secured from a native by Mr. C. A. Souter, I.C.S., who kindly lent it to me for description and illustration (*Proc. Zool. Soc.*, 1927, p. 791, text fig. I). The normal rosettes are broken up and fused to such an extent that, supplemented with additional pigment, they convey the impression of a black leopard speckled and streaked with yellow. From the crown of the head to the root of the tail there stretches a broad jet black band, here and there obscurely speckled or streaked and defined over the flanks by narrow longitudinal yellow stripes of varying length arranged subsymmetrically in two interrupted lines, one on each side. The flanks show no definite rosettes, being mostly black with yellow speckling and a few short yellow stripes, all that is left of the normal ground tint. On the thighs the blotches are more distinct and defined by zig-zag streaks recalling forked lightning. The limbs and tail are blacker than in the specimen from Putnam but the belly is white as in that variety (Pl. III).

This Kanara leopard is clearly not a 'melano', like the ordinary black leopards of the East Indies. Only near Grahamstown in South Africa do we find parallel cases of the blackening process it exhibits. Here the pattern may consist of a multitude of small solid spots on a yellow ground; or they may enlarge and coalesce to such an extent that the whole of the back and sides of the animal are glossy black, the spots only remaining distinct on the neck, the lower side and the extremities of the limbs.

Finally I may add that the red leopard skin from Hankow, presented to the museum by Mr. Ernest Poland, shows a variation of pattern somewhat like that of the specimen from Cuddapah, the spots having fused on the back and sides to form abnormally large irregularly shaped rosettes.

Indian and African Panthers

There has been a good deal of misapprehension regarding alleged differences between Indian and African panthers and leopards. Blanford, for instance, while disclaiming his ability always to distinguish the two Indian types he referred to as the bigger, paler, larger-spotted form inhabiting the hills and forests and the smaller, longer-tailed form with rougher fur and less clearly defined pattern commonly occurring in patches of grass and bushes amongst cultivated fields and gardens, said he could tell most African skins at a glance from both of these by their very much smaller spots. But I suspect his acquaintance with African leopards was restricted to the small-spotted forest type of the west coast and to Abyssinian



Variety of Indian Panther from Kanara.

skins and that he knew nothing of the larger-spotted East African types. As will be seen, moreover, from the descriptions of panther skins from India published below, some of the skins from that country have the spots quite as small as in the average small-spotted African forms.

Blandford's erroneous views on this subject were pictorially promulgated by Lydekker in Ward's *Game Animals of India*, 1924, where plates representing skins of an Abyssinian leopard, with small, colse-set spots, and an Indian leopard, with large, dark spots, are juxtaposed to illustrate the alleged differences between the animals of the two countries. But the Indian skin selected for the purpose is, in my experience, quite exceptional in the large size of the rosettes.

Another error, initiated apparently by de Winton and accepted without verification by Lydekker and other writers, is to the effect that African and Indian leopards may be distinguished by the nature of the spots on the neck, solid spots being more numerous and extending farther backwards in African than in Indian skins. This view I find repeated, for instance, in Dunbar Brander's *Wild Animals in Central India*, pp. 128-29, 1923, where the author dismisses as finally settled and buried for some time to come the idea of the existence of more than one species of leopard in India. On this head I may add that I have entirely failed to establish any constant difference between African and Asiatic leopards either in cranial or colour characters; and that I trust the view that there is more than one 'species' of this animal is buried for ever, although the existence of several environmental or local races, known as 'subspecies', cannot be ignored.

Lengths of Asiatic Panthers

Most of the recorded lengths of panthers are taken from tip to tip without distinction between the head and body and the tail. In Rowland Ward's *Records*, 1928, p. 483, for example, there are measurements on this basis of Indian panthers ranging from Kashmir and Nepal to Ceylon. Only the last on the list from Bijnor is marked as a female and she measures 7 ft. 4 in. Presumbaly the rest, varying between 8 ft. 6 in. to 7 ft. 8½ in., the average being 8 ft., were males. It must be remembered, however, that these examples were probably measured in the field because the sportsmen who shot them thought they were exceptionally large. At all events according to Dunbar Brander (*Wild Animals in Central India*, p. 130, 1923) 'a fair average male leopard measures 6 ft. 8 in . . . the large jungle-living animal is anything from 7 ft. 2 in. up to 7 ft. 9 in., a fair average specimen being 7 ft. 5 in.'

But these total dimensions are misleading as to actual size. The tail varies in length very considerably, as was long ago noticed by early writers. Hence in the case of two panthers giving the same total measurement, one with a long tail will be much smaller and less powerfully built in head and body than the other.

In this paper I have recorded the measurements of the head and body separately of most of the skins of adult specimens in the

Natural History Museum; but these are of no great value because most of the skins are probably stretched from being stripped and dressed. In the case of a few specimens, however, shot by trained collectors for the Mammal Survey or other scientifically organized expeditions, measurements in the flesh were recorded in millimetres. These, converted approximately into English feet and inches, are entered in the following table; and to this table I have added the dimensions of half a dozen specimens from Berar in India, shot and measured in the flesh by Gen. R. G. Burton (*Journ. Bomb. Nat. Hist. Soc.*, xxi, p. 1063, 1911). It will be noted that the average total length of the males of Indian panthers according to the table is just about 7 ft., 1 foot shorter than the average of the specimens measured by sportsmen and entered in Ward's *Records*.

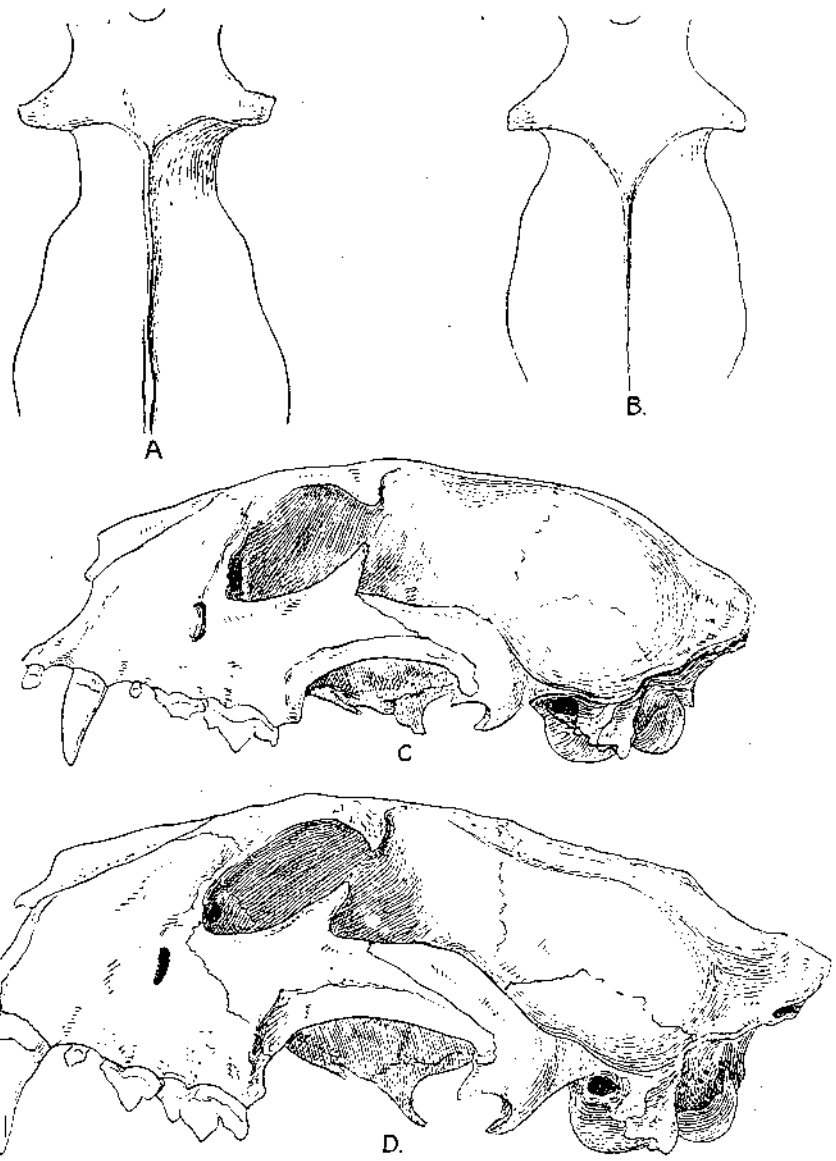
Locality and Sex			Head and Body		Tail		Total	
			Ft.	In.	Ft.	In.	Ft.	In.
Berar	♂	...	4	6	2	9	7	3
,,	♂	...	4	3	2	9	7	0
,,	♂	...	4	2	2	6	6	8
South Dharwar	♂	...	4	2	3	0	7	2
Berar	♀	...	3	8	2	6	6	2
,,	♀	...	3	7	2	7	6	2
Daltonganj	♀	...	3	5½	2	7	6	1
S.E. Shensi	♀	...	3	7½	2	7	6	3
Tongoo	♀	...	3	10	2	10½	6	8½
Annam	♀	...	3	7	2	8	6	3
Java	♀	...	3	6	2	4	6	1½

Sexual differences in the skulls of Panthers

(Pl. IV)

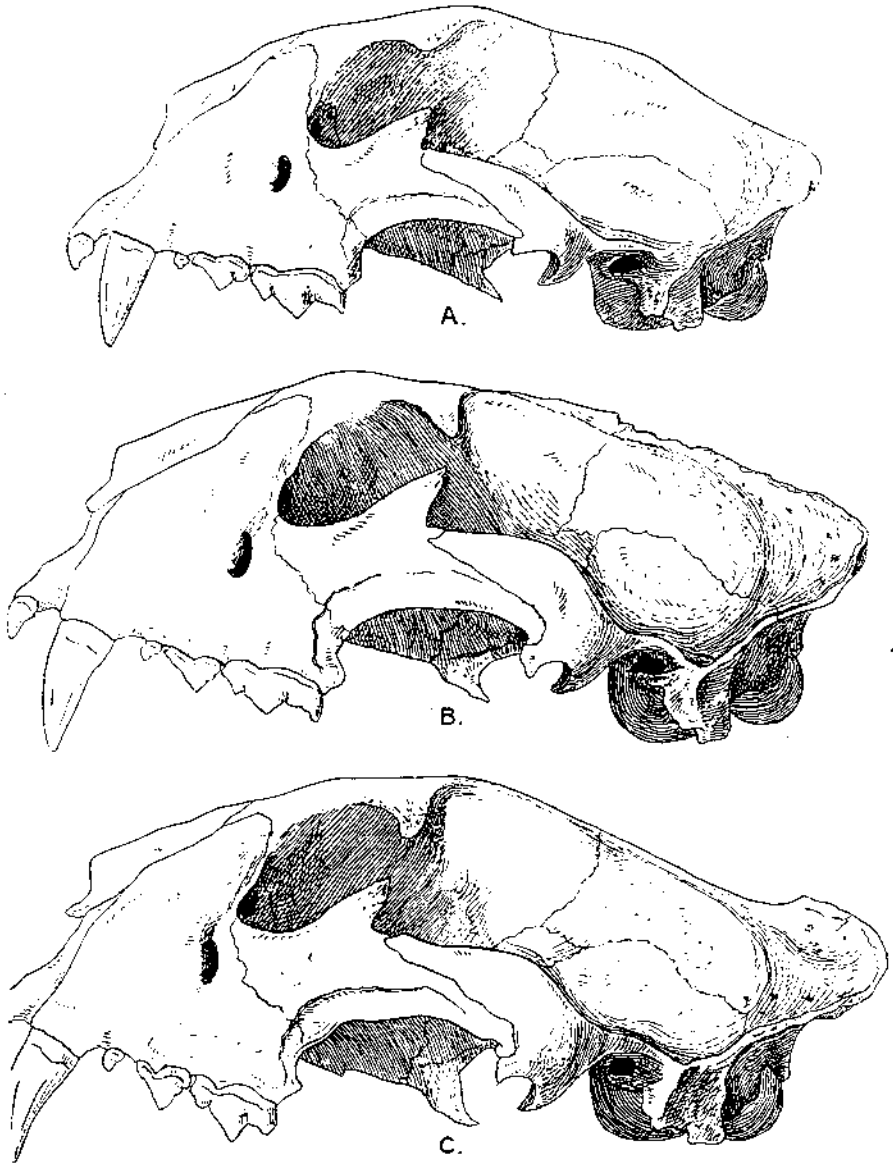
The skulls of full-grown male and female panthers differ not only in size but in shape; and these differences, as stated below, were at one time cited as evidence for the existence of two species, the panther and the leopard, in the same locality. By way of illustration of these differences I have figured on Pl. IV the skull of a tolerably old male from Ashkote, Kashmir, and of a rather older female from Nasair, Kashmir, which in the colour and pattern of their skins are approximately alike.

The male skull is much larger, has larger teeth and a less rounded cranial portion provided with a high median crest running into a more prominent occipital crest. It is also 'long-waisted', that is



A, B. Part of the upper surface of skull of adult male and female Panthers from Kashmir.
C. Side view of the female skull.
D. The same of the male skull.

(Half natural size.)



A. Skull of young male Panther from the United Provinces.
B. Skull of adult male Panther from the United Provinces.
C. Skull of adult male Panther from Bhagalpur.

(Half natural size.)

to say, the constriction of the area behind the postorbital processes is deeper and longer, being actually narrower than in the female, although the width across the interorbital region, the postorbital processes and the hinder part of the cranium is greater. The median crest too in the male skull arises much farther forwards, only a little behind the posterior border of the postorbital processes to which it is joined on each side by a low, transverse, concave ridge. In the female skull these ridges meet the very low longitudinal crest some distance behind the processes. (Pl. iv, figs. A, B, C, D.)

Although not always quite so well marked, similar differences occur between male and female skulls of adults of all races of panthers; and there is seldom any difficulty in distinguishing them. Only one skull has puzzled me. It was collected by G. C. Shortridge for the Mammal Survey at Potoli in Dharwar. It is obviously that of a full-grown animal and is ticketed as a male. Yet in all its characters it resembles a female skull, except in the size of the canine teeth which are unusually thick for that sex.

INDIVIDUAL AND AGE VARIATION IN THE SKULLS OF PANTHERS

(Pl. V)

Supplementing what was stated above with regard to cranial variations, I may add that I have failed to establish the existence of any constant differences between the skulls of the local races of panthers admitted in this paper, except in the matter of size. Skulls from the Caucasus, Persia, India and Ceylon are alike in size and do not apparently differ in character more than do individual skulls from the same province in India. On the other hand the skulls of the Chinese and Javan races are on the available evidence smaller than those of the Indian and Persian races.

But examination of several skulls of Indian panthers, presumably belonging to the same race, has shown very marked individual variations. On Pl. V, I have figured three of these side by side for comparison. Fig. A is the skull of an immature male from Bachkahi in the United Provinces (B. B. Osmaston). It is in the stage of development which is permanent in the adult female, a stage through which all male skulls pass before reaching maturity, the occipital crest being small and the median, or sagittal, crest on the cranium undeveloped. Its especial interest, however, lies in the elevation of the area just behind the postorbital processes, which is the highest point of the head. There is also a marked elevation at the point where the nasals join the frontals. Since these peculiarities are not shown by other male skulls of approximately the same age, they are clearly not attributable to immaturity but are individual variations which would doubtless have persisted without much modification throughout life.

Fig. B is an adult male skull also from the United Provinces (R. St. G. Burke). Apart from its larger size and better developed crests due to age, it differs markedly from the skull from Bachkahi in having its highest point in the interorbital region and in the absence of the swelling at the base of the nasals.

Fig. C is an adult male skull from Bhagalpur. It is very nearly

flat along the top from a point behind the postorbital processes to the interorbital region, and there are slight indications of a swelling at the base of the nasals. In these particulars it is almost intermediate between figs. A and B. It is noticeable also that the occipital crest is more prominent than in fig. B, the adult male from the United Provinces, as prominent, indeed, as that of the old male from Ashkote in Kashmir and a little deeper, whereas the sagittal crest is much lower than in that specimen and in the one from the United Provinces. This Bhagalpur skull, indeed, in its upper contour recalls the skulls of typical male Indian tigers. It is the only adult male skull I have seen from Bengal, the district whence the typical race of Indian panther came.

It may also be noticed that the Bhagalpur skull and the adult skull from the United Provinces are noticeably higher than the skull of the older male from Ashkote in Kashmir. (Pl. IV, D.) This, I believe, is due to age. From the examination of many examples I believe that the skull in both sexes tends to flatten along the top as age advances so that it becomes lower and looks longer than in those that have just reached or slightly surpassed maturity.

Some variations in the length of the nasal bones have already been described in the section discussing alleged cranial differences between tigers and panthers. But these bones vary also considerably in the shape of their upper ends, which may be either narrowed and apically pointed or broad and apically rounded. On the whole they are as a very general rule narrower and more pointed in Chinese, Malayan and Javanese than in Indian panthers; but amongst the latter there is considerable variation in this respect; and the single skull from Annam, described below, is remarkable for the width of the upper ends of the nasals and the roundness of their edges. (Pl. I, figs. F, G, H.)

Another portion exhibiting great variation is the mesopterygoid fossa on the base of the skull into which the nasal chambers open. The range of this variation is exhibited in the skulls of two female Indian panthers depicted on Pl. I. In a skull from Kashmir (fig. K) the fossa is very broad with thin arcuate lateral margins, whereas in one from Dharwar (fig. J) it is narrower and its margins are thick and parallel-sided. Every gradation between these extremes may be found in Indian panther skulls.

The Subspecies or Local Races of Asiatic Panthers

Panthera pardus Linn.

Felis pardus Linn. *Syst. Nat.* ed. 10, p. 41, 1758; and of most subsequent authors.

Panthera vulgaris Oken, *Lehrb. Nat.* pt. 3, p. 1052, 1816.

Leopardus varius Gray, *Mamm. of Brit. Mus.*, p. 40, 1843.

Analysis of the literature shows that the names *vulgaris* and *varius* are substitutes for *pardus* Linn. and therefore synonyms of it.

Since many subspecies of panthers or leopards are now admitted, it is necessary to know to which of them *pardus* Linn. belongs. This was settled by Oldfield Thomas when in his paper (*Proc. Zool. Soc.*, 1911, pp. 120-58) he showed that the first author quoted by Linnæus mentioning a locality for the species, was Alpinus who gave an account of Leopards seen alive in captivity at Cairo and Alexandria. Thomas therefore assigned *pardus* in the strict sense of the word to the Egyptian leopard which as a subspecies takes the trinominal title *Panthera pardus pardus*.

I see no reason to dissent from Thomas's decision on this point. But it was recently challenged by Allen (*Bull. Amer. Mus. Nat. Hist.*, 47, p. 248, 1924), mainly on the grounds that the specimens seen by Alpinus must have come from some point far up the Nile or from Arabia; and in support of this opinion he quoted a French author, who in 1740 declared that there are no lions or tigers or leopards in Egypt. I learn, however, from Major S. S. Flower, late Director of the Zoological Gardens in Cairo, that leopards are still found, not only in southern Sinai, which is politically part of Egypt, but also in the western desert of Egypt between Siwa and Dabaa, Dabaa being on the coast only some 100 miles west of Alexandria. Hence the leopards seen by Alpinus were probably locally captured; and the desert in question may be regarded, with good reason, as the typical locality of *Panthera pardus pardus*.

It may be added that Allen, taking Buffon and Daubenton as the first revisers, if such they can be called, of the leopards, designated Algeria as the type locality of this race. The difference is likely enough to be of no great moment, because it is more probable than not that the leopards of the western confines of Lower Egypt and of Algeria are racially identical animals. However that may be, it is clear that the typical *P. pardus pardus*, being a North African animal, falls outside the scope of the present paper.

There is only one other question to be raised in this connection. Lydekker regarded 'India' as the typical locality of *P. pardus pardus* because Linnæus added 'habitat in Indiis' to his diagnosis. This, however, is no indication of country, 'the Indies' to Linnæus being a vague term for the tropics of the eastern or western hemispheres.

The Panthers of Asia Minor, Persia and Sind

Panthera pardus tulliana, Val.

Felis tulliana, Valenciennes *CR. Acad. Sci. Paris*, 42, p. 1039, 1856; Tchihatcheff, *Asia Mineure*, pt. 2, p. 613, Pl. 1, 1856; Milne Edwards, *Rech. Mamm.* p. 214, 1867; Lydekker, *Proc. Zool. Soc.*, 1899, p. 795, Pl. 54.

Felis pardus, Alston and Danford, *Proc. Zool. Soc.*, 1880, p. 51.

Leopardus pardus tullianus, Satunin, *Mitth. Kauk. Mus.* II, p. 152, 1905; *id. Consp. Mamm. Imp. Ross.*, p. 158, 1914.

Felis pardus panthera, Lydekker in *Harmsworth's Nat. Hist.* I, p. 385, 1910. Dollman, after Lydekker, *Game Animals of India*, p. 321, 1924.

Felis pardus panthera or *tulliana* Lydekker, in Rowland Ward's *Records*, 1910, p. 500, and 1914, p. 498 (at least in part).

Felis pardus saxicolor, Dollman in Rowland Ward's *Records* 1928, p. 482 (not *Panthera pardus saxicolor*, Pocock; *cf. infra*).

Type locality.—Ninfe or Ninfi, 40 kilometres E. of Smyrna.
Distribution.—Asia Minor and Transcaucasian Russia.
Notes on synonymy.—There was at one time considerable difference of opinion about the status and characteristics of this panther. Although Valenciennes correctly described it as related to the ordinary leopard, D. G. Elliot, who examined the type in the Paris Museum, declared it to be nothing but a snow-leopard or ounce and made *tulliana* a synonym of *uncia* in his *Monograph of the Felidæ*, 1883. He was, of course, quite wrong. Tchihatcheff's figure of it leaves no doubt on that point. Nevertheless, Alston and Danford, unwisely trusting Elliot's verdict, recorded the ounce, on the evidence of what he said, as an inhabitant of Asia Minor (*Proc. Zool. Soc.*, 1877, p. 272). Fortunately Milne Edwards showed the error of Elliot's judgment, and Alston and Dandford made the necessary correction three years later (*Proc. Zool. Soc.*, 1880, p. 51), quoting the Asia Minor panther as *Felis pardus* and dissenting from M. Edward's view that it should rank as a distinct species. Later Prince Demidoff fell into the same error when he recorded the ounce from the Caucasus and gave a figure of that animal (*Hunting Trips to the Caucasus*, p. 85, 1898). This error was corrected by Lydekker who published a description and coloured illustration of a Caucasian panther, shot by Prince Demidoff, which he saw at Messrs. Rowland Ward's studios. He seems to have been a little doubtful about the name of the animal; but there are at present no data to justify its separation from *tulliana*, which according to Satunin occurs in Transcaucasia, Erivan, Armenia and Mount Ararat, and according to Danford's experience, was half a century ago generally distributed in the coastal mountainous districts of south-western and southern Asia Minor, although nowhere common.

Blanford and, following him, Lydekker regarded this panther as identical with the Persian race and as ranging from Anatolia to the confines of India. Lydekker, however, called it *panthera* following Pallas who adopted that name for the panthers of the Caucasian area (*Zoogr. Ross.-Asiat.* I, p. 18, 1811). But *panthera* is inadmissible for this race. It was originally assigned by Schreber (*Säug.* III, p. 586, Pl. 99, 1777) to a female panther figured and described by Buffon and Daubenton (*Hist. Nat.* ix, pp. 160 and 174, Pl. XII, 1761), which was definitely stated to have come from Algeria.

The typical example of this panther was sent by Tchihatcheff to Valenciennes who described it as equalling the largest African leopards in size and reddish grey in colour, with a long tail gradually thickening from the root to the tip, the terminal third being tufted. Tchihatcheff's figure, taken from the mounted skin, shows the pattern to consist of large rather widely separated rosettes, mostly broken and irregular and with decidedly darkened centres.

The British Museum possesses the flat native prepared skin of an apparently adult specimen obtained by W. Forbes at Aidin in the Pachalic of Anatolia and to all intents and purposes therefore a topotype of *tulliana*. It measures 8 ft. 8 in., the head and body being 5 ft. 3 in. and the tail 3 ft. 5in. Allowing for stretching,

this probably indicates a panther of about 8 ft. from tip to tip. The hair of the skin is worn off in patches but enough remains to show that the general colour, although pale and probably somewhat faded, is decidedly tawny or buff on the back, paler on the flanks where it merges with the white of the belly. The rosettes are large, the largest up to 2½ × 2 in., being larger, more widely spaced and thinner-rimmed than in typical Indian panthers, with their centres slightly darker than the ground tint. The coat is soft, smooth and at most slightly longer and fuller, the hair on the nape being longish, and the tail is a little more bushy than in Indian animals.

According to Alston and Danford this race 'presents considerable variety in coloration and in proportional length of tail'. The measurements they give of an adult female from Giaour Dagh near Osmanieh were :—head and body 4 ft. 11 in., tail 3 ft. 1 in., making a total of 8 ft. No doubt the skin was stretched.

The mountains of Osmanieh extend southwards to the Lebanon range in northern Palestine; and some sixty years ago leopards, according to Tristram, were common in that country even as far south as the Dead Sea. We have no information about these Syrian leopards. They may be identical with the Asia Minor race. But equally well they may be identical with the leopards of Sinai and western Egypt, which I regard as typical *Panthera pardus*. The panther of Asia Minor (*tulliana*) is, however, certainly distinct from the panther of Sinai.

I have seen only one skull assignable to *tulliana*, namely, that of the female from Osmanieh obtained by Danford, which is in the British Museum. But Satunin records two skulls from Erivan in the northern portion of Asia Minor. The dimensions of these three skulls are as follows :—

	Inches				Millimetres		
Locality & Sex	Total length	Cond. basal length	Zygom. width	Nasals	Upper carnal	Lower carnal	Upper canine
Erivan, ♂ ...	10·2	8·3	6				
,, , ♀ ...	8·2	7 –	5·3				
Osmanieh, ♀ ad.	8·2	7·5	5·2	2·5 × 1·3	23	17	13

The sexes of Satunin's skulls are unstated; but I assume from their dimensions they were male and female. I can find no difference between the skull from Osmanieh and skulls from India, and the dimensions show that this panther from Asia Minor is as large as any recorded race.

Panthera pardus saxicolor, Pocock

(Pl. VI)

Felis leopardus, P. L. Sclater, *Proc. Zool. Soc.*, 1878, p. 289. (Not *leopardus*, Schreber).

Felis tulliana, Blanford (in part); not *tulliana,* Valenciennes.

Felis pardus panthera or *tulliana,* Lydekker (in part); not *panthera,* Schreber.

? Leopardus pardus ciscaucasicus, Satunin, Consp. Mamm. Imp. Ross., p. 159, 1914.

Panthera pardus saxicolor, Pocock, *Ann. Mag. Nat. Hist.* (9), xx, p. 213, 1927.

Locality of type.—Asterabad in Persia.

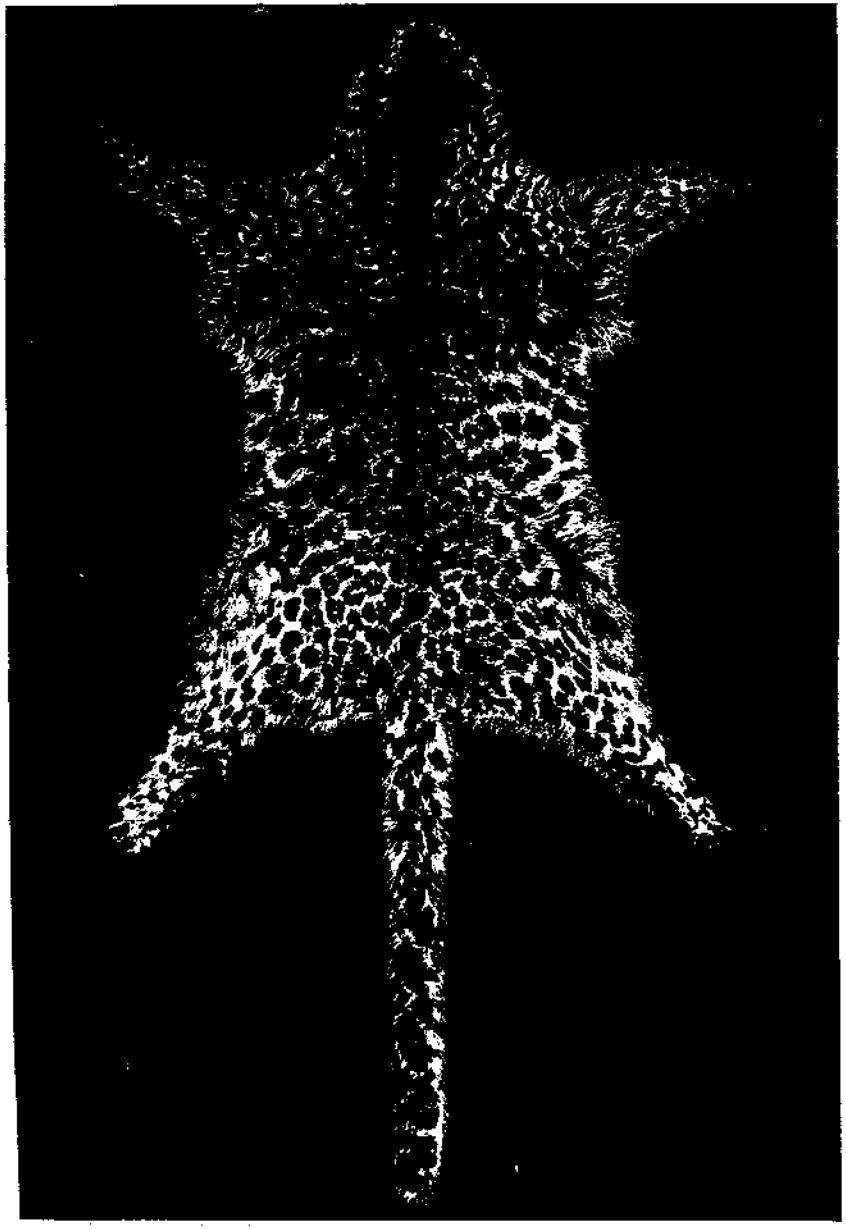
Distribution.—Persia eastward at least to Seistan.

Notes on the synonymy.—This panther has long been known and there are probably many earlier records of it than the one that heads the list of synonyms; but it has passed under inadmissible names, being regarded by Blanford and Lydekker as identical with the race inhabiting Asia Minor. I have interrogatively inserted the name *ciscaucasicus* into the synonymy because Satunin's very brief description of that race as differing from *tulliana* in being smaller, greyer and without any reddish shade, applies so far as it goes to the Persian animal. But as its name *ciscaucasicus* indicates, this panther inhabits southern Russia, north of the Caucasus, the type specimen coming from the Province of Kuban by the Sea of Azov. Apparently only one specimen was available. This was thick coated, the hair being up to 1 inch in length. Its head and body measured 5 ft. 3 in. and its tail 3 ft. 1 in., making a total of 8 ft. 4 in.; the basal length of the skull was 7·7 in., and the zygomatic width 6 in. The skin measurements have little value; but the cranial measurements agree very closely with those of the male example of *tulliana* from Erivan cited by Satunin, and hardly justify his description of this European leopard as smaller than the leopard of Asia Minor. There this race must be left, and pending further information regarding it, I think it wiser to retain for the Persian panther the name *saxicolor* which I gave it in 1927.

Of this Persian race I have seen several skins from the following localities :—

Asterabad. A mounted adult male (Type) in the British Museum, presented in 1882 by Lt.-Col. Beresford Lovett and identified by Lydekker as *tulliana.* The general colour is whitish grey very faintly washed with buff on the flanks, a little more deeply on the back, but without any trace of it on the head or limbs, the limbs being whiter than the head. The rosettes are of moderate size and moderately widely spaced and are smaller, thicker-rimmed and less annular than in *tulliana,* and deep chocolate brown in colour; the largest on the flanks measure about 2 × 1½ in. but are mostly about 1½ × 1¼ in. in diameter. The coat is full, thick and soft, with a considerable quantity of underwool; on the back it is about 1¼ in long, on the belly over 2 in., and on the middle of the upper side of the thick, bushy tail about 1¼ in. The skin, as mounted, measures: head and body 4 ft., tail 2 ft. 9 in., making a total of 6 ft. 9 in.

Rowanduz, near Sulaimaine in Iraq Kurdistan (Capt. Littledale). This skin is more richly tinted than the Asterabad skin described



Persian Panther (*P. pardus saxicolor*).
Skin from Pusht-i-Kuh, winter coat.

above and than the other Persian skins recorded below, linking them with typical *tulliana*.

Pusht-i-Kuh Range in Luristan. Three skins.

(1) Flat skin, in summer coat, belonging to Mr. C. E. Capito, and measuring: head and body 49 in., tail 37½ in., total 7 ft. 2½ in. Coat short, close and smooth with very little underfur, the hair on the back and on the middle of the upper side of the tail is about ¾ in. long, on the belly 1 in. The ground colour is a pale stone-grey, slightly darker and faintly tinged with buff on the back and in the centres of the rosettes, colour of flanks passing imperceptibly into white of belly. Rosettes black, showing up conspicuously against the grey tint, not large, largest about 1½ by 1 in. in diameter, moderately spaced, the intervals about ½ in. on flanks. This panther was shot in the hilly country to the N. E. of Dizful.

(2) Skin of a subadult or adult male also in summer coat (Sir Percy Cox and Capt. Cheesman) and measuring: head and body 56 in., tail 35 in., total 7 ft. 7 in. The coat is about the same length as in Mr. Capito's skin, but the colour is not so grey, being creamy-buff, and more resembling the skin from Rowanduz than either of the other two above described Persian skins.

(3) Skin in winter coat, from Marsh Ao Gorge, 1,000 ft. alt., at the S.E. end of the Pusht-i-Kuh territory, kindly lent to me by Mrs. Lane and measuring: head and body 44½ in., tail 32 in., total 6 ft. 4½ in. Coat long, thick, woolly, showing distinct inclination to tufting, 1¼ in. on back, 2 in. on belly and 1¾ in. in middle of upper side of tail. Colour almost as grey as in Mr. Capito's skin in summer coat, the rosettes less conspicuous on account of the roughness of the coat and of their colour which is brown as in the specimen from Asterabad. (Pl. VI.)

Mishun in the western part of the Province of Fars, approximately 51° E. and 30° N.

(1) A flat skin kindly lent by Mrs. Lane and measuring: head and body 56 in., tail 29½ in., total 7 ft. 2½ in. The tail which is apparently complete being comparatively short. Coat in length and quantity of underwool intermediate between the summer and winter coats exhibited by the skins from Pusht-i-Kuh and similar to the coat of the specimen from Asterabad. The colour is also as in the latter and not so washed out as Mr. Capito's skin from Pusht-i-Kuh.

(2) Head-skin, with skull, belonging to Mr. Capito, a little darker than the head of his skin from Pusht-i-Kuh.

(3) The undressed skin of a female, from Chak-i-Buzza Pa near Mishun, about 2,500 ft., belonging to Mrs. Lane and measuring: head and body 50 in., tail 32 in., total 6 ft. 10 in., closely resembles the complete skin from Mishun.

Seistan, Palang Kuh. An imperfect skin, in winter coat, presented to the British Museum by Col. R. L. Kennion. Coat long, soft and very woolly breaking up into tufts as in the skin in winter coat from Pusht-i-Kuh, but the coat is thicker and more tufted and the rosettes are blacker. Colour pale and washed out, buffy grey on flanks and back, pure white below. The general appearance of the skin is very ounce-like both in colour and coat.

In Col. Kennion's *By Mountain, Lake and Plain*, p. 267, 1911, Lydekker referred to this skin as representing an undescribed variety of leopard.

I have only seen one skull of this panther, namely, the skull of an adult male, accompanied by the head skin, brought by Mr. C. E. Capito from Mishun. Its measurements are as follows :—

	Inches				Millimetres		
Locality & Sex	Total length	Cond. basal length	Zygom. width	Nasals	Upper carnal	Lower carnal	Canine
Mishun ♂ ...	9·6	8·6	6·1	2·8 × 1·6	26	20	16

These measurements, as well as those given of the skin, show that the Persian panther is as large as the typical Indian panther. The skull, however, presents no distinguishing racial characters. In its general form, indeed, it is more like the skulls of two Indian panthers, namely, one from the United Provinces collected by Mr. R. St. G. Burke, and one from Mundiapani in Garwhal, collected by Mr. B. B. Osmaston, than these are like many another Indian skull.

I gladly take this opportunity of expressing my indebtedness to Mr. C. E. Capito not only for the loan of the skin and skull of his own specimens of this panther but for asking Mrs. Lane to lend me the three skins in her possession, a request she most willingly and promptly granted.

According to Mr. Capito these panthers in South Persia inhabit caves and gorges in the barren limestone and gypsum hills down to about 900 ft. Singularly enough there is no reference to this panther in the papers on the Mammals of Mesopotamia and Shiraz by Major R. E. Cheesman and Capt. C. R. S. Pitman printed in *A Survey of the Fauna of Iraq* published by the Bombay Natural History Society in 1923.

To this race belonged a pair of living panthers brought by Capt. Phillips from the Persian Gulf and presented to the Zoological Society in 1878. Dr. Sclater described them as being 'remarkable for their long, hairy coats, bushy tails and pale body colour which remind one rather of the ounce (*Felis uncia*)'.

Panthera pardus sindica, subsp. nov.

Felis tulliana, Blanford, *Mamm. Brit. India*, p. 69, 1891 (in part).
Felis pardus panthera and *F. pardus panthera* or *tulliana*, Lydekker, following Blanford (in part).

Type locality.—Kirthar Range on the Sind-Baluchi boundary.
Distribution.—Elsewhere unknown.

Resembling and no doubt completely intergrading with the Persian panther and distinguishable from the typical Indian form in coat and coloration.

Coat not soft, smooth and flat, but harsher and rough, almost as if singed, with a considerable quantity of underwool; hair on the back about 1 in. long, on the belly about 1¾ in. and on the upper side of the middle of the tail about ¾ in. Colour of the fulvous-buff type, richer than in the typical Persian panthers but very decidedly paler than in the average Indian form, the flanks washed with buff, which becomes intensified on the back; the rosettes show up everywhere against the pale ground on account of their large size, wide spacing and darker centres, the largest being about 1½ × 1½ in. in diameter, with the interspaces frequently as much as ¾ in.; on the average they are narrow-rimmed and inclined to be annuliform.

The only known skin of this race, that of a young male, measures : head and body 4 ft. 2 in., tail 2 ft. 10 in., total 7 ft.

The dimensions of two skulls are as follows :—

	Inches				Millimetres		
Locality & Sex	Total length	Cond. basal length	Zygom. width	Nasals	Upper carnal	Lower carnal	Upper canine
Kirthar Range ♂ (young) ...	8·4	—	5·2	2·5 × 1·2	24	17·5	14·5
,, ♀ ad	7·7	7	4·9	2·1 × 1·2	23	17	12

There is nothing remarkable about these skulls. Neither in shape nor size do they appear to differ from the skulls of either Persian panthers to the west or of typical Indian panthers to the east.

The specimens upon which this subspecies is based were collected by H. E. Watson who gave them to Blanford and he in turn presented them to the Natural History Museum; and it was the skin above described that Blanford apparently had before him and identified as *tulliana* when he wrote (*Mamm. Brit. India*, p. 69): 'There is a race inhabiting Persia and found in Baluchistan and the mountains of Sind that differs widely from all the others and is quite intermediate in coloration and spotting between the leopard and the ounce.' This statement is certainly not true of the skin from the Kirthar Range which is much more richly tinted than any ounce and has smaller and many more spots. Blanford probably knew, at least by hearsay, of the grey Persian leopard, which approaches the ounce in colour but emphatically not in pattern; but he did not distinguish the Persian from the Sind type. He may have compared the Kirthar Range skin with the skin of *tulliana* in the British Museum, which was available for examination. This would account for his identification of the Sind race with the one inhabiting Asia Minor. There is certainly great similarity between the two in colour and pattern, although the Sind specimen is not apparently quite so pale; but there is a great difference in the texture of the coat. More material of the two races will no doubt reveal further differences because there is apparently complete

distributional discontinuity between the two, the greyer Persian race (*P. pardus saxicolor*) dividing them over a wide area of longitude. It may be added that the Sind race differs from the typical Persian race in its harsher coat, brighter colour, and thinner-rimmed, larger, more widely spaced and therefore more conspicuous pattern.

Although this panther is strictly speaking Indian in a political sense, its affinities appear to be certainly nearer to the Persian type than to the panthers and leopards known to Indian sportsmen. I have therefore excluded it from the following section in which these are discussed.

To this subspecies I also refer the skin of a half-grown specimen obtained by Capt. J. E. B. Hotson on the Perso-Baluchi border, no precise locality being recorded on the label. It is rougher coated and the spots are smaller and much less clearly defined than in the example from the Kirthar Range. Those, however, are common features in immature skins. The colour, nevertheless, is decidedly yellowish tawny as in *tulliana*. But possibly this skin may belong to the more northern paler race, *saxicolor*.

(To be continued)